TWENTY-SIXTH

ANNUAL REPORT

OF THE

SECRETARY OF COMMERCE

FOR THE FISCAL YEAR ENDED JUNE 30

1938

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REPORTS BY BUREAUS

TWENTY-SIXTH ANNUAL REPORT

OF THE

SECRETARY OF COMMERCE

DEPARTMENT OF COMMERCE,
OFFICE OF THE SECRETARY,
Washington, August 15, 1938.

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

I am pleased to submit the Twenty-sixth Annual Report of the Secretary of Commerce, covering the fiscal year ended June 30, 1938.

FUNCTIONS OF THE DEPARTMENT OF COMMERCE

The complications of modern times, as caused by competitive conditions at home and abroad, have resulted in fundamental changes in business procedure, and have indicated the need for alertness and business statesmanship in the matter of approaching ever closer to a comprehensive knowledge of all the economic forces.

The Department of Commerce, in its endeavor to meet this need in a spirit of cooperativeness, is implementing its service facilities for increased assistance to the entire business community in surmounting those obstacles which business units, acting individually and without the aid of the Government, cannot overcome.

Each Assistant Secretary of Commerce, knowing the potentialities of the several Bureaus within his particular province, and equipped with the findings and recommendations of the committees advisory to the Secretary, is devoting much of his attention to this question of effective service implementation. While concise statements by the heads of the individual department units covering their activity during the fiscal period just closed form the body of this report, I am pleased to include in this letter of transmittal, for the immediate interest of the Congress, the highlights in the Department's activity.

ECONOMIC REVIEW

Following more than 4 years of gradually improving economic conditions, the upward trend was reversed during the second quarter of the fiscal year under review. In the early months of the year business

moved forward to a recovery peak, but the trend of the major economic indicators was downward throughout the remainder of the year. In the final quarter there were evidences that the corrective process had been completed and the basis laid for a resumption of the forward movement. The sensitive indicators of cyclical fluctuations were again pointing upward, although actual business volumes toward the end of the year approximated the lowest levels reached in the 1937–38 recession.

In view of the relatively favorable position during the early part of the year, when domestic business activity was at a rate considerably above that prevailing 12 months earlier, and the fact that the recession was very uneven, the year as a whole did not show a marked decline in comparison with the preceding year. The most inclusive indicator of year-to-year change, national income payments, shows only a slight decline—the total was less than 1 percent below the 1936–37 figure; it was 12 percent higher than in the fiscal year 1935–36. The declines in cash income from farm marketings and department store sales were about 3 to 4 percent, while our export sales, which moved contrary to the general trend, were up more than one-fifth in volume. The latter increase was a reflection, in part, of the altered situation in agriculture following a year of drought, and it was also an indication of the improved business conditions prevailing in major foreign markets during most of the year. The political trend abroad did have an adverse effect on our sales in some areas, but it likewise caused increased demands for materials needed for armament programs.

In primary production and distribution the decline in domestic activity was sharp. This curtailment was accompanied by a marked reduction in imports and in the volume of freight traffic. Working forces in the industries primarily affected were curtailed materially, while employment in other industries was reduced at a slower rate.

By the end of the year the decline in business volumes, as compared with either June of 1937, or the peak month of the recovery, was more pronounced than the average recession for the year as a whole. The drop was fairly uniform for the series of value figures shown in the left-hand side of table 1, although the volume figures given in the table indicate that manufacturing output, imports, and freight traffic were down much more than the average.

Although prices of raw materials had weakened as early as April 1937, prices of finished products continued to advance until September. In that month, however, a pervasive decline set in that continued until the fiscal year was drawing to a close. Prices of farm products and industrial materials came down sharply. Finished goods yielded more slowly, and in June 1938 such products had declined but 6 percent on the average.

With consumer incomes—as evidenced by the index of the Bureau of Foreign and Domestic Commerce of monthly income payments—still rising as late as August 1937 and with unemployed resources still generally available, the question of what caused the abrupt change in the trend of business is a challenging one. Explanations

have been set forth, both singly and in combination, but their variety indicates the difficulty of appraising what was very evidently a complex situation, and one in which a number of causes undoubtedly contributed to the net result.

Evidence is available that inventories, for example, rose more rapidly than business volumes during the 1936–37 and through the first quarter of the past fiscal year. This rise was thus based only partly upon additional needs for stocks resulting from increasing trade volumes; they reflected as well the appraisal of future prospects of prices and costs. When the price structure weakened toward the close of the preceding fiscal year, orders fell off rather promptly as forward purchasing was retarded and subsequently inventory liquidation, rather than accumulation, became the rule. At the end of August 1937, came the collapse in the stock market which signaled the advent of renewed depression.

While it has been pointed out that profits were still increasing at the time that the weakness developed in the commodity price structure—seasonally corrected index of the earnings of a sample group of large corporations reached a recovery peak in the final quarter of the fiscal year 1936–37—it has been argued that with prices turning downward and costs affected by the sharp rise in wage rates which culminated at the same time—the state of expectations with regard to probable profit trends underwent a substantial modification downward. The price trend also affected anticipations of profits arising from inventory holdings. That these expectations played some part in the shift which occurred in business operations after Labor Day of 1937 is a reasonable deduction from the course of events.

Another factor to which a part is assigned by some analysts is the abrupt decline in the contribution to prevailing activity through deficit financing of the Federal Government. This curtailment resulted in large part from the marked upturn in Government revenues in the latter half of the fiscal year 1937 when the social security taxes became effective, and the decline in Government expenditures subsequent to the payment of the adjusted service compensation certificates held by World War veterans. Adjustments in the tax structure was a condition allied to this feature of the situation. The extent to which the rise in activity had been geared to consumers' expenditures, and the failure of the durable goods industry—notably construction—to come forward at a rate sufficient to sustain the advance, are offered as supplementary explanations of the decline.

The foregoing is designed to indicate some of the forces probably at work, rather than to offer an explanation of the recession. Whatever may have been the cause or causes of the decline, the results are evident from table 1. In the following paragraphs the changes in the major segments of our economy during the year are reviewed briefly:

TABLE 1.—*Indexes of major economic changes*

[NOTE.—Index numbers are computed upon the average for the calendar year or years shown as the base period in this table]

Year ended June 30 and month	Total income payments [1]	Compensation of employees [1]	Cash income from farm marketings [1] [2]	Department store sales [1]	Construction contracts awarded [1]	Wholesale prices	Manufacturing production [1]	Net ton miles of freight carried by class I railroads	Foreign trade: Exports [3]	Foreign trade: Imports [4]
	1929=100		1924–29=100	1923–25=100		1926=100	1923–25=100			
	Index numbers of value						Index numbers of volume			
1920–24, average				91	74	114	87	92	[5]	[5]
1925–29, average			101	105	124	99	108	105	[5]	[5]
1929			102	110	127	96	118	110	[5]	[5]
1930	99.2	98.5	100	108	107	93	110	104	121	121
1931	87.5	85.4	72	99	76	79	86	86	98	101
1932	71.3	69.7	50	80	40	68	69	66	80	91
1933	57.9	56.2	42	64	23	63	66	57	64	76
1934	62.9	63.2	53	72	34	72	82	67	75	91
1935	68.6	67.9	60	76	28	78	80	67	72	93
1936	75.9	75.5	68	82	49	80	96	75	82	111
1937	85.6	85.6	78	92	59	85	114	90	90	131
1938	85.0	84.5	76	88	55	82	87	76	110	105
Percentage change:										
1938 from 1929	−15.0	−15.7	−25.5	−20.0	−56.7	−14.6	−26.3	−30.9	-------	-------
1938 from 1933	+46.8	+50.0	+81.0	+37.5	+139.1	+30.2	+31.8	+33.3	+71.9	+38.2
1938 from 1936	+12.0	+11.7	+11.8	+7.3	+12.2	+2.5	−9.4	+1.3	+34.1	−5.4
1938 from 1937	−.7	−1.5	−2.6	−4.3	−6.8	−3.5	−23.7	−15.6	+22.2	−19.8
Months, 1937–38:										
July	89.3	89.8	95	94	67	88	114	91	97	134
August	90.2	90.8	85	92	62	88	117	90	102	127
September	88.7	89.4	81	94	56	87	110	93	111	121
October	88.0	88.5	78	93	52	85	101	99	128	117
November	86.5	86.6	74	91	56	83	85	78	124	111
December	85.8	85.1	73	89	61	82	79	74	127	111
January	83.5	82.4	70	90	52	81	76	71	114	90
February	82.6	81.4	63	88	51	80	75	62	103	87
March	82.7	81.0	67	86	46	80	75	70	108	97
April	81.4	80.1	71	83	52	79	73	61	110	88
May	80.4	79.5	68	78	51	78	73	64	105	84
June	80.7	79.4	72	82	54	78	74	64	95	87
Comparison final month of fiscal years 1929–38:										
June 1929	99.6	100.2	94	113	126	95	127	109	[6] 121	[6] 136
June 1932	62.3	60.6	39	68	27	64	58	50	[6] 64	[6] 81
June 1933	57.8	56.2	70	67	18	65	93	64	[6] 60	[6] 84
June 1934	65.6	65.7	66	73	26	75	83	68	71	83
June 1935	69.7	69.5	62	79	30	80	85	70	70	99
June 1936	91.2	79.8	80	87	52	79	105	77	74	114
June 1937	88.8	89.8	85	93	61	87	114	85	95	140
June 1938	80.7	79.4	72	82	54	78	74	64	95	87
Percentage change: June 1938 from June 1929	−19.0	−20.8	−23.4	−27.4	−57.1	−17.9	−41.7	−41.3	-------	-------
June 1938 from June 1932	+29.5	+31.0	+84.6	+20.6	+100.0	+21.9	+27.6	+28.0	-------	-------
June 1938 from June 1936	−11.5	−.5	−10.0	−5.7	+3.8	−1.3	−29.5	−16.9	+28.4	−23.7
June 1938 from June 1937	−9.1	−11.6	−15.3	−11.8	−11.5	−10.3	−35.1	−24.7	0.0	−37.9

[1] Monthly figures are seasonally adjusted.
[2] Data do not include rental and benefit payments during the period such payments were made.
[3] Data are for exports of United States merchandise.
[4] Data are for general imports for all years through 1933 and imports for consumption beginning with the year 1934.
[5] Index numbers were not computed on a comparable basis prior to 1930.
[6] Index numbers are averages for the quarter ending June each year.

SOURCES: Total income payments, compensation of employees, and foreign trade, Bureau of Foreign and Domestic Commerce, Department of Commerce: cash income from farm marketings, Bureau of Agricultural Economics, Department of Agriculture; Department store sale, construction contracts awarded, and manufacturing production, Board of Governors of the Federal Reserve System; wholesale prices, Bureau of Labor Statistics, Department of Labor; and net ton-miles of freight carried, Interstate Commerce Commission.

Income payments almost as large as in 1936–37.

Total income payments, including salaries, wages, dividends, interest, rents, entrepreneurial income, and relief payments, totaled approximately 66.8 billion dollars for the year as compared with payments of 67.3 billion dollars for the 1936–37 period. In contrast to the rising trend that characterized the earlier period, income payments declined steadily throughout most of the fiscal year. From a recovery high of 89.4 (1929=100) for the first quarter of the fiscal year, the seasonally adjusted index of income payments declined to a low of 80.8 for the final quarter. The index at that time was still 43 percent above the depression low of 56.5 reached during the second quarter of the calendar year 1933.

Compensation of employees for the 12-month period ended June 1938 aggregated 43.4 billion dollars, a decline of 1.5 percent from the 44.1 billion dollars paid out during the preceding year. Compensation of employees includes wages on work-relief projects, but excludes direct relief and benefit payments under the social-security programs. Direct relief and social-security benefit payments increased by nearly $500,000,000 for the 12-month period.

For the year the commodity producing industries (mining, manufacturing, and construction) were the only major industrial group to experience a contraction. Employees' compensation in these industries was off 6 percent from the 1936–37 period. Salaries and wages were up 2 percent in the trade and transportation group, and 3 percent in the service industries (including Government).

As a result of the declining trend during most of the year, comparisons of June 1938 with June a year ago are less favorable. On the June-to-June comparisons, salaries and wages were off 27 percent for the commodity-producing industries and 8 percent for the trade and transportation group. Owing largely to the relative stability of governmental pay rolls, employees' compensation in the service industries was within 2 percent of the June 1937 level.

The flow of income to property owners during the fiscal year was approximately the same as in the preceding year. Interest payments showed a slight advance in the final quarter over those for the corresponding 3-month period of 1937, but with dividends off 30 percent aggregate property income payments were 14 percent lower.

While cash income from farm marketings was only about 3 percent lower in the fiscal year 1938 than in the preceding 12-month period, Government rental and benefit payments were reduced by more than one-third. As a result, total cash farm income was about 5 percent lower. Harvests of the major crops were much larger than in the 1936–37 fiscal year, but the increased supplies were accompanied by decreased demand and steadily declining prices resulting from generally depressed industrial conditions. Hence, seasonally adjusted cash farm income declined steadily during most of the year. As in other types of income payments, this downward tendency was in contrast with an upward trend during the fiscal year 1936–37.

Production and Distribution.

Although the production of nondurable goods turned downward earlier in the recession, the drop in the production of durable goods when it developed was much greater. Steel-mill operations, for example, declined from 85 percent of capacity in August 1937, to 28 per-

cent in June 1938. Automobile production in June was only about one-third as large as a year earlier, and many other durable-goods lines, including machine tools, and other steel products, lumber and building materials, and machinery, recorded marked declines.

The trend of operations in the leading extractive industries during the fiscal year 1938 was about the same as that for manufacturing industries. Output of mines reached a recovery high early in the year, and then declined with only minor interruptions through May 1938. On a seasonally adjusted basis, bituminous coal output dropped about one-third, and production of copper, lead, zinc, and iron ore showed similar contractions. Crude petroleum production was also lower, but the relatively steady demand for automobile fuels held the decline to moderate proportions.

Retail sales of general merchandise were generally maintained around the best levels of the recovery period during the first half of the fiscal period, but declined in the final 6 months. Aggregate retail sales, including sales of automotive dealers, for the year are estimated to have been nearly 10 percent lower than in 1936–37. Purchases of consumers' durable goods—those which can be more readily postponed—experienced a marked contraction as consumer incomes declined. Sales of new passenger cars, for example, were off more than a fourth for the year, and in the latter half were down almost 50 percent on a value basis.

Sales of general merchandise, as reflected by the results of department stores and the mail-order companies, were only moderately lower for the year as a whole, but the decline gradually widened. The contraction in retail trade was generally larger in the predominantly industrial areas as might be anticipated from the trend of the national income figures previously discussed.

For the fiscal year, freight-car loadings were 14 percent lower than in the preceding year; in the latter half of the period loadings were off by one-fourth from the corresponding period a year earlier—approximating the lows in 1932–33. The financial position of the railroads deteriorated, aggravating an already serious situation. Net operating income in the months January through June 1938 were the smallest on record; moreover, in February 1938 there was an excess of operating expenses over operating income. Freight rates were raised somewhat in the final quarter of the fiscal year, and passenger rates in the eastern territory were also advanced in an effort to bolster revenues. In May the railroads instituted proceedings to reduce wages of railway employees by 15 percent, but final determination on the proposal will not be reached for some months.

Construction.

Building construction, which had been looked to as a source of impetus to the rise in 1937, experienced a renewed slump which extended to both residential and commercial building. In July 1937, contract awards reached the highest total since April 1931, but subsequently declined through the third quarter of the fiscal year. In the final quarter, however, renewed activity of private builders appeared and the enlarged public-works program voted by the Seventy-fifth Congress promised a substantial rise in Government-sponsored construction.

During the early part of the fiscal year, relatively favorable business conditions and an increasing need for new facilities led many corporations to start work on industrial structures which had been under

consideration. As a result, awards for such structures rose to a relatively high total for a brief time. In July 1937, contracts let for industrial buildings were valued at $58,500,000, a total exceeded in only 2 months since 1925, which is the earliest date covered by these statistics for 37 States east of the Rocky Mountains. The contraction in business subsequent to August 1937 led to reductions in industrial building so that during the latter half of the fiscal year they averaged less than $10,000,000 per month.

Residential construction which had been tending upward early in the fiscal year, subsided rapidly in the fall of 1937. In the latter part of the fiscal year, residential awards resumed an upward trend, and by June 1938 were only about one-fifth below the recent high recorded in April 1937, on a daily average seasonally adjusted basis.

A factor in this recent rise was the liberalization of the Federal Housing Administration loan requirements. Also, the improvement in the rent-building cost relationship was a favorable influence which exerted its effect with the renewed upturn in income payments.

Unemployment increased during the year.

Employment decreased from September 1937 to January 1938, and subsequently showed little change through the balance of the fiscal year. During the last 4 months of the fiscal year, the number at work in nonagricultural pursuits held steady at slightly less than 32,000,000 workers, as compared with 35,000,000 in September 1937, and the March 1933 depression low of 26,000,000. These estimates cover all persons engaged in gainful work outside of agriculture, including self-employed and casual workers, but exclude those employed on projects of the Works Progress Administration and other emergency relief projects, and those enrolled in the Civilian Conservation Corps. With the decline in private employment in the fall of 1937, work on emergency projects was rapidly expanded so that by June 1938 a total of 2.9 million workers were engaged on Works Progress Administration and emergency relief projects.

Decreasing employment and the normal growth of the working force resulted in an increase in the number of unemployed from about 5.7 million in September 1937 to about 11 million at the end of the fiscal year, according to unofficial estimates which check closely with the unemployment census conducted by the Government in November 1937. Counted as unemployed in these estimates are those at work on Works Progress Administration and other emergency relief projects, including the Civilian Conservation Corps.

Export trade relatively better than domestic trade.

Exports of United States products continued to rise during the greater part of the fiscal year 1937–38. Business activity in most foreign countries averaged higher than in the preceding fiscal year, though the general trend was downward in the latter half of the year. In a number of countries the increased demands resulting from armament expenditures was an important factor in the trade situation. Our above-average crops of 1937, while poor crops were harvested in some other important producing countries, enabled importing nations, principally those in Europe, to buy United States grain at competitive prices for the first time in a number of years. Moreover, the reductions in tariffs and other concessions of the reciprocal trade agreements in effect between the United States and 15 countries throughout the

year, and with 2 additional countries for part of the year, were a force operating in the direction of increasing the volume of United States foreign trade, although the results of this program are not susceptible of precise measurement.

It is not possible to mention in this brief review all the factors that influenced trade movements in 1937–38. Note should be taken, however, of certain retarding influences. Disturbed conditions in China and Spain, the official control over import trade exercised by Japan, and the changes in tariffs and applications of the expropriation law of 1936 by Mexico—all operated to curtail our trade with those four countries.

The gain of one-fifth, or more than a half a billion dollars, over the preceding year brought the total of our exports to the largest figure for any fiscal year since 1929–30. Compared with the value in the depression low year, 1932–33, last year's figures were more than 135 percent higher.

Exports of agricultural products were one-fifth larger, reaching the highest value in the past 7 fiscal years. The quantities of grain exported from the United States, particularly of wheat and corn, compared favorably with those past years when our position in world grain markets had been more significant.

The increase in the value of grain and flour exports in 1937–38 over the preceding drought year figure was $182,000,000, whereas the value of all agricultural exports taken together increased $158,000,000. Exports of a number of other agricultural products—meats, fruits, leaf tobacco, and lard—increased, but the substantial reduction in the value of unmanufactured cotton exports, as a result of the decline in prices, acted to more than counterbalance the combined increases for products other than grain.

A substantially larger quantity of United States cotton—our principal agricultural export commodity—was shipped to the countries of Europe in 1937–38 than in the preceding fiscal year, but since Japan's purchases of cotton decreased by more than one-half, total exports were only moderately larger than in the preceding fiscal year. The value of exports of unmanufactured cotton in 1937–38 dropped to approximately $312,000,000, or $71,000,000 under the value in 1936–37.

Exports of nonagricultural products, which had expanded in the preceding fiscal year to almost three-fourths of the export total, increased approximately one-fifth in value and, therefore, constituted approximately the same large proportion of the export trade in 1937–38. Finished manufactures comprised 49 percent and semimanufactures 18 percent, practically the same percentages as in the preceding year. Principal nonagricultural exports showing marked advances included metal-working machinery and other industrial machinery, agricultural implements, aircraft, automobiles and trucks, heavy iron and steel products, and refined mineral oils.

United States trade with the world in 1937–38, compared with several post-war years and a pre-war average period, is presented in table 2. Practically the entire change in the value of our trade in 1937–38 from that of the preceding fiscal year was the result of variations in the volume of goods exported and imported. This was not the case, however, with reference to other recent years; the changes in the prices of commodities over a period of years explain

a significant portion of the fluctuations in values. In terms of volume, the export trade in 1937–38 was half again as large as the average for the period 1932–36.

The sustained high value of merchandise exports in 1937–38, and the contraction in import trade, resulted in an excess of exports over imports of over $1,000,000,000, the largest merchandise export balance for any fiscal year since 1928–29. This excess was largely counterbalanced in our international balance of payments by net imports of gold and silver.

Imports from all great trade regions of all classes of merchandise were smaller in value in 1937–38 than in the preceding fiscal year, during which the monthly volume rose to an all-time high record. The incoming trade subsequently declined until the import volume in the second quarter of 1938 touched the lowest level since 1934. Total imports for the year 1937–38 were down about one-fifth in both quantity and value as compared with the preceding fiscal year.

The lowered value of import trade in 1937–38 resulted from a reverse domestic situation to that which had prevailed the year before. Reflecting the recession in manufacturing output, industrial demand for imported crude materials slackened greatly, while the ample domestic supplies of grain and lower prices cut off imports of grain and feed which had loomed large in the imports of 1936–37.

In comparison with the decline of one-fifth shown for the value of total imports, the decline in imports of competitive agricultural products such as wheat, corn, feeds, vegetable oils, and meat products, which were obtained from abroad in large amounts during the years of domestic shortage, was almost two-fifths. Above average decreases occurred also in competitive agricultural products which are regularly imported into the United States in large quantities—for example, hides and skins, and raw wool.

Financial developments.

During the early months of the fiscal year, attention in the financial markets was directed primarily to the series of official steps taken with a view to easing general credit conditions. A combination of factors had tended during the second half of the preceding fiscal year to produce some uncertainty in business prospects. Since the volume of banking funds available for lending and investment was satisfactory and liquidation by banks of Government securities had practically ceased after the Federal Reserve System's stabilizing efforts of March and April 1937, the Federal Reserve banks adjusted their rediscount rates during August and September to a uniform rate of 1½ percent, except the Federal Reserve Bank of New York, which lowered its rate to 1 percent, the lowest central bank rate in history.

The principal statistical factor on which credit-easing operations were predicated was the relatively low volume of excess reserves of the reporting member banks which had fallen to $773,000,000 by the end of August 1937, as compared with $2,152,000,000 at the end of January 1937. Among the New York banks the decline in excess reserves was relatively greater than for the country as a whole, and since the autumn demands for currency and credit were viewed as requiring easing action the Board of Governors of the Federal Reserve System requested the Secretary of the Treasury to release

$300,000,000 from the inactive gold account. Simultaneously, the System on September 12 announced that the Reserve Banks would stand ready to buy additional Government securities in order to meet the expected seasonal demands. Within 10 days of this action excess reserves had increased to a total of more than $1,000,000,000.

In the meantime, stock prices, which had risen during July, turned downward toward the end of August. This decline, which extended to corporate bond prices, was accentuated by several sharp breaks, notably by those of October 18 and 19. The Board of Governors reduced the margin requirements on security loans, both by banks and by brokers from 55 to 40 percent, effective November 1, but share prices continued to fall, and during the first 5 months of the fiscal year showed a net loss of about 30 percent.

Generally speaking, security markets remained weak until the final month of the year. Although sensitive to the movement of share prices during the first half of the year, domestic bond issues were relatively firm at times of further weakness of stocks during the second half. Foreign issues broke sharply in March 1938, when Austria was incorporated within the German State, and reacted delicately during subsequent months to foreign political developments.

Loans and investments of reporting member banks in 101 cities fell from $22,290,000,000 at the end of June 1937 to $20,561,000,000 on June 29, 1938. The year's decline in total loans—$9,760,000,000 to $8,321,000,000—resulted from a steady drop from the end of August 1937 to the end of the fiscal year. Loans by reporting member banks for commercial, industrial, and agricultural purposes rose from $4,331,000,000 at the beginning of the year to $4,807,000,000 at the end of September, and then receded steadily to a year-end figure of $3,936,000,000. Loans to brokers and security dealers fell sharply after the break in stock prices during the second half of October, and as a result of a downward tendency during the rest of the year, stood at $652,000,000 at the end of the year, as compared with $1,447,000,000 on June 30, 1937.

Security issues for the purpose of raising new capital during the year were relatively small in volume. Although the supply of investment funds was ample, the sharp declines in security prices and the uncertainty of business prospects acted as a deterrent to new flotations.

In line with the easy money policy and because of a changed situation as compared with that confronting the Treasury and Reserve Bank authorities late in 1936, when the gold sterilization program was inaugurated, it was announced by the Secretary of the Treasury on February 14, 1938, that gold acquired after January 1, 1938, would be included in the inactive gold account only to the extent that such acquisitions in any one quarter exceeded $100,000,000. In accordance with the proposals made by President Roosevelt on April 14, in his message to Congress, the Treasury at once desterilized approximately $1,400,000,000, the net accumulation since December 21, 1936, and the Board of Governors, on April 15, "as part of the Government's program for encouragement to business recovery," reduced the reserve requirements on all classes of deposits of member banks by approximately 13¼ percent. The net effect of these steps was to increase excess reserves of member banks to $2,875,000,000 by the end of the fiscal year and to bring money rates to levels well

below those of a year previously, as reflected, for example, in the yield on Treasury notes of 3–5 years' maturity which fell from 1.55, on June 30, 1937, to 0.68 by the corresponding date of 1938.

Net gold imports during 1937–38—though aggregating $799,000,000—were not so large as in the 3 preceding years. Although the inflow continued on a relatively high level early in the year, its rate was materially retarded after the sharp fall in security prices during September and October 1937. During the next 2 months the movement was actually reversed when heavy foreign withdrawals of dollar balances reduced foreign-owned short-term dollar assets held in American banks from $2,305,000,000 on September 30 to $1,730,000,000 on December 29, and gold was exported and placed under earmark for foreign account as a consequence. This outward movement was influenced by an improvement in the French situation, and by the removal of other factors which had caused foreign capital during earlier months to be expatriated to the United States.

The withdrawal of foreign-owned dollar balances continued during the second half of the fiscal year, but was influenced more and more by the foreign need for dollars to meet the substantial net payments due this country from the large excess of merchandise exports. Except for periodic weakening, as for example following the President's message to Congress on April 14, the dollar remained firm during the rest of the year. Gold continued to flow to the United States in moderate amount, and during a great part of the second half of the year foreign currencies, influenced by new financial crises in France, were under pressure.

Treasury receipts during the year aggregated $6,242,000,000 as compared with $5,294,000,000 during the preceding year. On the other hand, expenditures amounted to $7,766,000,000 as against $8,105,000,000 in 1936–37. The gross debt, less net balance in general fund, increased during the year from $33,871,000,000 to $34,949,000,000.

TABLE 2.—*Foreign trade of the United States*

Fiscal year ended June 30—	Millions of dollars							Quantitative indexes (1923–25=100)	
	Exports		General imports	Imports for consumption	Excess of exports (+) or imports (−)				
	Total	United States merchandise			Merchandise	Gold	Silver	Exports [1]	Imports [2]
1910–14, average	2,166	2,130	1,689	1,678	+477	+17	+20	[3] 70	[3] 63
1922–26, average	4,332	4,248	3,646	3,504	+685	+213	+14	[3] 96	[3] 98
1927–31, average	4,599	4,515	3,795	3,787	+805	+65	+16	[3] 122	[3] 116
1932–36, average	1,993	1,958	1,725	1,716	+268	−534	−117	75	92
1936–37	2,838	2,791	2,942	2,892	−104	−1,635	−84	90	132
1937–38	3,403	3,361	2,361	2,331	+1,043	−799	−165	110	105
Percent change:									
1938 from 1910–14	+57.1	+57.8	+39.8	+39.0				+57.7	+66.7
1938 from 1922–26	−21.4	−20.9	−35.2	−33.5				+14.4	+7.3
1938 from 1927–31	−26.0	−25.5	−37.8	−38.4				−9.3	−9.1
1938 from 1932–36	+70.8	+71.7	+36.9	+35.9				+47.2	+14.3
1938 from 1936–37	+19.9	+20.4	−19.7	−19.4				+22.1	−20.2

[1] Export indexes are based on domestic exports.
[2] Import indexes are based on "General imports" through the calendar year 1933 and "Imports for consumption," thereafter.
[3] Estimated by fiscal year; for calendar indexes see Trade Information Bulletin No. 839, Summary of United States Trade with the World, 1937, issued by the Bureau of Foreign and Domestic Commerce.

TABLE 3.—*Foreign trade by trade regions and economic classes, years ended June 30*

	Millions of dollars						Percent of total					
	1910–14 (average)	1922–26 (average)	1927–31 (average)	1932–36 (average)	1936–37	1937–38	1910–14	1922–26	1927–31	1932–36	1936–37	1937–38
TOTAL EXPORTS, INCLUDING REEXPORTS OF FOREIGN MERCHANDISE												
To—												
Europe	1,350	2,253	2,162	930	1,140	1,446	62.3	52.0	47.0	46.7	40.2	42.5
All other continents	816	2,079	2,438	1,063	1,698	1,957	37.7	48.0	53.0	53.3	59.8	57.5
Canada and Newfoundland	320	639	806	290	453	516	14.8	14.8	17.5	14.6	16.0	15.2
Latin America	302	722	806	303	522	642	14.0	16.7	17.5	15.2	18.4	18.9
Asia	121	502	558	350	512	553	5.6	11.6	12.1	17.6	18.0	16.3
Oceania	48	146	161	53	81	103	2.2	3.4	3.5	2.7	2.8	3.0
Africa	25	69	106	67	131	143	1.1	1.6	2.3	3.4	4.6	4.2
EXPORTS OF UNITED STATES MERCHANDISE												
Foodstuffs	421	946	724	234	212	417	19.8	22.3	16.0	11.9	7.6	12.4
Crude materials	713	1,194	1,098	603	703	687	33.5	28.1	24.3	30.8	25.2	20.4
Semimanufactures	342	555	636	291	519	619	16.0	13.1	14.1	14.8	18.6	18.4
Finished manufactures	654	1,554	2,057	831	1,357	1,638	30.7	36.6	45.6	42.4	48.6	48.7
GENERAL IMPORTS												
From—												
Europe	836	1,093	1,145	516	831	665	49.5	30.0	30.2	29.9	28.3	28.2
All other continents	852	2,554	2,650	1,208	2,110	1,696	50.5	70.0	69.8	70.1	71.7	71.8
Canada and Newfoundland	119	406	463	239	434	314	7.0	11.1	12.2	13.9	14.8	13.3
Latin America	435	965	950	419	660	541	25.8	26.5	25.0	24.3	22.4	22.9
Asia	259	1,045	1,107	498	866	756	15.3	28.7	29.2	28.9	29.4	32.0
Oceania	17	57	47	18	67	25	1.0	1.6	1.2	1.0	2.3	1.1
Africa	23	80	82	34	82	61	1.3	2.2	2.2	2.0	2.8	2.6
IMPORTS FOR CONSUMPTION												
Foodstuffs	398	849	867	515	871	645	23.5	23.3	22.9	30.0	30.1	27.7
Crude materials	595	1,400	1,355	493	918	712	35.2	38.4	35.7	28.7	31.7	30.5
Semimanufactures	307	655	719	326	581	490	18.2	18.0	18.9	19.0	20.1	21.0
Finished manufactures	389	743	853	382	523	484	23.1	20.4	22.5	22.2	18.1	20.8

RECIPROCAL TRADE AGREEMENTS PROGRAM

The Department, through the Bureau of Foreign and Domestic Commerce, has maintained a close association with the reciprocal trade agreements program since the inception of the program in 1934. In the interdepartmental organization for the work, functioning under the leadership of the Department of State, the Department of Commerce provides detailed analyses of the problems of American exporters in foreign markets; develops similar facts concerning foreign countries' tariffs, and other trade barriers to the admission of American products; and prepares basic data for the requests to be made of the other governments, in the course of negotiations.

During the past fiscal year, the Department has assisted in the preparation and negotiations of new trade agreements with Czechoslovakia, Ecuador, United Kingdom (including Newfoundland and the British Colonial Empire), Turkey, and Venezuela, and of the revision of the existing agreement with Canada. The agreements with the first two countries named have been concluded; the others are still under negotiation. The Department has also contributed during the year to the exploratory studies of American trade rela-

tions with a number of additional countries with which negotiations are being contemplated.

General analyses of the progress and results of the trade agreements program were prepared by the Department after the middle and end of the past year, these studies receiving wide circulation. The Department also contributed toward the analyses, issued jointly with the other cooperating Government agencies, of the first 2 years' trade experience under the agreements with the Netherlands and with Switzerland.

As of June 30, 1938, all but 1 of the 18 reciprocal trade agreements concluded were in operation. However, the substantial progress of the program is indicated by the fact that, within a period of 4 years, agreements have been negotiated and made effective with countries which together normally account for nearly 40 percent of the total foreign trade of the United States. If the negotiations with the countries announced are successfully completed, the scope of the program will be extended to the countries accounting for nearly 60 percent of the total of American foreign trade.

From the facts at hand, it appears that the trade agreements program is operating as a definite stimulus to the increase of our foreign trade, particularly on the export side.

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 industrial activity and the irregular movement of merchandise from manufacturer to consumer, varying demand for the different types of credit, trends in the prices of industrial and consumer goods, changes in consumer demand, influence not only single business enterprises but the entire structure of our economic life. These problems vitally concern every citizen alike, whether he be an employer, employee, or unemployed. They concern his income and expenses; in other words, the standard of living of himself and family. 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 study many of these problems with the purpose of clarifying the general understanding of business operation and aiding businessmen in better administration of their own enterprises. Facilities for this work, however, are still woefully lacking. The fields in which more research should be undertaken promptly are construction and related durable goods industries; the compilation and analysis of statistics for the purpose of appraising broad trends in our national economy of such fundamental areas as national income, wealth and debt; the collection, analysis, and dissemination of current statistics for each of the important trades for production, sales, inventories, and related items; the compilation of statistics upon both long-term and short-term credit; studies of the cost of distribution; investigations of trade practices; investigations of the changes in price structures and their effects upon industry, trade, and the ultimate consumer; and a more exact interpretation of the consumer and his needs to businessmen. 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.

FINANCES

In order to conduct the regular functions and activities of the Department of Commerce during the fiscal year 1938, $44,191,750 was made available from the sources indicated as follows:

Unobligated balances of prior year appropriations available during 1938		$1,037,880
Department of Commerce Appropriation Act, 1938		43,032,242
Amount appropriated in the 1938 annual act, available for 1937	$102,000	
1939 appropriations available during 1938		500,000
Deficiency and supplemental appropriations available for the fiscal year 1938		372,600
Funds transferred from other Departments and agencies		402,828
Funds transferred to other Departments and agencies	8,000	
Unobligated balances of 1938 funds carried forward and available for 1939	1,043,800	
Total	1,153,800	45,345,550
Net amount available during 1938		44,191,750

The disbursements during the fiscal year 1938 from funds made available for the regular functions and activities of the Department (i. e. exclusive of funds allotted or transferred from Emergency Appropriations) including unliquidated balances from prior years, amounted to $41,323,994. The Treasury receipts resulting directly from activities of the Department of Commerce were $7,140,384, leaving a net outlay for the fiscal year 1938 of $34,183,610.

EMERGENCY FUNDS

In addition to its regular functions, the Department has for the past several years participated in various emergency projects designed for the relief of unemployment, and improvement of economic conditions generally. The following table shows the allocations or allotments made from emergency appropriations to the Department

during the fiscal years 1934 to 1938, inclusive, and the obligations incurred against these funds. The accomplishments through the use of these funds will be found discussed under the respective sections of the report pertaining to the bureaus receiving the funds.

TABLE 3.—*Allotments to the Department of Commerce for work incident to emergency relief and obligations incurred thereunder during the fiscal years 1934 to 1938, inclusive*

	1934	1935	1936	1937	1938	Total
Office of the Secretary:						
N. I. R. A.:						
Allotments			$947,000			$947,000
Obligations			945,805			945,805
W. P. A.:						
Allotments			40,000	$30,000	$20,620	90,620
Obligations			19,074	50,917	20,268	90,259
Total:						
Allotments			987,000	30,000	20,620	1,037,620
Obligations			964,879	50,917	20,268	1,036,064
Bureau of Air Commerce:						
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	260,600	847,980
Obligations			200,637	349,336	259,927	809,900
Total:						
Allotments	2,339,406	912,075	244,200	362,380	260,600	4,118,661
Obligations	622,997	1,951,780	733,457	494,736	259,927	4,062,897
Bureau of Foreign and Domestic Commerce:						
C. W. A.:						
Allotments	372,275					372,275
Obligations	194,785	154,854			8,247	357,886
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	8,247	457,854
Bureau of the Census:						
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	48,427	893,388
W. P. A.:						
Allotments			8,231,948	2,785,500	83,000	11,100,448
Obligations			7,048,087	3,698,294	77,000	10,823,381
Drought relief in agricultural areas:						
Allotments		1,000,000				1,000,000
Obligations		999,570				999,570
Census of partial employment, unemployment and occupations:						
Allotments					850,000	850,000
Obligations					815,692	815,692
Total:						
Allotments	2,261,346	1,508,390	8,991,948	2,785,500	933,000	16,480,184
Obligations	1,360,618	2,075,605	7,520,782	3,936,503	941,119	15,834,627
Bureau of Marine Inspection and Navigation:						
N. I. R. A.:						
Allotments	33,043	60,000				93,043
Obligations	28,393	62,581	1,065			92,039

TABLE 3.—*Allotments to the Department of Commerce for work incident to emergency relief and obligations incurred thereunder during the fiscal years 1934 to 1938, inclusive*—Continued

	1934	1935	1936	1937	1938	Total
National Bureau of Standards:						
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	$2	75,000
Total:						
Allotments	100,000		145,000			245,000
Obligations	87,690	11,911	100,254	44,741	2	244,598
Bureau of Lighthouses:						
N. I. R. A.:						
Allotments	5,620,334					5,620,334
Obligations	2,706,548	2,684,952	197,934	18,061		5,607,495
W. P. A.:						
Allotments			20,000			20,000
Obligations			19,029			19,029
P. W. A.:						
Allotments					2,098,750	2,098,750
Obligations						
Total:						
Allotments	5,620,334		20,000		2,098,750	7,739,084
Obligations	2,706,548	2,684,952	216,963	18,061		5,626,524
Coast & Geodetic Survey:						
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
Bureau of Fisheries:						
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
Total:						
Allotments	677,346	1,500	171,372	10,000		860,218
Obligations	390,256	254,566	171,549	43,132		859,503
Total—Department of Commerce:						
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	105,569		17,776,972
P. W. A.:						
Allotments		973,075	84,700		2,098,750	3,156,525
Obligations		614,454	343,926	90,581		1,048,961
W. P. A.:						
Allotments			8,843,320	3,177,880	358,220	12,379,420
Obligations			7,477,637	4,234,075	357,197	12,068,909
C. W. A.:						
Allotments	2,952,615	182,390				3,135,005
Obligations	1,791,394	1,097,182			8,247	2,896,823
F. E. R. A.:						
Allotments		245,000	760,000			1,005,000
Obligations		134,057	472,695	238,209	48,427	893,388
Drought Relief in Agricultural Areas:						
Allotments		1,000,000				1,000,000
Obligations		999,570				999,570
Census of Partial Employment, Unemployment, and Occupations:						
Allotments					850,000	850,000
Obligations					815,692	815,692
Grand total:						
Allotments	17,906,870	3,911,765	11,019,820	3,187,880	3,306,970	39,333,305
Obligations	9,962,912	10,361,104	10,278,302	4,668,434	1,229,563	36,500,315

FOREIGN AND DOMESTIC COMMERCE

In view of the fact that the past year has been characterized by numerous and rapid modifications of the economic picture, there has naturally been a marked increase in the demands upon the Bureau of Foreign and Domestic Commerce for information and guidance that would help American businessmen to cope effectively with new situations and to overcome unexpected obstacles.

In many cases timeliness was of the very essence of the Bureau's service. For example, the conflict in the Far East, particularly in its earlier stages, produced many dislocations of regular American commercial intercourse, with resultant uncertainty, confusion, or perplexity on the part of numerous businessmen. The Bureau maintained continuous contact with its offices in China and Japan, utilizing the swiftest methods of communication as a means of keeping our business communities hourly advised concerning happenings in the Orient. In Central Europe the annexation of Austria by the German Reich gave rise to a variety of complex problems. It was essential that the significance of the resultant changes and new regulations be analyzed for the guidance of our traders. The approaching change in the status of the Philippines, and the repercussions already observed in the commercial structure of the islands, likewise formed the subject of painstaking study.

The economic recession and subsequent movement of recovery in the United States led to many readjustments in business. These were studied objectively, with the primary purpose of suitably supplementing the recuperative forces.

The following actual examples of practical aids to the business community indicate the striking increase in the Bureau's activity. The district offices increased their distribution of Trade Opportunities from 99,000 to 168,000. One industrial division registered an 80 percent increase in the number of visitors supplied with specific information. Another division noted an increase of 2,000 in the number of written requests for information. There was noted a 25 percent rise in the number of paid subscriptions to one of the Bureau's principal periodicals, a 13 percent rise in demands for Sales Information Reports in foreign firms, and an increase of 38 percent in the number of private business houses that defrayed the cost of installing the Bureau's "Business information file."

Illustrative of the practical value of the trade-promotion work may be mentioned the orders obtained by American manufacturers from Brazil for about $7,000,000 worth of locomotives and freight cars, as made possible by the joint effort of the Transportation Division and the Foreign Commerce officers; and a similar transaction with the Chilean State Railways, which brought to our country orders for railway equipment valued at more than one-half a million dollars.

Other examples of benefits enjoyed by American firms, as direct results of the Bureau's activity in their behalf, are briefly as follows: The consummation of a $450,000 contract for 25,000 tons of sulphur; the sale of $200,000 worth of wood pulp in Turkey; the obtaining of an order from a foreign government for motortrucks with an aggregate value of nearly one-half a million dollars; the reopening of an aircraft factory, made possible by the receipt of orders from

abroad; an appreciation of $50,000 in profits to members of the motion-picture industry by virtue of a change in the attitude of foreign censors toward specific feature pictures; arrival from a South American republic of an order for $120,000 worth of rosin and turpentine as a quick consequence of a "trade lead"; the free entry into Mexico of 30,000 tons of American wheat; similar entry into Greece in the case of American machinery valued at $140,000; the clearance of our apples into Egypt in shipments ranging up to 10,000 boxes; the settlement of a heavy claim for marine loss for an American insurance company; and the prevention of incalculable loss and inconvenience for hundreds of American industrialists through the issuance of advice that there existed a possibility of their trade-marks being pirated abroad.

Activity and vigilance have characterized the work of the Bureau's Foreign Commerce Service at its 32 posts abroad, where the officers have responded to the needs arising from the changing economic circumstances of the world. A great many requests from American traders, for guidance and practical help, reached these offices. The difficult nature of these requests often called for efforts of peculiar vigor and discretion. Under the stimulus of a restored intimacy of contact with American business, this Service has achieved many outstanding results.

The Bureau has been one of the major instrumentalities contributing to the success of the Government's program of reciprocal trade agreements, as described elsewhere.

The work of intensively studying the subject of domestic trade, and the economic conditions incident thereto, has been continued. The findings should prove valuable in pointing the way to solving numerous existing problems. The trade-reporting service is providing a continuously accurate picture of what is happening; the service has been extended geographically, as well as with respect to the number of sources of data, and new series of pertinent figures have been instituted recently. Reporting work, formerly done by the Federal Reserve System, is now a part of this service. The most comprehensive manual of consumer marketing statistics ever assembled is virtually completed. Vital aspects of our industrial markets have been studied intensively. Installment credit has been the subject of impartial study. Several illustrated publications, designed to be especially helpful to persons who are operating relatively small stores, have been issued.

Numerous studies of broad national significance in the domain of economic research have been made. Statistics regarding current business trends have been widened in scope, and are proving increasingly useful. Long-term debt, national income, construction activities, and similar topics of great importance to the Nation's economic welfare continue to be subjects of close scrutiny.

The organizational set-up of the Bureau itself has been thoroughly considered, with a view to making the Bureau structure more logical and consequently more intimately responsive to the needs of the business community. With this objective in view, several minor changes have been effected already, while others, broader in scope, impend.

AIR COMMERCE

The continued rapid growth of air transportation in the United States within the past few years made it necessary for the Bureau of Air Commerce to inaugurate a general modernization and improvement program of its aids to air navigation upon which air operations have become increasingly dependent. In addition, it was necessary to bring up-to-date the rules and regulations pertaining to aeronautics, and this was done by the promulgation of the Civil Air Regulations.

The modernization and improvement program of the Federal Airways System was carried on during the year. The most salient feature of this program involved 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 and radio range signals. Detailed engineering specifications were prepared covering all components of a standard facility of this type, which incorporated all 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.

Considerable progress was made toward a solution of the problem of blind approach to airports and the actual landing of aircraft by instruments. A contract was awarded for the construction and installation of a complete instrument landing system, which will be installed and tested at the Bureau's radio test station at Indianapolis.

Development work was brought to a conclusion on a system of teletype operation by radio.

Further research was carried on into the utilization of the ultra-high frequency bands for radio ranges, radio markers, and radiotelephone broadcasts.

A new type of radio beacon, the omni-directional beacon, was developed, and specifications prepared and a contract awarded for its further development and construction.

Research was carried on regarding precipitation static phenomena and the resultant interference to radio reception.

The Bureau operated eight airway traffic control stations, located at Newark, Chicago, Cleveland, Pittsburgh, Detroit, Washington, Burbank, and Oakland. Each station is now in operation 24 hours per day. Arrangements were being completed for additional airway traffic control stations at Atlanta, Fort Worth, Kansas City, St. Louis, and Salt Lake City.

An airport traffic control section was established for the purpose of coordinating and standardizing airport control tower equipment, operation technique, and personnel.

A number of new air-line operations and extensions to lines already in operation were inaugurated during the year, and these were inspected by the air-line inspection staff of the Bureau.

Regular scheduled service was continued both across the Pacific to the Orient, and from the United States to Bermuda.

Survey flights were continued by American, British, and German interests across the North Atlantic between the United States and Europe. In connection with the establishment of this service the

Department of Commerce was represented on the Inter-Departmental Committee on Civil International Aviation. This committee has endeavored to make all agreements on the basis of reciprocity so that American air lines can compete on an equal footing with foreign air lines.

The Bureau continued its development work and research into special problems affecting flight. A safety and planning program was initiated which included 159 projects constituting the continuing program of the Bureau. A number of these projects have been completed and reports issued thereon.

A medical research laboratory was being installed at Kansas City to handle special research into various problems of aviation medicine affecting safety. Other special medical research projects were being undertaken by various universities under contracts with the Bureau.

A section on private flying was established to consider the needs of private flyers and all nonscheduled air-line interests.

The Bureau continued its participation in the Works Progress Administration airport development and construction program. On June 30, 1938, a total of 1,315 airway and airport construction projects had been submitted for consideration, of which 560 had been completed.

As a result of the air-marking program sponsored by the Bureau, approximately 10,215 air markers have been constructed or repainted.

Transfer of the responsibilities of the Bureau of Air Commerce to the new Civil Aeronautics Authority will be effected late in August under the provisions of an act of Congress signed by the President on June 23, 1938, thus bringing to a close a 12-year period during which the development and regulation of civil aeronautics in the United States was under the jurisdiction of the Department of Commerce.

LIGHTHOUSE SERVICE

Outstanding achievements of the Lighthouse Service during the past fiscal year have fallen into two broad classifications; namely, the administrative field, where considerable progress has been made in bringing additional groups within the civil service and providing for the selection of personnel of higher qualifications; and the engineering field, where expansion in the total number of navigational aids has been accompanied by important improvements in equipment, tending to increase the effectiveness of the aids in promoting safety at sea. The notable trends have been toward the use of more automatic apparatus, making possible the establishment of a large number of aids at points which could not otherwise be so effectively marked; the increased use of radio, both for the sending of signals for use in navigation, and as a more effective communication means within the Service; and the marking of an increased mileage of secondary channels for night as well as day navigation.

Of importance is the Executive order of March 29, 1938, placing petty officers in both the deck and engine departments of all vessels of the Service under the civil service. The measure affects upward of 325 vessel positions and also light-attendant positions, resulting in an increased number of employees under the civil service.

Another important measure affecting personnel administration is that presently to become effective, involving assembled educational

examinations for the lighthousekeepers and vessel officers, which will result in higher standards, made necessary by the increasing amount of technical skill which is required in a service becoming highly mechanized. The probationary period for entrance into positions as lighthousekeeper has been extended from 6 months to 1 year, thereby making possible a more thorough demonstration of ability before permanent appointment.

There was allotted to the Lighthouse Service, under the Public Works Administration Appropriation Act of 1938, the sum of $2,098,750, for which a special program had previously been submitted, covering construction undertakings in 28 States. With a total of 104 individual projects, a wide distribution of funds will result, as many of the projects call for operations at two or more points, as well as the purchase of considerable equipment. Upon the definite announcement of the allotment, immediate steps were taken to commence the entire program, in accordance with the intent of the act. However, as the act received the President's signature only 10 days before the end of the fiscal year, preliminary planning only is reported herein.

A further allotment of $1,680,000 for the construction and reconditioning of lighthouse tenders and lightships was made by the Public Works Administration at the end of the year.

Considerable progress has been made in the modernization of Lighthouse Service facilities upon the Mississippi and tributary rivers. The increasing draft of vessels, and the demand for more consistent operating schedules, have resulted in a need for large numbers of additional buoys at certain seasons. This alters the duties of lighthouse tenders. This area also provides an important field for economical and efficient use of modern lighting equipment. Changes, both in administrative methods and equipment, are necessary to meet present conditions, and bring a large and important district more closely into line with the organization of other lighthouse districts. More effective service and certain economies are expected from a series of servicing bases being established at centrally located points. The tender equipment in this area has been considerably strengthened by the commissioning of the new lighthouse tender *Goldenrod*, a vessel specially constructed for the work now required in the maintenance of aids to navigation on interior rivers.

The Missouri River, which is now under extensive improvement for navigation purposes, will soon have its navigational aids extended from Kansas City to Rulo, Nebr. Early availability of water from the Fort Peck Reservoir will expedite the achievement of this desirable objective. Work on the remainder of the river as far as Sioux City, Iowa, a total distance of 790 miles, is proceding rapidly, with expectation of completion within 3 years.

This expansion, when considered in conjunction with the increasing use of buoyage on navigable rivers and the near completion of pooling operations in the upper Mississippi, clearly emphasizes the desirability of supplementing the tenders in the fifteenth lighthouse district. It is proposed, therefore, to construct at once two additional tenders of this special type. At the close of the fiscal year the total number of aids to navigation maintained by the Lighthouse Service was 28,758, a net increase of 650 over the previous year. Included in the addi-

tional aids established, 405 were lighted aids and 54 were sound signals.

The Department of the Interior cooperated in providing new aids to navigation for three of our remotely situated islands in the Pacific Ocean, namely, Howland, Baker, and Jarvis Islands.

During the fiscal year 10 new radiobeacon stations were established and 2 were discontinued, thus resulting in a net increase of 8 radiobeacon stations. Approximately 30 percent of the marine radiobeacons of the entire world belong to the United States of America. This type of navigational aid has increased numerically with a greater rapidity during the last 10 years than any other type maintained by the Service. The increase exceeds 100 percent.

A new departure in the field of radio is the establishment of a fully automatic, unattended, low-power radiobeacon at St. Ignace, Mich. This is particularly useful to the ferries which operate across the Straits of Mackinac. This radio aid, termed a "marker radiobeacon," operates continuously.

Synchronized radiobeacon and sound-in-air signals, for distance finding, have increased in number, there now being 91 such stations in operation. Communication facilities have been extended also to include important isolated ships and stations.

Particularly valuable to mariners are the increased facilities which have been provided for broadcasting, by radiophone, of important and emergency information regarding aids to navigation, weather conditions, and other hydrographic matters. In the collection and dissemination of this information the Service has received the valued cooperation of the Navy Department, the Coast Guard, and the Weather Bureau.

ENFORCEMENT OF THE INSPECTION AND NAVIGATION LAWS

During its seventy-fourth and seventy-fifth sessions, the Congress enacted 96 pieces of legislation which directly or indirectly affected the work of the Bureau of Marine Inspection and Navigation. This legislation added materially to the Bureau's activities and broadened its jurisdiction by extending the inspectional laws to include certain classes of vessels not heretofore subject to inspection; for example, seagoing vessels of 300 gross tons and overpropelled by internal-combustion engines, and tank vessels engaged in carrying inflammable and combustible cargo in bulk. In order to permit a more uniform and effective administration of these new provisions of law the Bureau has prepared, for submission at the next regular session of Congress, necessary amendments to facilitate their application to the broad fields of vessel construction, equipment, operation, and manning to which they apply.

Substantial progress has been made by the Bureau in the planning, drafting, and promulgation of approved rules and regulations for the adequate protection of life and property at sea through the establishment of additional safeguards against fire, improved machinery, and equipment, and better trained and more efficient officers and crews. The effectiveness of this action is manifest in statistics which show that only one passenger life was lost during a period of more than 3 years, due to casualty on inspected vessels of our merchant

marine. The Bureau's corps of inspectors and the personnel of the merchant marine share this fine record of safety.

During the year compliance with the regulations was enforced concerning automatic-sprinkler systems and other fire-protection equipment on board passenger vessels. The mandatory provisions of the law obliged the Bureau to revoke the certificates of inspection of several passenger vessels, necessitating the placement of these vessels in a restricted service. During the year vessels were inspected for compliance with subdivision and stability requirements, and tank vessels were inspected for compliance with amended rules and regulations. Also, the work has been continued incident to the preparation of rules and regulations for the carriage of dangerous cargoes, and the revision of ocean and coastwise regulations. An intensive campaign has also been conducted for drilling and instructing crews of passenger and excursion vessels in the performance of their duties. Thorough fire drills and lifeboat drills held at frequent intervals by local and assistant inspectors on the occasion of regular inspections and reinspections of passenger vessels, together with frequent detailed drills and inspections by traveling inspectors, have resulted in a more efficient working organization of masters, officers, and crews.

Another major accomplishment is the establishment of modified rules of procedure for the investigation of marine casualties and accidents. The reports submitted by the three classes of boards investigating casualties involving loss of life, major accidents not involving loss of life, and accidents of a less serious nature, and the decisions rendered thereon by the Director, have reduced greatly the number of disputes heretofore occurring on shipboard and have resulted in a higher degree of efficiency in the manning and operation of our merchant marine. Through the medium of this procedure shipowners, masters, and vessel personnel have learned that the Bureau expects and requires strict observance of the laws.

Through bulletins, daily newspapers, and radio the Bureau has endeavored to make the public aware of the dangers that attend the handling of small pleasure craft, whether driven by sail, motor, oars, or paddles, and has specified proper methods for avoiding the hazards common to this form of transportation and recreation.

It has been felt for some time that the present motorboat law, which was enacted on June 9, 1910, is unsatisfactory under present conditions. A bill to repeal this law was introduced in the last session of the Seventy-fifth Congress, and it is thought that the bill should also be considered by the next Congress.

The act of June 25, 1936, later amended by the act of March 24, 1937, provided for the issuance of certificates of service and efficiency, and continuous discharge books, or certificates of identification to seamen. After nearly 2 years' experience in the administration of those laws, it is believed that further amendment is necessary to simplify procedure and provide for better administration.

The Bureau approves all plans and specifications for the construction of new vessels, and major alterations to existing vessels subject to inspection, to insure that all the safety features recognized as being essential to safety of life at sea will be adopted. It also supervises the marking of both subdivision and strength load lines on all

ocean, coastwise, and Great Lakes merchant vessels of 150 gross tons and over, and maintains a check on the sailing drafts of these vessels to insure that the applicable load lines are not submerged. The building program of the Maritime Commission has made much progress during the year, and this Bureau has reviewed plans and specifications of the vessels building under this program. This alone has involved examination and approval of many hundreds of plans.

SURVEYING AND MAPPING

The Government and the engineering profession lost one of its outstanding leaders with the death, on November 25, 1937, of Rear Admiral Raymond Stanton Patton, while Director of the United States Coast and Geodetic Survey. He made many contributions to this service throughout his career. Rear Admiral Lee Otis Colbert was appointed April 8, 1938, as Director of this Bureau.

Constantly confronted with increases in calls for accurate, live charts and related products, this Bureau is making every effort, with its limited staff and vessels, to meet the exacting demands of today. The data made available, which are being utilized to an ever-increasing extent, have a tangible dollars-and-cents value for every citizen.

Sales of nautical and aeronautical charts, two of this Bureau's best-known products, showed an increase of 7 and 5 percent, respectively, over the previous record year 1937. These gains indicate the steady growth in number of yachts, motorboats, and aircraft in use.

Because of the great change in navigation requirements, much additional work was continued during the year in replacing with new hydrographic surveys the patch-upon-patch charting of United States waters.

Today, in contrast with the leisurely light-draft sailing vessels of early days, there are scores of important harbors where large, deep-draft vessels must proceed by the shortest possible route, regardless of weather and visibility. This development has meant a steadily growing demand for surveys in greater detail, and for their extension seaward.

The complete series of 87 sectional aeronautical charts, embracing the entire country, is now available. Two of the series of 6 direction-finding charts and 4 of the series of 17 regional charts both for long-distance flying, have also been issued. As in the case of nautical charts, revised editions are frequent in the interests of human safety.

Progress has been made in completing the country's geodetic control surveys. Ultimately, the entire United States will be divided into small areas, each outlined by a number of selected points or stations whose exact geographical locations are matters of record, so that it will be possible to control the accuracy and reduce the cost of subsequent detailed surveys in these areas.

In air photography, the remarkable nine-lens camera recently developed by the Coast and Geodetic Survey has proven its worth. In areas of flat terrain, an increase in efficiency of 20 percent has been attained, and extension of the same efficiency to areas of considerable relief by procurement of supplemental instruments is anticipated.

FISHERIES

During the calendar year 1937, the fishing industry maintained approximately the same economic level as in the preceding year. Available data show that the unit values of many processed fishery products increased during the year, and that the total value of canned fishery products and byproducts was the largest of any year on record. However, prices for frozen fishery products and some species of market fish decreased.

The total commercial catch for the United States, including Alaska, amounted to 4,840,200,000 pounds, valued at $92,823,000. There were 129,000 commercial fishermen actively engaged in fishing operations while an estimated 500,000 persons found employment in related activities.

In the collection and dissemination of statistical information, plans are being developed to make statistical canvasses with sufficient frequency to include all of the major geographical sections annually with the exception of the Mississippi River area.

Special attention was given during the past year to Japanese fishing operations in Bristol Bay, Alaska. The problem was made the subject of diplomatic negotiations between the Department of State and the Japanese Government. As a result, assurances were obtained from Japan that it would suspend its official survey of the salmon fishery in Bristol Bay and would issue no licenses to vessels to take salmon in those waters.

Studies of salmon in Alaska were continued for the purpose of regulating fishery operations to assure an ample escapement of brood fish for maintaining the runs without impairment. Although the runs of salmon as a whole were lighter in 1937 than in the previous year, they were better than average, and the catch was the third highest on record.

The fur-seal herd, which has its breeding grounds on the Pribilof Islands in Bering Sea, now numbers 1,839,000 animals, and 55,180 pelts were taken last year. The herd, once threatened by extinction, contains three-fourths of all the fur seals in the world.

Technological investigations to increase the economic value of the products of fisheries were continued. Previous investigations have played an important part in the development of quick-freezing methods and in the use of halibut liver oil as a source of vitamins A and D.

Through a newly established Market News Service operating in New York City and Boston, producers and buyers are kept informed of conditions at terminal and producing points and can govern sales or purchases accordingly.

The catch of shad on the Atlantic coast having declined 80 percent in half a century, an investigation was begun in the fall of 1937 to discover why the numbers of this choice food fish have been so seriously reduced, and to outline a system of management for the restoration of the fishery. Because the catch of shad in the Hudson River, which had declined to low levels, recently made a spectacular recovery under careful regulations promulgated by the State of

New York, particular study is being made of this area to determine the conditions necessary for maintaining the runs at a given level of abundance. Investigations of the effectiveness of natural and artificial propagation are an important part of the shad studies along the South Atlantic coast.

Fish-cultural operations resulted in the distribution of 7,822,000,000 fish and eggs, a reduction of 1.2 percent from last year. Among the contributing factors to the reduction in output were the flooding of the Louisville, Ky., hatchery in the spring of 1937 which affected the 1938 production, and the handling of a smaller number of rescued fish resulting from development of the 9-foot channel in the upper Mississippi River.

Although 90 hatcheries were in operation, the demand for game fishes for stocking waters on Federal lands increased to such extent that many applications for fish could not be filled. Five new hatcheries, in process of construction, will be utilized for the propagation of game species. At the same time, efforts are being made to develop rearing facilities to grow game fish to a larger size before they are released.

Studies during the current year in the field of pollution have yielded a better understanding of the action of certain industrial pollutants, particularly dye wastes, pulp and rayon effluents, petroleum waters, and mine wastes. Many manufacturers have voluntarily cooperated with the Bureau in the practical application of its findings to definite pollution problems and have followed recommendations for their correction.

On the basis of some 3 months of actual operation it is generally conceded that the fishways installed at Bonneville Dam by the War Department, with the cooperation of this Bureau, have proved successful.

During the period from May 1 to July 1, a total of 33,194 chinook salmon, 10,020 steelhead trout, and 18,761 blueback salmon passed through the fishways, according to official counts. In addition, some 39,000 other fish were counted. Frequent inspections below the dam established the fact that there was no congestion or delay, the fish finding the entrances and making the ascent readily. The number of fish which reached Bonneville, while smaller than expected, was not surprising in view of the fact that the spring run in the river was light.

While observations on the downstream passage of young salmon are more difficult, because of the fact that the migration of fingerlings takes place chiefly at night, a sufficient number of young have been observed in the fishways and fingerling bypasses during the day to warrant the belief that the young fish have been making use of the facilities provided for their safe passage.

Although New England oystermen have attempted for many years to rid their grounds of starfish by dredging or other means, these efforts have been largely futile, as may be seen from the fact that in 1937 virtually the entire early set of oysters was destroyed by starfish. The Bureau has developed, through laboratory and field studies, a chemical method for controlling starfish and has provided oyster growers with a satisfactory weapon against this highly destructive enemy. Careful tests indicate that calcium oxide is an effective agent for the destruction of starfish on the oyster beds without injury to the oysters. In-

vestigations are being continued to insure the use of the chemical under such conditions that injury to other bottom organisms may be avoided.

Exploratory trawling has disclosed the presence of large schools of mature shrimp in the offshore waters of the Gulf of Mexico. Commercial exploitation of these shrimp has relieved the drain on reserves of immature shrimp inshore.

The fundamental purpose of marine commercial fishery research is to provide information on the condition of the various stocks of fish, and to aid in foretelling periods of abundance or scarcity. With such knowledge, it is possible to maintain the supply at productive levels through wise utilization. Commercial statistics alone are inadequate. Studies are urgently needed to serve as a basis for predicting the future abundance of mackerel and for safeguarding stocks of haddock from depletion. Progress is seriously impeded by lack of a suitable fishery research vessel on the Atlantic coast. The Pacific coast investigations also require a deep-sea research vessel.

NATIONAL STANDARDS

An important development of the past year at the National Bureau of Standards was the inauguration of the research program on building materials and structures with special reference to low-cost housing, for which Congress made an appropriation of $198,000. In this work practically every division of the Bureau has taken part. The method of approach selected is to treat the house as a unit, so that in a test of one element the relation between that element and all other portions of the structure must be taken into account. The progress of this work is reported in a new series of publications entitled "Building Materials and Structures."

Satisfactory progress has been made on the redetermination of the international electrical units in terms of the absolute units. In connection with the new system of photometric units, the luminous intensity of a black body at the iridium point has been determined in "new candles," and certain electric lamps have been measured in the same terms to serve as working standards.

The broadcasting of standard frequency radio signals has been expanded so that the service now includes radio frequencies, seconds intervals, and the American standard of musical pitch.

The Twenty-eighth National Conference on Weights and Measures, held at the Bureau on May 31 to June 3, was attended by 250 people, including 140 State and local officials. The Bureau presented a special report on the tests of vehicle scales which it is making in cooperation with the States. The annual conference of State Public Utility Commission Engineers was also well attended, 21 States and the District of Columbia being represented. Through these conferences the Bureau's findings are made available to State and municipal regulatory bodies.

As a contribution toward more precise knowledge of the values of the physical constants, the Bureau has redetermined the heat of combustion of carbon, using natural and artificial graphite and diamond. The value thus secured is an improvement over that heretofore available and in line with present-day scientific requirements.

The effect of different kinds of lubricating oils on the performance of aviation engines is being studied for the Navy Department. Inspection forms have been prepared for use at the Bureau and in industry, so that comparable data from many sources will be available on the condition of aviation engines as determined at periodical inspections.

Progress has been made in the standardization of color names for drugs and other pharmaceuticals. This work is in charge of a research associate representing the American Pharmaceutical Association, the United States Pharmacopoeial Revision Committee, and the Inter-Society Color Council.

New equipment recently constructed has made possible the precise measurement of X-ray potentials up to 400,000 volts. Plans are now being prepared for a new high voltage laboratory, where improved facilities will probably permit measurements up to 1,000,000 volts.

Eight new standard samples of metals, alloys, and other substances were added to the Bureau's stock, making 112 now available for use in the control of analyses in commercial laboratories.

A research was completed on cross connections in plumbing systems. The printed report on this subject should furnish the technical data needed by city officials for formulating regulations to prevent accidental connection between pipes in buildings carrying impure water and water for human consumption.

Considerable attention has been paid to methods for evaluating the wearing quality of materials, and particularly carpets. Before any wear-testing machine can be used as a basis for the purchase of materials, the variables of the machine test must be standardized. Therefore, the wear of carpets on the machine designed some years ago by the Bureau is being compared with their wear in service. In order to furnish such a comparison, 25 different kinds of carpets have been laid in one strip in the hall of a Government building, and the number of people walking over them is recorded by a photoelectric counter. The carpets are cleaned frequently and their rate of wear is determined by measurements of their thickness every few days. So far the results indicate good agreement between service and machine.

The Silver Producers of America have continued their research on new industrial uses for silver, the project having its headquarters at the Bureau. The preliminary program, under which a great number of leads were followed up, has been completed and the most promising lines of work have now formed the basis for a smaller number of more elaborate research projects. The use of silver for electrical contacts, in bearings of high-grade machinery, and for lining chemical apparatus and certain food containers seems likely to become accepted practice.

Several years' work has culminated in the production of pure iron. Spectrographic examination of the finished ingots has shown minute traces of copper as the only metallic impurity. Other work on the ferrous metals has resulted in the extension of the fusion-in-vacuo method to the determination of oxygen in alloy steels.

A great deal of attention has been paid to aircraft materials, particularly the effect of corrosive atmospheres and low temperatures.

The importance of heat treatment in the case of high strength aluminum alloys has been brought out.

Apparatus for measuring vibration in concrete has been constructed, and appears to give reliable indications of the particle velocity and amplitude when concrete is poured by the vibration method.

Nearly 6,000,000 barrels of cement was tested for the Government by the Bureau's branch laboratories at Allentown, Pa.; Denver, Colo.; San Francisco, and Riverside, Calif.; and Seattle, Wash.

Since the Bureau's work has indicated that the dense types of stone are not appreciably affected by frost, studies have been started to determine the effects of other weathering agents on marble and granite. A procedure using sulphur dioxide gas appears to deteriorate marble in such a way that the final appearance of the stone is much like that found in old buildings and monuments.

During the past year an increased percentage of Simplified Practice Recommendations have been reaffirmed without change, showing apparently that in several industries a fair degree of stability has been reached. Twenty-nine recommendations were surveyed and reaffirmed, several of them without change. A total of 14 new and revised Simplified Practice Recommendations were made available during the year.

Commercial standards are improving consumer confidence in the products and are providing a uniform basis of competition. They fit in well with the Bureau's certification plan in which the quality of a product is guaranteed to comply with some nationally recognized specification or commercial standard.

A new edition of the Code for Protection Against Lightning, as well as a revised Handbook for Weights and Measures Officials have been issued. The revision of the National Electrical Safety Code and the Code for the Protection of the Head, Eyes, and Respiratory Organs is being pushed, and printed copies of these should be available early in the coming year. The total number of sources of supply of commodities covered by Federal Specifications and Commercial Standards was increased to 614. These lists are issued in mimeographed form in separate parts, each of which covers closely related products. They are supplied to agencies making purchases out of tax monies, on request.

CENSUS

As the impartial, scientific fact-gathering agency of the Federal Government, the Bureau of the Census occupies a unique position. For nearly 150 years "the census" has provided a nonpartisan, factual account of the Nation's social and economic life.

During the past 5 years there has been a particularly rapid growth of governmental activities involving a direct and detailed knowledge of population, agriculture, manufactures, business, etc. Witness the immediate need for census data arising from the social security and unemployment relief programs, the agricultural adjustment and social conservation programs, minimum wage legislation, etc. Each of these major advances in social and economic welfare have been implemented by census statistics, for only these compilations were

complete in their coverage of the Nation, regular in occurrence, and comparable from decade to decade.

All types of census data have been demanded for the direct administration of these programs. For example, population data alone provides a basis for the allotment of funds to States, cities, and counties; for estimating the number of persons eligible for benefits; for measuring the effective coverage of a particular program; for fundamental research bearing on the effect of changes in present legislation, or administration. Similar administrative and legislative needs are met by census facts concerning agriculture (number of farms, tenure, value, mortgage status, farm labor, acreage in each crop), manufactures (production of individual commodities, number of employees, wages, purchase of raw materials, inventories), retail and wholesale distribution, etc.

The importance of adequate preparation and planning for the 1940 decennial census is emphasized by these new needs for and uses of census data. This planning and preparation has been a major activity of the Bureau during the past year. A preliminary farm schedule for 1940 was tried out in several counties during the past year in cooperation with the Department of Agriculture. The results of this trial census are now being analyzed to determine the relative accuracy of replies obtained on questions, the reaction of farmers to certain questions, the time required for enumeration, the most rapid method of checking and compiling the answers, etc. These analyses will result in the adoption of such questionnaires and methods as will rapidly and economically produce complete and accurate farm figures.

New techniques for the rapid compilation of the 1940 population, employment, and unemployment statistics have been developed, and were used on a large scale in connection with the 1937 unemployment registration. The speed and accuracy with which the more than 13,000,000 schedules of this registration were compiled by the Bureau for the Administrator of the Unemployment Census is an evidence of the success of these improved methods.

The preparation of the thousands of detailed maps which will be used in 1940 to insure a complete coverage of all persons, farms, factories, and business establishments, but without any chance of duplication of enumeration, has been under way for more than a year. Each of the 140,000 enumeration districts must have its own map showing the exact boundaries of the area to be canvassed. The enumeration district maps for each State must show the latest boundaries of all counties, cities, and even wards. Indeed, in large cities each block is distinctly marked and identified with a number.

The reorganization of the Division of Manufactures has been completed. The collection, tabulation, and publication of the Bureau's monthly, quarterly, and annual industrial and business reports are now coordinated with the biennial census of manufactures. Studies are now under way for the improvement and extension of the current data, and the increasing of the timeliness of these reports.

To meet the demand for more current data on business activity, a sample survey of retail and wholesale trade during 1937 and the first two quarters of 1938 is now under way. Reports from a large sample of independent and chain retail and wholesale establishments

are being collected. These reports will be tabulated by type of establishment with the 1935 census reports for identical establishments. This will give percentage change by quarters for January 1937 to June 1938, with a 1935 base.

Reports showing the receipts and expenditures of State governments during 1937 are now being compiled. The last previous reports of this type were for 1931. This inquiry is now on an annual basis and, together with the reports on financial statistics of cities, provides the only consolidated statement of governmental finance for these units of Government. Because of differences of classification of accounts between States (and cities) it is necessary to make an entirely separate compilation of receipts and expenditures in order to attain comparability.

PATENTS

Interest in the American patent system has been more widespread in the last 12 months than at any time in two generations. It was one of the subjects of the President's message to Congress on January 3, 1938. A score of bills contemplating vital changes in the statutes were before the Seventy-fifth Congress. Among these legislative proposals was a bill providing for the compulsory licensing of patents; a measure prohibiting the patenting of "labor-saving" machines, and another looking to the establishment of a single court of appeals having national jurisdiction and final authority in the determination of questions arising out of patent grants. The passage of the latter bill was unanimously recommended by the Patent Committee of the Senate, but an objection to its consideration in the latter days of the session prevented its enactment by the Seventy-fifth Congress.

A temporary national economic committee, constituted by the same Congress, was empowered and directed to investigate, among other matters, "the effect of existing * * * patent and other Government policies upon competition, price levels, unemployment, profits, and competition." The Commissioner of Patents and his associates have put themselves at the disposal of this committee and are prepared to furnish facts and recommendations with regard to improvements in the present statutes. The special Patent Office Advisory Committee, in collaboration with the Commissioner and other officials, is continuing its studies of some of the problems with which the economic committee is concerned, and at the same time is pursuing its work for the betterment of the system as a whole, including purely intramural procedure. The advisory committee, appointed by the Secretary of Commerce in July 1933, has already devoted its attention to the so-called suppression and pooling of patents and one of the cures advocated for the abuses imputed to these practices—compulsory licensing. It is expected that the advisory committee's information and viewpoints will be welcomed by the temporary national economic committee.

The number of applications for patents (including designs) and for the registration of trade-marks, prints, and labels filed in the year ended June 30, 1938, was 92,018, exceeding by 2,038 the total received in the same relative period of 1937. Applications for patents other

than those covering designs were 66,050, an excess of 2,278 over the aggregate for 1937, and the largest total since 1932. A substantial increase was recorded also in the number of applications for design patents. These were 8,014, or 1,397 more than in 1937, and the greatest annual aggregate in the history of the Office.

Receipts for the fiscal year 1937–38 were $4,551,298.87, an excess of $74,385.62 over expenditures. For the last 5 years the annual surpluses have averaged $122,566.

Notwithstanding the large increase in the number of new applications, and without enlargement of the technical personnel, final disposition was made of 60,168 cases in 1937–38, against 58,091 in 1936–37. At the same time, however, the cases awaiting action by examiners were 45,723, compared with 38,121 at the close of the preceding year. The total of applications pending on June 30, 1937, was 109,735. On June 30, 1938, there were 116,041.

Classification of patents has progressed as satisfactorily as the funds and personnel available for the task would permit. In the interval since the last previous report four new classes (8, 68, 124, and 260) comprising 35,806 original patents and 15,011 cross references have been revised. In addition, 26 subclasses of class 152 were abolished and 251 new subclasses were established. The new subclasses in class 152 embrace 11,182 original patents and 9,666 cross references. There were established 282 subclasses in existing classes. These new subclasses contain 12,263 patents and 6,168 cross references.

Notable among the statutes affecting the Patent Office enacted by the Seventy-fifth Congress was one making it unlawful for any person not duly recognized to practice before it to hold himself out as a patent solicitor, patent agent, or patent attorney. Violation of this statute is punishable by a fine of from $50 to $500.

Public Act No. 586, also passed by the Seventy-fifth Congress, permits any natural or juristic person, including nations, States, municipalities, and the like, exercising legislative control over the use of a collective trade-mark to register it by procedure similar to that governing the registration of other marks. Until the enactment of this provision organizations controlling the use of a trade-mark by a number of manufacturers or dealers could not in general register a trade-mark.

Of 226 petitions to give pending applications special status with the purpose of expediting their prosecution 104 were granted. Sixty-nine of these, in turn, were granted in the interest of prospective manufacture necessitating the investment of capital and the employment of labor. The number of "petitions to make special" were fewer by 110 in 1937–38 than in the preceding year.

FOREIGN-TRADE ZONES

As of June 30, 1938, the Foreign-Trade Zones Board, composed of the Secretary of Commerce, chairman, the Secretary of the Treasury, and the Secretary of War, has issued two grants for the establishment of foreign-trade zones, in accordance with the provisions of the act of Congress approved June 18, 1934 (48 Stat. 998, 1003).

Under the terms of the first of these grants the city of New York inaugurated its zone on February 1, 1937, at Stapleton, Staten Island.

The other grant, issued to the State of Alabama on September 1, 1937, will result in the opening of a zone at Mobile, Ala., by the Alabama State Docks Commission, in July 1938.

Pending receipt of further necessary information, there are held in abeyance applications for grants from the board of State harbor commissioners at San Francisco, from the American Foreign-Trade Zone, Inc., at Jersey City, N. J.; and from the Puerto Rican insular government for a zone at San Juan.

The Board has formulated instructions for the preparation, posting, and filing of schedules covering the rules, regulations, service rates and charges, and privileges within each specific zone. Such a schedule has been issued by the operators of the zone at Mobile, and one for the New York zone is nearing completion.

Also in the process of formulation by the Board are detailed instructions to the zone operators for the installation of a uniform system of records and accounts, and the institution of a uniform method of annual reports of operation and fiscal condition, for the immediate use of the Board in keeping the Congress fully informed concerning the activity of each and every active zone. These instructions will be placed in effect before the end of the calendar year 1938.

The Board reprinted the regulations governing the establishment, operation, maintenance, and administration of foreign-trade zones in the United States. It was possible to include in this reprint not only the orders which have been issued since the date of the original regulations but also orders which are effective from January 1938.

The operators of the New York zone have repaired existing facilities and have developed plans for new construction which place at the disposal of users every benefit of a modern terminal. The availability of suitable facilities and the organization of a competent staff have led the operators to undertake an aggressive campaign to indicate to prospective users the advantages of the zone. The response to this activity has been very encouraging, and the facilities thus provided have been extensively employed for the handling and storing of merchandise. It is especially notable that during a period of decreased imports, business coming to the New York zone continued to increase.

Through the medium of the zone, hitherto unknown business has been brought to the United States, and American labor has benefited thereby. For instance, there has come from South America canned beef to be prepared for distribution in the United States. American labor has repacked it in lighter containers of American manufacture and has prepared it for sale by attaching labels and opening keys. American labor has also cured and prepared for American and foreign markets large shipments of Brazil nuts received from South America. These are but two examples of business, both old and new, to the port, that the New York Foreign-Trade Zone is attracting to itself and to the United States.

With the inauguration of a zone at Mobile, both the Atlantic and Gulf coasts, together with their hinterlands, will have available the facilities of customs-guarded areas wherein foreign merchandise may be stored, manipulated, and mixed with domestic products for importation after payment of duty, or reexportation without duty payment.

BUSINESS ADVISORY COUNCIL

Since its organization in June 1933, under the provisions of the enabling act of the Congress authorizing the Department of Commerce "to foster, promote, and develop foreign and domestic commerce," the Business Advisory Council, composed of representative leaders of industry and commerce, continues to devote itself 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 centralizing agency for industrial views on governmental matters which affect business.

This work has been of real value in the conduct of the Department's affairs, because of the effect it has had in furthering cooperation between Government and business. Business and the Department alike are gratefully aware of the good that has emanated from the deliberations of this body of advisors.

Initially the Council's functions were limited primarily to an advisory relationship to the Department of Commerce, but to an increasing degree committees of the Council have reported directly to the heads of other Federal agencies.

Fifteen formal reports in documentary form emanated from the Council during the year. It is known definitely that these reports are proving eminently beneficial in the fields they cover. The Department is confident that this vigorous group of practical men will continue to produce constructive suggestions in these and other important fields.

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. W. A. Harriman is at present chairman of the Council.

General Council members

*F. B. Adams, New York, N. Y.
William L. Batt, Philadelphia, Pa.
John D. Biggers, Toledo, Ohio.
James F. Brownlee, Louisville, Ky.
*Charles A. Cannon, Kannapolis, N. C.
W. Dale Clark, Omaha, Nebr.
*William L. Clayton, Houston, Tex.
David R. Coker, Hartsville, S. C.
W. Howard Cox, Cincinnati, Ohio.
William H. Danforth, St. Louis, Mo.
*R. R. Deupree, Cincinnati, Ohio.
*William C. Dickerman, New York, N. Y.
*Gano Dunn, New York, N. Y.
R. G. Elbert, New York, N. Y.
W. Y. Elliott, Cambridge, Mass.
John H. Fahey, Washington, D. C.
T. Austin Finch, Thomasville, N. C.
Robert V. 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.
William A. Julian, Washington, D. C.
H. P. Kendall, Boston, Mass.
Fred I. Kent, New York, N. Y.
*Delancey Kountze, New York, N. Y.
Morris E. Leeds, Philadelphia, Pa.
C. K. Leith, Madison, Wis.
Paul W. Litchfield, Akron, Ohio.
Earl M. McGowin, Chapman, Ala.
*George H. Mead, Dayton, Ohio.
D. M. Nelson, Chicago, Ill.
J. C. Nichols, Kansas City, Mo.
*George A. Sloan, New York, N. Y.
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.
A. D. Whiteside, New York, N. Y.
H. Hyer Whiting, San Francisco, Calif.
S. Clay Williams, Winston-Salem, N. C.
R. W. Woodruff, Wilmington, Del.

*Member of the executive committee.

FISHERY ADVISORY COMMITTEE

The Fishery Advisory Committee continued in service throughout the year. Representatives of the fishery industry, who serve without pay and act in an advisory capacity to the Secretary of Commerce and the Commissioner of Fisheries, comprise its membership. The practical experience of representatives of the industry has been particularly helpful in developing and revising programs in order to more definitely meet the needs of the industry, the public today, and the Nation's future requirements.

Many problems of the fishery industry are continuing ones, and when solutions are available the remedies cannot be readily applied. The fishery resources, both marine and fresh water, are subject to depletion by overfishing and wasteful practices. Production varies also from economic and natural or biologic causes. Some of these factors can be controlled or otherwise utilized to advantage. The fisheries are, therefore, subject to management, and a long-time program of investigation is being developed to guide management practices.

During the year the committee gave a great deal of time to consideration of means for improving fishery-management practices; for promoting the more extensive use of fishery products, including the popularizing of abundant but little-known species; and for otherwise maintaining fisheries activities in the United States upon a permanent and active basis. The Department acknowledges the splendid assistance of the Fishery Advisory Committee in making possible many of the recent developments in the activities of the Bureau of Fisheries.

The names of the members of the Fishery Advisory Committee follow. Gardner Poole is chairman.

Great Lakes and Inland Waterways Region
O. L. CARR, Kansas City, Mo.
JOHN R. SCHACHT, Philadelphia, Pa.
*CHAS. W. TRIGGS, Chicago, Ill.
F. A. WESTERMAN, Lansing, Mich.
E. L. WICKLIFF, Columbus, Ohio.

Gulf Region
A. M. ADAMS, Key West, Fla.
C. W. GIBSON, Corpus Christi, Tex.
JOHN LANASA, New Orleans, La.
*FRANCIS WM. TAYLOR, Pensacola, Fla.
JOHN VERSAGGI, St. Augustine, Fla.

Middle Atlantic Region
O. G. DALE, Jr., New York, N. Y.
W. A. ELLISON, Jr., New York, N. Y.
GEO. T. HARRISON, Tilghman, Md.
THOS. H. HAYES, Lewes, Del.
*J. H. MATTHEWS, New York, N. Y.
H. A. MCGINNIS, Philadelphia, Pa.
SVEN MARTHIN, Wildwood, N. J.

Middle Atlantic Region—Continued.
LEWIS RADCLIFFE, Washington, D. C.
R. V. TRUITT, College Park, Md.

New England Region
THOMAS J. CARROLL, Gloucester, Mass.
*E. H. COOLEY, Boston, Mass.
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.
E. B. MCGOVERN, Seattle, Wash.

South Atlantic Region
FRANK D. FANT, Jacksonville, Fla.
*SOL FASS, Portsmouth, Va.
WILLIAM WESTON, Columbia, S. C.

*Regional chairman and member of the executive committee.

Reports of the various bureaus of the Department, setting forth their accomplishments during the year, are attached.

Sincerely yours,

DANIEL C. ROPER,
Secretary of Commerce.

REPORT BY BUREAUS

CHIEF CLERK AND SUPERINTENDENT

The need for additional personnel throughout the office of the Secretary continued acute during the year. Through the performance of 1,112 days' overtime, the borrowing of help from other branches of the Department, and the cooperation of the employees, it was possible to keep the work fairly current, but under conditions most undesirable. The dispatch of business of the divisions of the office of the Secretary retards or facilitates the activities of all bureaus of the Department, and satisfactory performance cannot be had without adequate personnel.

INTERNATIONAL CONFERENCES AND EXPOSITIONS

Paris International Exposition.—The exhibits of the Department of Commerce at the International Exposition at Paris were dismantled and returned to the United States immediately after the close of the fair in November 1937; and a report, embracing financial details, was submitted soon thereafter for inclusion in the required report to be made to Congress by the Commissioner.

Great Lakes Exposition.—The Congress having authorized continued participation, the Department maintained its exhibit at the Great Lakes Exposition, Cleveland, Ohio, until its close on October 29, 1937, thereafter making full report with financial statement for inclusion in the Commissioner's report to Congress.

Greater Texas and Pan American Exposition.—Representation at the Greater Texas and Pan American Exposition, Dallas, Tex., having been authorized by the Congress, the Department continued participation until the closing date, October 31, 1937, and submitted a statement of financial and other details to the Commissioner for embodying in his report to Congress.

In addition to 20 exhibitions in the United States in which the Department participated, it presented an exhibit at the meeting of the International Association for the Protection of Industrial Property at Prague, Czechoslovakia, and at the Exposition of Aeronautical Products, Lima, Peru.

Future international expositions.—The Department is engaged in preliminary work for the following international expositions to be held in the United States in 1939: Pan American Exposition, Tampa, Fla.; Golden Gate International Exposition, San Francisco, Calif.; New York World's Fair, New York City; and the Seventh World's Poultry Congress and Exposition, Cleveland, Ohio.

In accordance with legislation passed by Congress, the Department of Commerce is charged with responsibility for all Federal activities

in connection with the Pan American Exposition. The President designated as Federal Commissioner Dr. Alexander V. Dye, Director of the Bureau of Foreign and Domestic Commerce, with many years' experience at Latin-American posts in the Foreign Service of the United States. The departments and independent agencies are cooperating to the end that this exhibit shall depict the functions of the Federal Government.

Exhibits at the fairs in New York City and San Francisco are to be arranged by themes, and this Department will be represented by one or more of its bureaus in a majority of the subjects at each exposition.

The Bureaus of the Census, Fisheries, and Foreign and Domestic Commerce are actively engaged in preparations for the Seventh World's Poultry Congress and Exposition. They are cooperating with the Department of Agriculture with a view to presenting displays graphically depicting all functions of these Bureaus in connection with the poultry industry.

During the year ended June 30 the Department of Commerce was interested in, and submitted nominations of delegates to, more than 20 international congresses covering the fields of commerce, education, industry, and science.

Work in connection with a number of international gatherings scheduled for 1939 and 1940 has been initiated. Of these the Department is especially interested in the Eighth International Conference of American States, to be held at Lima, Peru, in December 1938, and in the First Inter-American Travel Congress to be held at San Francisco in April 1939. It is assisting in drawing up plans and agenda and working in close cooperation with the Pan American Union and the Department of State in preparation for these meetings.

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, 1938, 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	$1,937,842	$377,500	$8,000			$2,323,342
Bureau of Air Commerce	11,156,500	−360,000				10,796,500
Bureau of Foreign and Domestic Commerce	3,021,600		100,000	$118,500		3,240,100
Bureau of the Census	2,065,000					2,065,000
Bureau of Marine Inspection and Navigation	2,412,000					2,412,000
National Bureau of Standards	2,618,000			209,878		2,827,878
Bureau of Lighthouses	11,020,900	355,100				11,376,000
Coast and Geodetic Survey	2,649,400			74,450	−$8,000	2,715,850
Bureau of Fisheries	1,967,000					1,967,000
Patent Office	4,582,000					4,582,000
Total	43,430,242	372,600	108,000	402,828	−8,000	44,305,670

Disbursements during the year ended June 30, 1938, from appropriations and from funds transferred from other departments were as follows:

Bureau or office	Appropriation for—			
	1936	1937	1938	Total
Office of the Secretary	$51.80	$221,206.59	$1,757,454.25	$1,978,712.64
Bureau of Air Commerce	19,437.41	536,372.92	8,837,872.33	9,393,682.66
Bureau of Foreign and Domestic Commerce	576.53	53,318.59	2,932,527.75	2,986,422.87
Bureau of the Census	8,245.07	50,919.49	1,974,106.62	2,033,271.18
Bureau of Marine Inspection and Navigation	130.56	137,215.80	2,231,419.65	2,368,766.01
National Bureau of Standards	1,297.15	134,495.99	2,588,946.79	2,724,739.93
Bureau of Lighthouses	20,652.13	1,078,578.15	10,197,083.79	11,296,314.07
Coast and Geodetic Survey	832.35	314,792.33	2,359,359.85	2,674,984.53
Bureau of Fisheries	469.96	123,962.12	1,411,502.96	1,535,935.04
Patent Office	2.27	144,706.96	4,186,455.88	4,331,165.11
Total	51,695.23	2,795,568.94	38,476,729.87	41,323,994.04

MISCELLANEOUS RECEIPTS

Office of the Secretary:	
Sale of Government property	$1,472.83
Other	496.47
Bureau of Air Commerce:	
Violation, air-traffic regulations	2,770.00
Sale of Government property	29,034.58
Other	1,171.03
Bureau of Foreign and Domestic Commerce:	
Fees under China Trade Act	1,075.00
Sale of publications	36,158.37
Sale of Government property	876.06
Other	732.01
Bureau of the Census:	
Statistical services	4,236.94
Other	617.00
Bureau of Marine Inspection and Navigation:	
Tonnage tax, United States	1,781,252.46
Navigation fines	79,905.65
Navigation fees	186,172.08
Overtime service	42,822.27
Reimbursement for loss on continuous discharge books	1,897.15
Sale of Government property	2,607.62
Other	1,848.05
National Bureau of Standards:	
Testing fees	107,882.68
Sale of Government property	543.48
Other	69.85
Bureau of Lighthouses:	
Reimbursement, Government property lost or damaged	10,076.12
Sale of land and buildings	40,000.00
Sale of Government property	12,999.13
Other	6,039.37
Coast and Geodetic Survey:	
Sale of charts	81,593.08
Sale of maps	13,959.18
Sale of publications	9,140.89
Sale of Government property	4,560.46
Other	866.10

MISCELLANEOUS RECEIPTS—continued

Bureau of Fisheries:	
Sale of furs	$1,101.01
Sale of sealskins	293,512.66
Sale of foxskins	21,243.90
Sale of Government property	8,057.47
Other	6,083.14
Patent Office: Fees	4,346,859.74
Bureau of Mines: Excess cost over contract price	481.19
Miscellaneous: Refund, State and local taxes	169.23
Total, Department of Commerce	7,140,384.25

DIVISION OF PERSONNEL

At the close of the fiscal year 1938, exclusive of 139 persons paid from emergency funds, the personnel of the Department numbered 16,833. Of that number, 4,947 were employed in the District of Columbia and 11,886 in the field. The total personnel as of June 30, 1937, exclusive of 473 persons paid from emergency funds, was 14,698. Of that number, 4,584 were employed in the District of Columbia and 10,114 in the field.

The number of employees retired on annuity during the year under the Civil Service Retirement Act was 73—38 by reason of age, 25 on account of disability, and 10 by optional retirement. Under the Lighthouse Retirement System, 25 were retired for age and 36 on account of disability. A total of 2,156 civilian employees have been retired under applicable statutes to the close of June 30, 1938.

DIVISION OF PUBLICATIONS

The following statement shows, by appropriation title, the amounts expended or obligated from appropriations available for printing and binding during the fiscal year 1938:

Title of appropriation	Available	Expended [1]	Balance [1]
Printing and binding, Department of Commerce	[2] $501,150.00	$481,638.09	[3] $19,511.91
Same, deficiency, 1937–1938	[4] 102,029.49	99,454.94	2,574.55
Printing and binding, Patent Office	965,000.00	882,660.26	82,339.74
General Committee of the Accident Prevention Conference	[5]	13,481.93	
Fisheries market news service, Bureau of Fisheries	[5]	1,022.34	
Customs statistics, Bureau of Foreign and Domestic Commerce	[5]	15,392.40	
Investigation of building materials, National Bureau of Standards	[5]	1,510.09	

[1] Estimated; exact figures cannot be given until all work ordered is completed and billed.
[2] Includes a credit of $1,150 for copies of Coast Pilots furnished U. S. Naval Academy.
[3] Includes a reserve of $14,600.
[4] Amount available for expenditure in 1938 from a deficiency appropriation of $205,000 for 1937 and 1938.
[5] Amount available for printing not stated in appropriation item.

Receipts from sales of the Department's publications for the fiscal year 1937 (the latest period for which complete data are available) were $639,398.03, compared with $589,331.44 for 1936. The following table presents a comparison for the 2 years by selling agencies:

Sales	Receipts	
	1936	1937
By the Superintendent of Documents: Miscellaneous sales and subscriptions	$142,826.24	$151,129.97
By Coast and Geodetic Survey: Coast pilots, inside route pilots, tide tables, current tables, charts, and airway maps	92,332.35	106,488.71
By Patent Office: Specifications of patents, reissues, etc., trade-mark section and decision leaflet of Official Gazette, and classification bulletins and definitions	354,162.85	381,779.35
Total	589,331.44	639,398.03

DIVISION OF PURCHASES AND SALES

During the fiscal year 1938 there were placed 14,053 purchase orders, which, including freight, travel, rent, and miscellaneous accounts, involved the expenditure of $5,297,219.06. These amounts show an increase in orders of 1,882 over the fiscal year 1937 and an increase in expenditures over the same period by the amount of $4,178,916.20. This increase was due principally to the increased activities of the Bureau of Air Commerce.

There were 830 contracts approximating $2,398,487.70 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 102 formal contracts amounting to $4,318,414.98 prepared by this Division, making a total of 932 contracts examined and prepared, involving a total expenditure of $6,716,902.68.

Through the cooperation of the Procurement Division, Treasury Department, there was obtained by transfer, without exchange of funds, a large quantity of surplus and forfeited property. Also, there was transferred, without exchange of funds, from this Department to other branches of the Government, including the Procurement Division, surplus material valued at approximately $200,000.

Approximately 3,000 reports of surplus and seized property have been received from the Procurement Division and appropriately handled. Many of these reports require the canvassing of the bureaus and offices of the Department, the tabulation of their replies, and reporting to the Procurement Division. This office is now also required to report to the Procurement Division all unserviceable property which has a sale value.

DEPARTMENT LIBRARY

At the close of the fiscal year 1938 the number of books and pamphlets in the Department library was 238,898, and periodicals and newspapers currently received, 1,724. The number of books and pamphlets cataloged was 9,412; cards added to the catalog, 25,521; books prepared for the shelf, 7,039; books bound, 1,128; number of books circulated, 40,098; books borrowed from the Library of Congress and other libraries, 1,679; books loaned to other libraries, 412; N. R. A. hearings circulated, 579.

OFFICE OF THE SOLICITOR

During the fiscal year ended June 30, 1938, there were 620 opinions rendered; and 442 contracts, 900 leases, 3 insurance policies, 52 revocable licenses, and 388 bonds were examined. Legislative matters handled numbered 274.

During the year all regulations of the Department and each of the bureaus were codified, after review and the making of the necessary revision to bring them up to date. The office also reviewed the Federal Register work for the Department. Many other questions not requiring written opinions involving statutes, contracts, treaties, regulations, and administrative law and procedure were disposed of in conferences with officials of the bureaus and representatives of other departments.

BUREAU OF AIR COMMERCE

The organization of the Bureau of Air Commerce remained substantially unchanged during the year, except that the office of an additional Assistant Director was created. All activities of the Bureau were under a Director, aided by two Assistant Directors and a technical assistant, having 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, the Assistant Directors, and the heads of the seven divisions, with the technical assistant to the Director as the secretary of the board, dealt with all matters regarding policy within the Bureau. In addition, there was an advisory board to the Bureau, consisting of some 21 civilian and other representatives of all national aviation interests.

During the year there was organized a group known as the Airways Operation Advisory Committee for the purpose of formulating programs, policies, and regulations for the operation of the civil airways. The membership of this Committee was composed of representatives of the War Department, the Navy Department, the National Aeronautic Association, National Association of State Aviation Officials, Aeronautical Radio, Inc., Air Line Pilots Association, United States Coast Guard, Interstate Commerce Commission, United States Weather Bureau, American Municipal Association, Air Transport Association of America, Private Flyers Association, the Sportsman Pilot Association, National Safety Council, and a representative of airport officials. This committee held a series of meetings with the Bureau.

A similar advisory committee was established to consider the private flying problems incident to the writing of the Civil Air Regulations.

A reorganization was effected of all the field activities of the Bureau into seven regions, each under the supervision of a regional supervisor. These new regions were made up of the nine general inspection and the six airways districts under which the Bureau's field work had been previously carried on. The regionalization made possible a closer coordination of the Bureau's functions and a more expeditious handling of Bureau matters which had been formerly referred to the Washington office.

THE FEDERAL AIRWAYS SYSTEM

At the outset of the past fiscal year, the Bureau of Air Commerce undertook a comprehensive airways modernization and extension program. This program was made possible by appropriations and authorizations totaling approximately $7,000,000, of which approxi-

mately $3,000,000 was appropriated and made available for expenditure during the fiscal year 1938; $2,000,000 was authorized to be contractually obligated during the fiscal year for expenditure subsequent thereto; and $2,000,000 was authorized to be contractually obligated during the fiscal year 1939 for expenditures during that fiscal year and subsequent thereto.

Many new developments and mechanical improvements in connection with airways aids had been successfully worked out during the preceding years, but not generally applied to the airways system, owing to lack of funds. It was therefore determined first to bring the existing airways up to thoroughly modern standards by improvements to existing aids and by installing such additional aids as were needed to render a complete service. Consequently, the first 5 millions were allocated to the modernization of existing airways, and the remaining 2 millions to the extension of the Federal airways system to include new routes.

A great deal was accomplished in the carrying out of both phases of the airways program. On account of the large number of new radio stations to be constructed within a short time and the fact that equipment for the simultaneous stations was of a new design, an innovation was undertaken in the method of procuring and installing the radio equipment. Four radio range equipment contracts were let; one contract included all equipment and installation at 44 simultaneous stations, another included all equipment and installation at 35 stations, a third included furnishing of equipment and installation at 36 nonsimultaneous stations, while the fourth covered all equipment required to convert 50 existing nonsimultaneous stations to the simultaneous type. All four of these contracts were let during the first half of the fiscal year.

The first units of this equipment were assembled and tested in the early spring of 1938, and by the end of the fiscal year six installations had been completed, with the remainder scheduled to be made at the rate of 12 to 15 stations per month until the entire program had been completed.

Equipment required for the teletype communications system extensions was obtained in the early part of the fiscal year, and by the end of the year some 7,000 miles of teletypewriter circuits had been added to the system.

The program called for the installation of 100 cone of silence markers at various range stations and by the end of the fiscal year all of the equipment had been manufactured and installation had been completed at two stations. Of the proposed 21 fan type marker installations, 1 such marker had been installed and placed in operation and the balance were scheduled for installation during the months of August, September, and October.

In addition to the surveys and site selections required for the new radio aids, the Bureau was able to complete a large part of the survey and site selection work required for the realignment of several portions of existing airways, and for new airways. Contracts were let for the supplying of a considerable portion of the equipment necessary for the new airways, including 180 new beacon light units.

Radio.—The Radio Technical Committee for Aeronautics, sponsored by the Bureau of Air Commerce and directed by the chief of

its radio development section, continued its active coordination of the work of various Government and civil research organizations. Bureau radio engineers participated in the work of the Interdepartment Radio Advisory Committee, in the Inter-American Radio Conference at Habana, Cuba, the United States-Canadian Conference in Washington, and the International Telecommuncations Conference at Cairo, Egypt. These activities were responsible for important contributions to aeronautics through their provision for essential radio-communication needs both for the present and for the future, especially in connection with international aviation.

Numerous improvements in existing types of radio aids were developed during the year, notably in connection with the now standard system of simultaneous radio range and radiotelephone transmission. The stability of radio range courses was still further improved by new methods of transmission-line design and antenna tower tuning.

Considerable progress was made toward a complete and satisfactory solution of the increasingly important problem of blind approach to airports under conditions of no visibility, and the actual landing of aircraft by instrument guidance alone. Detailed performance specifications for a complete system were prepared, based upon the recommendations of the Radio Technical Committee for Aeronautics and the best features of the several different experimental systems thus far developed. A contract under these specifications was advertised and awarded for the development and manufacture of such a system to be installed at Indianapolis, Ind., where further experimentation and field tests will be conducted. The system provides for operation on one of the standard ultra-high frequency channels recently allocated for this purpose.

Development work which has been in progress for several years on a system of teletype operation by radio was brought to a conclusion and a comprehensive report thereon prepared for use as the basis for planning a network of ultra-high frequency radio teletypewriter circuits. The proposed system of automatic relay stations would at the same time lend itself to ground-to-aircraft transmission by teletype when receiving printers suitable to aircraft installation become available.

The general course pursued by the Bureau during the past year in the development of aeronautical devices based upon the use of radio, beyond those immediate problems involved in the program of improvement of existing facilities, was chiefly in the field of new applications of the ultra-high frequencies. Not only has this recently opened part of the radio spectrum offered a means of relieving serious congestion, but it has rendered possible the development of entirely new types of aids.

A large amount of experimental work was conducted on the development of airway radio ranges for operation on ultra-high frequencies. This work was productive of much new information on directive antennas, particularly in connection with the respective merits of vertically versus horizontally polarized waves.

Two somewhat similar types of ultra-high frequency radio markers were developed as a means for providing airmen with positive position identification. One of these markers, a Z type or zone

marker, is being located at radio range stations while the other, a type FM or fan marker, is being installed at specified points along the range courses. The latter serves both as an aid to navigation and as an important link in the Federal system of airway traffic control.

Concurrent with the development of ultra-high frequency ranges and markers, work was carried forward on the design of ultra-high frequency transmitters and antennas for radiotelephone transmission.

As a means of encouraging and assisting aircraft operators to adopt ultra-high frequency equipment for the types of service to which it is best suited, the Bureau awarded development contracts to radio manufacturers for transmitters and receivers designed to meet the rigid and peculiar requirements for aircraft installation.

Specifications were prepared and a contract awarded for the development and construction of a new type of radio beacon for possible application to the Federal airways system. This is the omnidirectional beacon, differing from the conventional equisignal (N–A) range in that, instead of producing the usual four fixed courses, it will provide essentially the same navigational information to a pilot flying toward the beacon regardless of his direction therefrom.

At the request of various air lines and in compliance with the recommendations of the Radio Technical Committee for Aeronautics, the Bureau undertook an investigation of precipitation static phenomena encountered in aircraft and associated in flight through rain, snow, dust, or similar conditions which result in severe interference to radio reception. Work was started under contract with the Bureau at both Reed College, Portland, Oreg., and Purdue University, Lafayette, Ind., on exhaustive research programs on these problems.

Communications.—The Bureau cooperated with the Alaska Aeronautical and Communications Conference in preparing plans for the operation of the necessary aviation communications and aids to air navigation in the Territory of Alaska, and participated in several conferences which considered the provision of meteorological and radio communication service for proposed trans-Atlantic, trans-Pacific, and United States–Australia aircraft service.

Arrangements were made for the establishment of continuous radio receiving watches on the frequency 6,210 kilocycles wherever receiving equipment could be made available. This receiving watch on 6,210 kilocycles was in addition to that maintained on 3,105 kilocycles.

The operating speed of the entire teletype system was increased 50 percent, or from 40 to 60 words per minute.

Arrangements were made for the purchase and installation of automatic devices for timing all communications transmitted by teletype and broadcast at the 85 scheduled radio broadcasting stations.

Airway traffic control.—The 8 airway traffic control stations extended their hours of traffic control coverage from 16 to 24 daily. During the year the stations handled a total of 294,528 flight plans. Teletype circuits totaling 4,000 miles with 52 drops were established for handling communication information only. Preliminary arrangements were made relative to equipment and personnel required for the establishment of airway traffic control stations at Atlanta, Fort Worth, Kansas City, St. Louis, and Salt Lake City.

Airport traffic control.—An airport traffic control section was established to administer portions of Part 26 of the Civil Air Regulations, and particularly that of preparing and issuing examinations for the certification of airport control tower operators. A total of 40 such certificates had been issued at the close of the fiscal year.

Lighting.—The development of a reflector-type runway marker was initiated, and experimental installations were made at the Washington Airport, Washington, D. C., and at the Municipal Airport, Nashville, Tenn.

In the past, beacon lights have occasionally failed to operate properly owing to the formulation of a coating of ice resulting from freezing rain or snow. To obviate this difficulty, the Bureau contracted for the purchase of 80 dome-type 24-inch rotating beacons. This new beacon is a radical departure from the standard rotating type in that the projectors and lamp-changers rotate inside an enclosed one-piece heat-resisting glass dome. The dome-type beacon, through the heat generator inside the dome, allows the ice and snow to melt off and at the same time prevents the mechanism from becoming frozen. The beacons will be used in those portions of the United States that are visited annually by severe ice and snow conditions.

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

Item	July 1, 1937	June 30, 1938
Airway mileage: miles	22,399	22,834
Lighted do	176	[1] 849
Day (unlighted) do	441	0
Lighted routes on day airway status (lights not operating) do	437	0
New routes under construction number	280	267
Intermediate landing fields do	1,916	1,943
Beacon lights in operation		
Radio stations:		
Scheduled weather broadcast stations do	82	85
Radio ranges do	164	179
Radio markers do	55	54
Teletypewriter circuits miles	13,885	[2] 21,790

[1] Albany-Rouses Point (NY-M), 164 miles; Augusta-Columbia-Charleston (A-C Airway), 160 miles; Cincinnati-Washington Airway, 414 miles; Seattle-Vancouver Airway, 111 miles.
[2] Does not include airway traffic control, Army, Navy, or Weather Bureau circuits.

TRANSOCEANIC ROUTES

The trans-Pacific air route continued operation from San Francisco to Hong Kong, giving through service for mail, passengers, and express from the United States to the Orient. Exploratory flights were made looking toward the provision of service to Australia and New Zealand.

Regular passenger and mail service was continued between the United States and Bermuda, with an American air line and a British company providing schedules.

Exploratory flights were made over the North Atlantic in preparation for regular service. American, British, and German interests engaged in these flights. The first of six huge flying boats being constructed for use in this service by an American air line was test flown, and further tests are now under way.

Protracted negotiations regarding reciprocal agreement were carried on relative to establishment of service between the United States and Europe.

REGULATION OF AIR COMMERCE

During the year all the rules and regulations of the Bureau pertaining to aeronautics were revised and rewritten and issued as the Civil Air Regulations. The regulations dealing with various specific matters, such as aircraft registration certificates, airplane airworthiness, pilot rating, and the air-traffic rules, are carried under separate headings known as parts. Thus part 00 deals with aircraft registration certificates, part 20 with pilot rating, and part 60 with the air-traffic rules. In promulgating the Civil Air Regulations the Bureau cooperated with the aviation industry itself, and care was taken that the regulations be made sufficiently flexible to provide for such future revisions and amendments as become necessary.

The general scheme of preparing and issuing these regulations was adopted by the committee in charge of the United States Code of Administrative Regulations as a model for all Federal regulations.

Air-line inspection.—The Civil Air Regulations concerning scheduled air-line operations were put into effect. Certificates and letters of competency were issued replacing the former letters of authority for scheduled air-line operations. These certificates and letters of competency clarified and simplified the method of setting forth the specifications and conditions under which operations were to be conducted.

There was considerably more inspection activity during the year, occasioned by a number of extensions to existing air-line operations, the formation of new services, and additional schedules over existing routes.

Inspection of scheduled air-line radio operation, maintenance, and installation was conducted by the air-line radio inspectors, who also inspected and issued type certificates to 83 items of radio equipment.

General inspection.—The advent of the Civil Air Regulations greatly increased the scope and volume of business of the general inspection section. Activities increased approximately 20 percent during the fiscal year, and it is believed that there will be an additional increase of 25 percent during the coming year.

Airworthiness of aircraft and equipment.—The new presentation of all requirements for airplanes, engines, propellers, and equipment in Civil Air Regulation form was completed and made effective. The Bureau continued, through participation in several meetings and the preparation and issuance of additional technical publications, as an active member of the Army-Navy-Commerce Committee on Aircraft Requirements.

Additions to the engineering staff were trained and a branch office was opened at Kansas City, Mo. The volume of work received expressed in new designs continued to increase. Several projects in the "giant" category of flying boats and landplane aircraft were in process of being examined for approval.

Airway coordination.—The activities of the airway coordination section included the clearance of proposed changes and additions in air-navigation aids on the Federal airways system, computation of air-mail contract mileage for the Post Office Department, preparation of air-line maps showing regular and alternate routes, designation of civil airways, clearance of proposed radio tower locations for the Federal Communications Commission, and recommendations for painting and lighting specifications for all obstructions to air navigation.

Instrument-flight training.—Approximately 50 inspectors of the field force took the instrument trainer and refresher courses. Much was accomplished toward encouraging uniformity in blind flying procedure and instruction.

Legal.—During the fiscal year a comprehensive revision and codification of the Civil Air Regulations was undertaken, and forms were drafted for use in connection therewith. The Bureau continued active participation in the establishment and maintenance of aeronautical agreements with foreign countries, which included a new arrangement with Canada concerning airmen, aircraft, and air navigation, and also continued negotiations with France, Poland, and New Zealand, and opening of negotiations with Portugal. Active participation, concerned with the establishment of air routes, services, and navigational facilities in overseas and foreign air commerce, was continued. The Bureau also participated in matters pertaining to international law, principally in the work of the International Technical Committee for Aerial Legal Experts.

Accident analysis.—A total of 2,527 reports of accidents was analyzed and classified for statistical purposes. Statements were issued covering the probable cause of 8 air-line accidents and 61 accidents in non-airline operation. Public hearings were held in connection with the eight accidents in scheduled air-line operation and one accident in nonscheduled flying.

Registration.—A total of 63,361 applications was received for airmen and aircraft certificates, and 47,898 certificates were issued. A total of 32,754 airmen certificate renewals was recorded, and 8,326 transfers of title to aircraft were completed. At the end of the fiscal year 85,496 current aircraft and airmen certificates were outstanding. The issuance of new type identification certificates to all airmen was undertaken.

Enforcement.—During the year 666 violations of the Bureau of Air Commerce regulations were reported. Varying degrees of penalty were imposed in 574 cases, and the others were dismissed.

DEVELOPMENT

A four-cylinder barrel-type aircraft engine was constructed under contract to the Bureau, and successfully passed its acceptance test.

An airport orientator was developed, purchased, and flight tested, and found to meet satisfactorily the requirements for an instrument which will provide a pilot with airport and approach information pictorially represented, and in proper orientation with the ground.

The development and manufacture of an automatic instrument log for recording photographically the instrument readings and control settings in an aircraft cockpit, continuously and automatically, were conducted under contract. The device was ready for flight testing at the close of the fiscal year.

During the fiscal year a total of 13 reports and 3 confidential notes were published dealing with various aeronautical matters. Other reports and notes were in various stages of preparation at the close of the fiscal year.

Arrangements were completed for the establishment of an aeronautical testing station by the city of Indianapolis, Ind., for the exclusive use of the Bureau in service testing aids to air navigation and safety equipment for aircraft. Under the terms of the agreement, Indianapolis agreed to build an airport and hangar with space for shops on a 266-acre tract of land adjacent to its municipal airport.

AVIATION-MEDICINE STUDIES

A medical station was established at Kansas City, Mo., for the primary purpose of conducting a study looking toward the solution of pressing safety problems in relation to pilot fatigue and other factors connected with the human element in aviation. A lease was negotiated and all alteration work contracted for, to insure housing that would include scientific lighting, complete control of the atmosphere, complete acoustical treatment, and shielding for X-ray and other specialized apparatus. Procurement arrangments were completed for all equipment, including the most advanced opthalmological examining equipment, audiometer, X-ray and fluoroscope, electrocardiograph, amplifying stethoscope and basal metabolism and vital capacity spirometer, and a Link trainer.

The Columbia and Harvard medical research contract on the effects of oxygen deprivation (high altitude) on the human organism was completed.

Three medical research contracts were awarded to universities as follows:

1. Dartmouth College to conduct an investigation on the subject of aniseikonia.

2. Harvard Fatigue Laboratory to conduct studies and develop methods of measurement for (*a*) the dilineation of personality types, (*b*) susceptibility to anoxia, (*c*) emotional stability, and (*d*) the proximity to major and minor psychotic break-down.

3. The Johnson Foundation (University of Pennsylvania) to conduct research studies for the purpose of developing biophysical methods for measurement of vascular signs of physical strain and emotional states and also to determine electrical methods for study of variations in properties of the nervous system in relation to fluctuations in the blood chemistry.

A contract was let for the purchase of a bone conduction hearing device and a report on its operating characteristics under service conditions.

AIRPORTS

The national airport survey, commenced in June 1937, was continued for the purpose of obtaining information regarding all civil airports in the United States. The survey was divided into three general parts, as follows:

1. A financial study to ascertain the capital investment in airports since the 1930 survey, including the cost of operation and maintenance, amount and sources of revenues, and the methods of obtaining funds for capital improvements.
2. An analysis of the dimensions and the equipment of the airports, to provide more dependable information than had been obtained previously.
3. Securing of aerial photographs to give information regarding the facilities and dimensions of airports.

Part of the studies toward a national airport plan were completed and exhibits were made for the airport conferences held in December 1937 and March 1938. The national airport plans for the Southeastern States and the New England States were completed in their preliminary form.

At the close of the fiscal year, 87 percent of the civil airports had been analyzed with respect to their facilities, 64 percent with respect to their financial set-up, and 32 percent of the vertical aerial photographs had been completed.

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. During the fiscal year the Bureau approved 305 airport and air-marking projects involving an estimated expenditure of $39,709,780. As of June 30, 1938, a total of 1,315 airway and airport construction projects had been submitted for consideration since the inception of the airport program. Of these, 560 projects had been completed, 293 were active, 34 had been consolidated, 47 had not been started, 194 had been suspended, 4 had been transferred, and 193 had been discontinued. Works Progress Administration funds in the amount of $136,427,947 were provided for use in connection with the projects, and of this amount $92,381,262 had been expended.

Air marking.—As a result of the Bureau-sponsored air-marking program, approximately 10,125 air markers had been constructed or repainted as of June 30, 1938. A bulletin covering the subject of air marking was prepared during the fiscal year.

Airport rating regulations.—A draft of tentative airport rating regulations was prepared and submitted to the National Airport Conference, to the aeronautical industry, and to other interested organizations. As a part of these tentative regulations, standard and performance specifications, covering all airport lighting equipment, were prepared for the guidance of municipal and Federal agencies engaged in airport construction work.

Seaplane facilities.—Studies were made of various problems in seaplane operations, such as water maneuvering characteristics of large seaplanes to establish minimum operating areas, a study of beaching facilities, a preliminary survey of two transcontinental routes for seaplanes, and an investigation of seadrome lighting.

ADMINISTRATION

The Administrative Division, in addition to carrying on its regular routine duties, installed a machine system for keeping the cost accounts in the Washington office and for keeping allotment ledger, general ledger, and cost accounts in the regional offices of the Bureau. It also developed and installed a machine system for control of authorized and proposed positions and of funds required therefor.

DISSEMINATION OF INFORMATION

The Information and Statistics Division continued its duties of tabulating and disseminating aeronautical information through printed bulletins, special articles and correspondence, photographs, motion pictures, maps, compilation of statistics, and supplying of information on airports and air-navigation aids. The bulletin Tabulation of Air Navigation Radio Aids was changed from a quarterly to a monthly publication.

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	Purchase and maintenance of aircraft	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 [1]	628,000	1,537,000.00	$263,000	5,538,700.00	[2] 2,911,800	[4] $697,470	-------	11,575,970.00
1939	650,000	1,249,800.00	258,000	6,758,600.00	[3] 4,575,000	[4] 650,000	$335,000	14,476,480.00

[1] The discrepancy between these figures and those shown for 1938 in the Annual Report of the Secretary of Commerce for the fiscal year ended June 30, 1937, is due to changes made in the original appropriations by the third deficiency bill, after the report had gone to press.

[2] The act also authorized the Secretary of Commerce to enter into, prior to July 1, 1938, contracts for the purchase, construction, and installation of additional air-navigation aids not in excess of $2,000,000, and to obligate, prior to July 1, 1939, a further $2,000,000 for such purposes.

[3] Of this sum, $2,000,000 is available for payment of obligations incurred under authority of appropriation act for fiscal year 1938 to obligate that amount prior to July 1, 1938. The Secretary of Commerce was also authorized to enter into, prior to July 1, 1939, contracts for the purchase, construction, and installation of air navigation aids which authorization is in lieu of, and not in addition to, the authorization contained in the first proviso of the appropriation act for 1938, as shown in footnote 2.

[4] The amounts for the fiscal years 1938 and 1939 under "Traveling expenses" were not appropriated specifically for the Bureau of Air Commerce, as this item of expense was covered by a separate appropriation to the Department of Commerce, and the figures shown represent the allotments made by the Department to the Bureau.

Statistics on personnel employed by the Bureau of Air Commerce on June 30, 1938, and on the corresponding date of the preceding year follow:

Item	June 30, 1937			June 30, 1938		
	District of Columbia	Field	Total	District of Columbia	Field	Total
Salaries, Bureau of Air Commerce	204		204	264		264
Aircraft in commerce		180	180		287	287
Establishment of air navigation facilities		81	81		215	215
Maintenance of air navigation facilities		1,457	1,457		2,002	2,002
Safety and planning				18	20	38
Total	204	1,718	[1] 1,922	282	2,524	[2] 2,806

[1] In addition, on June 30, 1937, there were 81 employees engaged on projects sponsored by the Works Progress Administration.
[2] In addition, on June 30, 1938, there were 73 employees engaged on projects sponsored by the Works Progress Administration.

GROWTH OF AVIATION INDUSTRY AND SAFETY IN FLYING

In conclusion, it seems proper to make note of the phenomenal growth of the aviation industry since the passage of the Air Commerce Act of 1926, and of the increased safety in flying accomplished under the aegis of the Bureau of Air Commerce.

During the 12 years that the Bureau has functioned, the number of firms in the industry has almost tripled, the number of licensed airplanes increased approximately five times, and the number of licensed pilots increased elevenfold. The 545 student licenses issued in 1927 had increased to more than 38,000 by the end of the fiscal year 1938. Particularly in scheduled air transportation are comparative figures noteworthy. For example, the daily average of miles flown (domestic and foreign extensions) soared from 11,830 at the end of 1926 to 234,922 at the end of the past fiscal year. The amount of income to contractors for carrying the air mail increased from three-quarters of a million dollars to more than 21 millions annually. In the last 5 years alone, the total value of aircraft in service has increased from 9½ to 19½ million dollars, while in the same period, the scheduled miles flown annually has gone from 54,642,545 to nearly 77 million. Passengers carried by the air lines in 1927 totaled 8,679; last year the lines carried 1,267,580, and during June 1938, the final month of the fiscal year just past, the lines carried 115,255 passengers. Increases have been noted in practically every phase of the industry, year by year.

In carrying out the mandates of the Air Commerce Act, the Bureau of Air Commerce, in all its actions, made safety its primary objective, and as a result, air travel has become safer year by year. The improvement in safety in both scheduled air-line and miscellaneous flying operations is evident in the statistics on fatalities. The number of miles flown per fatal accident in scheduled air-line operations increased from 1,467,622 in 1927 to almost 13,000,000 in 1937. During this same period, the miles flown per fatal accident in miscellaneous operations, which includes the sometimes hazardous experimental and exhibition flying as well as training and private flying, increased

from 279,070 to 556,737, while at the same time the miles flown per passenger fatality in this phase of flying activities rose from 285,174 to 1,009,768.

An important factor in this increase in safety has been the assistance rendered by the Bureau of Air Commerce through its Federal airways system, and its rules and regulations governing flying operations, airworthiness requirements for aircraft and accessories, and competency qualifications for airmen.

BUREAU OF THE CENSUS

INTRODUCTION

The major task now facing the Bureau of the Census is the gigantic one of preparing for the decennial census of 1940.

This census will be the most complete and most important statistical inventory of the human and economic resources of the Nation ever taken. Millions of fundamental facts about people, farms, stores, factories, and resources must be gathered, compiled, and published.

These facts will not be buried in musty vaults but must be put to work to help solve the problems of those very persons and organizations furnishing the original information to the Census Bureau.

The Bureau is faced with demands for more direct and detailed knowledge of population, agriculture, manufactures, business, and other subjects included in the decennial census as the result of changes and shifts in our social and economic life which have occurred in the eventful years since the census of 1930.

A new factor is the great increase in the need for census facts as an administrative tool in the carrying out of social and economic programs. Never before have census facts been in such demand for direct administrative use in solving the problems arising in our present social and economic reconstruction period.

In order to secure sufficient, complete, and accurate base data for the existing economic welfare and control programs it will be necessary for the Bureau of the Census to expand considerably the tabulations of census data, and to appreciably increase the social and economic inquiries on the schedules which will be used in the next decennial census.

Some evidence of the magnitude of the task faced by the Bureau in its preparatory work can be gleaned from the fact that the services of approximately 150,000 people will be required to take the census. Of this number, about 8,000 will be employed in Washington compiling the data gathered in the field by about 140,000 enumerators. To recruit, equip, and train this great working force presents a formidable problem in organization and supervision, but that is only one part of the job.

Long before the first enumerator is hired, about 140,000 separate large-scale detailed maps—one for each enumerator's district—must be drawn and verified.

The preparation and testing of the many schedule forms involve months of conferences, committee meetings, and hearings, in order that the needs of all interested groups and individuals may be given the consideration they deserve. Every schedule must be planned to secure the maximum of useful data with the minimum of expense and trouble to the respondents who must report.

Astonishingly large quantities of printed forms, equipment, and supplies must be prepared and distributed throughout the Nation and its Territories before the first family or factory is enumerated. Each supervisor and enumerator must receive instruction and training for his task. All this is exacting and time-consuming work.

Legislation.—These epochal changes in the functions of government and the organization of American life since 1930 have been recognized as far as possible in the activities and services of the Bureau of the Census under its present legal authorization. The further extension of the Bureau's services requires a revision of the census law. As a result of the Bureau's careful study of the needs of other Federal agencies, of State and local governmental agencies, and of business and industry, it is apparent that the following important needs be recognized soon by proper census legislation: (1) Housing data in addition to that usually secured in the decennial census should be obtained to serve the Federal, State, and local housing agencies; (2) employment data as well as unemployment and occupations should be gathered at the time of a population census; (3) certain basic facts about farms must be secured more often than every 5 years; (4) population details by small areas should be secured at 5-year rather than 10-year intervals; and (5) some fundamental data on the activities of business and industry should be obtained at least on an annual basis, leaving the more complete picture to be obtained quinquennially through complete national censuses, such as those now published, the latest of which is for 1935.

Advisory committees.—The maintenance of a high standard of statistical work by the Bureau of the Census requires the knowledge and advice of experts in all fields of social and economic life. On many problems advice and constructive criticism can be secured by correspondence and special conferences. However, the increasing demands made upon the Bureau in various fields have become so great as to require the attention of special advisory committees. In the sections of this report dealing with statistics of manufactures, financial statistics of States and cities, and vital statistics, are listed the special advisory committees for these subjects.

The reports and recommendations of these special committees are referred to the general Census Advisory Committee which, since 1937, has been appointed by the American Statistical Association to advise the Director of the Census on all phases of census work. This committee will have the major responsibility for making recommendations as to changes and improvements proposed for the decennial census of 1940.

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

ROBERT E. CHADDOCK, chairman, Columbia University, New York City.
MURRAY R. BENEDICT, College of Agriculture, University of California, Berkeley, Calif.
PAUL T. CHERINGTON, New York City.
FREDERIC J. DEWHURST, Twentieth Century Fund, New York City.
WILLIAM F. OGBURN, University of Chicago, Chicago, Ill.
WILLARD L. THORP, Dun & Bradstreet, Inc., New York City.

PREPARATIONS FOR THE 1940 CENSUS

Preparations for the Sixteenth Decennial Census to be taken in 1940 have occupied much of the time of the staff of the Bureau during the past fiscal year. The following sections are illustrative of the work necessary to prepare for a large decennial census rather than being exhaustive in their treatment of the Bureau's many activities in this work.

PREPARATION OF MAPS

In order that the enumeration of population, agriculture, business, and the other subjects to be covered in the 1940 census may be complete and yet not involve any duplication of reporting it is necessary that each enumerator should be supplied with an accurate, up-to-date map showing the exact boundaries and characteristics of the area which has been assigned to him for enumeration. The Bureau's maps, therefore, must be revised each decade to provide for changes in county, township, and city boundaries. In preparation for the census of 1940, base maps are being prepared for the 3,071 counties and for more than 3,000 cities. The county boundaries and the boundaries of approximately 52,000 minor civil divisions which subdivide these counties are receiving official verification by local correspondence. The city boundaries and approximately 15,000 ward boundaries within cities likewise are being verified through correspondence with local officials and city base maps are being prepared showing these boundaries. It is necessary to verify all changes in political boundaries before beginning work on the final preparation of the 140,000 enumerator district maps for the next decennial census.

During the past year approximately 1,850 letters have been sent to city engineers concerning annexations and detachments. Nearly 1,000 county and city maps have been secured from local officials.

Census tracts.—The need for detailed analyses of population in the larger cities has made desirable the reporting of census data by special, quasi-permanent statistical areas known as census tracts. These areas are determined by local officials and agencies in cooperation with the Bureau of the Census. During the past fiscal year, 9 cities having 100,000 population or more have been newly tracted, the tracts of 5 cities have been revised, making a total of 53 cities tracted as of June 30, 1938. Of cities having less than 100,000 population and not in metropolitan areas, 5 have been tracted during the past year, making a total of 8 cities in this group tracted to date. In addition, tracts have been established in 18 areas surrounding cities of 100,000 population or more, which completes the tract work for cities, or areas surrounding cities, preparatory to the census of 1940.

Metropolitan business areas.—In connection with the 1930 Census of Population the Bureau delineated the principal metropolitan districts of the United States, each of which was required to have an aggregate population of 100,000 or more, one or more central cities of 50,000 or more, and contiguous civil divisions with a density of not less than 150 inhabitants per square mile. While these areas proved very useful for population analyses, they were subject to some

criticism from the point of view of broad economic analyses such as those of marketing research, regional planning, public health, etc. Businessmen have urged that the utility and scope of these districts be broadened by increasing the number of districts and by using the metropolitan districts as a unit for the publication of a wide range of census statistics. A study of the redefinition of metropolitan areas and of the possible extensions of usefulness for these districts as statistical reporting areas is now being made by a committee composed of Dr. Paul T. Cherington, of New York City, chairman, representing the American Marketing Association; T. W. Howard, United States Chamber of Commerce, Washington, D. C., representing manufacturers and chambers of commerce; and Dr. Ralph J. Watkins, University of Pittsburgh, representing the American Statistical Association. Upon the completion of its survey this committee will transmit its recommendations concerning metropolitan business areas to the Bureau of the Census.

Township areas.—In order to make possible the presentation of accurate density statistics for minor civil divisions and to provide a detailed check on the acreage returns on the Census of Agriculture, a project for measuring the township and other minor civil division areas of the United States, financed in part by Works Progress Administration funds, was started in January 1938. Funds were provided to continue this work during the fiscal year of 1939. It is anticipated that all minor civil divisions in the United States will be measured in time to publish their areas in the reports of the Sixteenth Decennial Census. Upon the completion of this project it is anticipated that a population density map for the entire United States will be prepared from data secured in the 1940 census. The township area data will make possible more detailed figures on agricultural acreages, production per acre, land in farms, and other items, as well as population density.

CENSUS OF AGRICULTURE

Trial census of agriculture.—In cooperation with the Department of Agriculture a trial was made of questions proposed for the 1940 Census of Agriculture. The State statisticians of the United States Department of Agriculture made the actual enumeration and forwarded the schedules to the Census Bureau for tabulation and analysis. They then made written reports on all items of interest connected with the enumeration. These reports included comments on the schedule questions themselves, the time required, reaction of the farmer to certain questions, the relative accuracy of replies obtained, the difficulty of obtaining certain information, and other pertinent facts. These reports were summarized by the Census staff so that all feasible improvements and suggestions may be adopted.

At a meeting of agricultural economists and State agricultural statisticians it was moved that the Bureau of the Census undertake a second trial census of agriculture in selected areas during the next fiscal year, after the revision of tentative schedule forms for the 1940 census but before the adoption of the final forms. This project was recommended as of particular significance because of its probable contribution to a better enumeration of farms and to the securing of more accurate farm statistics in the decennial census of 1940.

Research and sampling.—A considerable amount of research work has been done in connection with the determination of adequate sampling procedures and measuring of the quality of statistical data. A mapping study and analysis of farm location at the last census has been made to determine the possibilities offered not only for improvement of statistics but for the greatly extended use of area identification of farm properties. This has been discussed with some of the leading soil and farm management authorities in the country, with the general belief that a new method of approach to many farm problems has been discovered.

DECENNIAL CENSUS OF POPULATION

Location of institutions.—An exhaustive list of institutions, such as hospitals, reformatories, asylums, residence schools, etc., is being prepared, giving the most detailed location possible for each. In the preparation of this list a complete canvass has been made of the records of Federal, State, and county agencies, and medical associations as well as by a canvass of directories. Federal organizations such as Army posts, Navy stations, lighthouses, and Coast Guard stations and ships have also been listed. It is very essential for the proper enumeration of the decennial census that each institution be identified and located in advance and be enumerated as a separate unit from the normal population.

Delimitation of unincorporated urban places.—The Bureau has developed a procedure for delimiting unincorporated urban places for the enumeration in 1940. This work is being undertaken by the Bureau of Public Roads in 19 States, covering more than half of the unincorporated urban places of 1,000 or more inhabitants in accordance with plans developed cooperatively with the Bureau of the Census. This work (1) will serve to make possible a more adequate classification of the several million inhabitants of these unincorporated urban places, who, heretofore, have been classified as rural nonfarm; (2) it will provide a valuable supplement to existing census data for the citizens of the United States, with particular reference to the needs of businessmen meeting problems of marketing; and (3) it should give improved census coverage by facilitating the allocation of enumerator work loads and the establishment of proper pay rates.

Urban and rural classification.—The classification of the population as urban and rural on the 1930 basis has been carried back to the first census, that of 1790, whereas the earliest census for which such figures were heretofore available was 1880. The complete presentation of these data will be made in connection with the 1940 census.

TABULATION AND COMPILATION OF STATISTICS

In connection with the Bureau's work on the Trial Census of Agriculture, the Census of Manufactures, and the Unemployment Census it has been possible to develop and test census operations covering the most important and time-consuming parts of census work—the tabulation, compilation, and publication of statistics. It is of the utmost importance that the 1940 census be compiled rapidly, yet accurately. In connection with this phase of the preparatory work for

the 1940 census the above projects have made possible the testing of (a) methods of personnel training; (b) the efficiency of office machines; (c) the arrangement, handling, and tabulation of punch cards; and (d) the rapid summation, tabular presentation, and publication of census data.

CENSUS OF MANUFACTURES

Preliminary work on the 1937 Census of Manufactures was begun in July 1937. This involved the preparation of a card index of the establishments to be canvassed, the mailing of special questionnaires requesting information pertaining to changes in the status of plants or factories since 1935, and the revision of the schedules.

The manufacturers, through their associations, actively cooperated in the formulation of the schedules. At the request of the Director of the Census, the National Association of Manufacturers appointed the following members to cooperate with the Bureau in formulating and conducting the 1937 Census of Manufactures: Fuller F. Barnes, president of the Associated Spring Corporation, chairman; F. B. Davis, Jr., president of the United States Rubber Co.; and O. E. Braitmayer, vice president of the International Business Machines Corporation. Noel Sargent, secretary of the National Association of Manufacturers, and Eugene F. Hartley, former chief statistician for manufactures in the Bureau, also served on this committee at the request of the Director of the Census. This committee held a number of meetings with representatives of the Bureau and greatly assisted in the formulation of the schedules.

The Bureau also consulted most of the leading trade associations as to the form of the special questionnaires for their respective industries. Copies of all schedules were sent to the Central Statistical Board for criticisms and suggestions. By the first week of December 1937 the general schedule and all of the 143 special schedules had been approved and sent to the printer.

In January 1938, 231,964 questionnaires were mailed to the manufacturers listed to receive schedule forms for this inquiry. By June 30, 1938, 201,978 of these schedules had been filled out by the respondents and returned to the Bureau's Washington office. In addition, a number of returns were in the hands of Bureau representatives throughout the country. It is believed that practically all schedules will be received in the Washington office by August 1, 1938. The Division of Manufactures had received 181,334 schedules from the Field Division by the close of business June 30, 1938. Of these 39,303, or 21.7 percent, were omitted from the census because the concerns were not manufacturers, their products were valued at less than $5,000, or they had gone out of business prior to 1937. Of the remaining 142,031 "acceptable schedules," 77,317, or 54.4 percent, were edited, and 60,677 had been verified. It is hoped that the remaining reports will be edited and verified and statistics released before the end of the calendar year 1938, thus establishing a new record for the timely compilation and reporting of these statistics.

For the first time the Census of Manufactures is securing inventory data in the 1937 schedules. Inventory data have been one of the most important omissions in our economic statistics up to the present time, and although attempts have been made to collect such data in the past, both by governmental and private agencies, these

attempts have been far from satisfactory. Two questions, one on finished products and the other on materials, supplies, fuel, work in process, etc., are asked for inventories, securing data for both the beginning and the end of 1937. A second new inquiry, which appeared for the first time in the 1937 schedules, calls for the total number of employees in this plant not reported as salaried or wage-earning employees. This question was added to take care of personnel engaged in selling and other nonmanufacturing endeavors. In other respects, the data called for in 1937 are the same as for prior biennial censuses, namely, name and address of establishments; number of wage earners and their wages; number of salaried employees and their salaries; cost of materials, supplies, containers, fuel, and purchased electric energy; cost of contract work; value of products; and quantities of fuel and electric energy used.

Consolidation and reorganization.—By order of the Secretary of Commerce, effective October 25, 1937, the functions and personnel of the Division of Current Business Statistics were transferred to the Division of Manufactures. The collection, tabulation, and publication of the monthly, quarterly, and annual reports are now coordinated with the biennial census work in the first five of the following six office groups which were set up in the reorganization:

Group 1. Food and kindred products.
Group 2. Textiles and their products.
Leather and its manufactures.
Group 3. Iron and steel and their products, not including machinery.
Nonferrous metals and their products.
Machinery, not including transportation equipment.
Transportation equipment, air, land, and water.
Group 4. Forest products.
Paper and allied products.
Group 5. Chemicals and allied products.
Products of petroleum and coal.
Rubber products.
Stone, clay, and glass products.
Group 6. Printing, publishing, and allied industries.
Miscellaneous industries.

Each of these groups is under the supervision of an associate economic analyst, who reports to the chief statistician or to the assistant chief statistician through an economic analyst. Each analyst is in charge of two industry groups. Where there were but two professional technical positions in the two Divisions before the consolidation, there are now 12 in the consolidated Division of Manufactures. This addition of professional personnel not only makes available much-needed technical supervision and coordination but assures closer relationship with, and increased service to, industrial and business organizations.

CURRENT BUSINESS STATISTICS

The Bureau issued statistical reports for 63 industries (or commodities) during the past fiscal year, 51 being published monthly, 7 quarterly, and 5 annually. With the monthly and quarterly reports being handled by the same personnel who tabulate the data and compile the statistics for the Biennial Census of Manufactures, the two types of reports will be more closely coordinated than heretofore.

Such coordination will be mutually beneficial to the current reports and the biennial census, and will make possible the development of better monthly indices of the various industries; indices which can be checked and revised every 2 years in line with the more complete biennial census reports.

Through correspondence and interviews with executives of trade associations and manufacturing establishments, the current reports have been changed to meet recent developments in business practice and to provide for future requirements. Every effort is being made to expedite the release of the current statistics. Arrangements were made early in 1938 for the mechanical tabulation of three important industries which were formerly hand tabulated.

At the request of the Department of Agriculture, all wheat-flour mills in States that would have new wheat stocks for the quarter ending June 30, 1938, were requested to report new and old wheat stocks held in mills and mill elevators as of that date. It is planned to make this additional inquiry once each year. Seventy-five wheat-flour mills that formerly reported milling production quarterly were requested to report monthly on flour production and quarterly on stocks of wheat and flour.

The report on the Manufacture and Sale of Farm Equipment and Related Products for 1937 covered 1,015 manufacturers with 1,116 establishments. The principal changes in the data published for 1937 are: (1) The reporting of data on tractors, by horsepower groups, and by steel and rubber tires; (2) the reporting of data on combines (harvester-threshers) into three groups, by width of cut; (3) the separating of stock tanks into steel and wooden; and (4) the reporting of steel stock pens in terms of linear feet instead of number of pens. A considerable gain was made in the release date of the preliminary reports for farm equipment. The first release on tractors, combines, and grain threshers for 1937, was issued on January 27, 1938—the similar report for 1936 was issued on April 3, 1937.

CENSUS OF ELECTRICAL INDUSTRIES

Each fifth year the Bureau of the Census conducts a census covering telephone and telegraph communications; electric light and power stations; and street railway, motor-bus, and trolley-bus operations. The 1937 Census of Electrical Industries is now in process.

In January 1938 approximately 47,500 schedules were mailed to telephone companies (most of which are connecting lines without switchboard facilities), 600 schedules to telegraph and radio-telegraph companies, 5,000 to electric light and power companies, and 3,000 to street railway, motor-bus, and trolley-bus concerns.

By the end of June approximately 42,300 telephone schedules, 500 telegraph schedules, 3,200 electric light and power schedules, and 1,400 street railway and bus schedules had been received in the Washington office.

CENSUS OF BUSINESS

In February 1938 the Bureau began work on a sample survey of retail and wholesale trade, the purpose of which is to provide indexes of change in these lines of business activity since the 1935 Census of Business. As in the case of the Census of Business, the

1937–38 Census Survey of Business is being undertaken with funds made available by the Works Progress Administration.

Arrangements were made to collect, by means of a mail canvass, reports from a large sample of independent and chain retail and wholesale stores using, as a basis for the mailing list, reports received from establishments which reported at the time of the 1935 census, but eliminating retail establishments which reported sales of less than $5,000 for that year, wholesale establishments which reported sales of less than $25,000 for that year, and also certain classifications which were either covered by other statistical series or could not be canvassed satisfactorily by mail. The return of approximately 250,000 acceptable schedules is expected.

The Census Survey of Business will secure data for the four quarters of 1937 and the first two quarters of 1938. All of the information will be collected and compiled for identical establishments. The retail schedules called for the reporting of net sales showing cash, open account, and installment sales separately, pay-roll data, proprietors' and firm members' withdrawals, and stocks on hand for the specified periods.

The inquires on the wholesale questionnaire call for sales data by quarters and pay-roll information for the entire year 1937 and the first half of 1938. Sales data relative to spot cash, credit less than 10 days and credit of 10 days or more, for the entire year 1937 and for the first 6 months of 1938, and stocks on hand for specified periods will also be reported. Additional trend information for both retail and wholesale trade will be made available by the presentation of sales and pay-roll information for the year 1935.

During the past fiscal year, the Bureau prepared 13 special tabulations of data pertaining to the 1935 Census of Business. These tabulations were requested by various individuals and corporations at a total cost to such individuals and corporations of $6,610.22. The most important of these tabulations consisted of an analysis by small areas of the retail trade in Los Angeles, Calif., for 1935, 1933, and 1929, which was prepared for a special committee of interested business groups in that city.

AGRICULTURAL INFORMATION

The regular informational work relating to agriculture has expanded far beyond the routine answering of correspondence. In addition to writing approximately 3,000 letters furnishing information and census agricultural material, many thousands of requests for State, county, and United States figures were answered. This has developed further informational and consultation work by this Division.

The staff is called upon to answer technical problems of business, agriculture, and education where statistics are based largely upon the census. The members of the Bureau's staff have become the consultants upon many subjects requiring specialized knowledge of the interpretation and use of census data. A few of such problems are as follows: (*a*) Crop insurance; (*b*) changes in real estate values; (*c*) crop changes affecting mortgages; (*d*) irrigation problems; (*e*) tenancy; (*f*) shift in population; (*g*) farm income.

The service work performed by this Bureau has become a major part of the interim work. A total of 181 photostats of minor civil division figures and special tabulations were paid for by outside agencies, and 67 tabulations made without charge for governmental agencies and private parties.

COTTON AND COTTONSEED

During the past season the Bureau received regular reports from approximately 14,300 cotton ginneries, 500 cottonseed oil mills, 300 refiners and consumers of cottonseed oil, 2,500 storage places such as warehouses and compresses, and from 2,000 cotton-consuming establishments. Because of these reports there are more complete, current statistics on cotton than on any other major agricultural commodity. Semimonthly reports are issued for cotton ginned, and monthly for cotton consumed and held, cotton spindle activity, and cottonseed and its major products. A special report on the bales and pounds of the several kinds of linters and other cotton fiber produced by the oil mills was issued.

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

All of these reports are compiled and released rapidly: The cotton ginning report is released on the 8th day following the report date; the report on cotton consumption, imports and exports, and stocks, on the 14th day; the cottonseed and products report, on the 12th day; and the animal and vegetable fats and oils report, within the following month.

FINANCIAL STATISTICS OF STATES AND CITIES

Advisory committee.—Especially difficult problems of statistics and accounting are involved in the compilation of uniform financial statistics for States, cities, and other governmental units in the United States. The Secretary of Commerce and the Director of the Census have appointed the following special advisory committee on financial statistics to make recommendations concerning the Bureau's reports in this field. This committee held three meetings in Washington during the past year to study the work of the Bureau and make recommendations thereon:

A. M. Hillhouse, National Committee on Municipal Accounting, Chicago, Ill.
Frederick L. Bird, director of Municipal Research, Dun & Bradstreet, Inc., New York City.
Charles J. Fox, city auditor, Boston, Mass.
Dan O. Hoye, city controller, Los Angeles, Calif.
Welles A. Gray, finance department, Chamber of Commerce of the United States, Washington, D. C.
Carl H. Chatters, executive director, Municipal Finance Officers' Association, Chicago, Ill.
L. McCarthy Downs, auditor of Public Accounts, Commonwealth of Virginia, Richmond, Va.

Financial statistics of cities.—The final annual reports for 1935 and 1936 were published during the past fiscal year. These reports present the data for each of the 94 cities in the United States having a popu-

lation of 100,000 or more. The 1936 inquiry was expanded to provide new (or more detailed) data on number of employees by departments, interest rates on bonded debt, tax collections and delinquency, grants in aid, and relief expenditures. A reclassification of accounts was made and will be used in the 1937 report which is now being compiled.

Value of exempt real property.—A special compilation of the value of real property exempt from general taxation for State and local purposes was made and released. The data embodied in this release were available in only 52 of the 94 cities having a population of over 100,000. An attempt is being made to secure a complete coverage on this subject for 1937.

Financial statistics of States.—The annual compilation and publication of financial statistics for States has been resumed, the first report to cover the year 1937. These reports were discontinued in 1933, following the publication of the report for 1931. In order to reflect the changes and increased complexities of State finances it has been necessary to revise the classification of accounts. A preliminary revised classification has been adopted and will be used in the 1937 inquiry.

Debt of State and local governments, 1937.—In cooperation with the United States Treasury, an intercensal inquiry of State and local debt was made. The inquiry included 48 States, 607 counties, 983 cities, and 264 special tax districts. The results of this inquiry are being analyzed by the Treasury Department, and it is anticipated that a report of these data will be published by that Department.

Chain store tax collections, 1937.—In cooperation with the Bureau of Foreign and Domestic Commerce, an inquiry was made of chain store tax collections in the 17 States having such tax. An analysis of these data is being made by the Bureau of Foreign and Domestic Commerce.

Digest of State taxation and revenue laws.—The digest of State taxation and revenue laws which is compiled by the Bureau has been brought up to date for the following States: Arkansas, Colorado, Georgia, Indiana, Louisiana, Minnesota, Mississippi, New Hampshire, North Dakota, Rhode Island, South Dakota, and West Virginia. A series of digests has been started on the income and inheritance tax laws of all States having such laws.

VITAL STATISTICS

Advisory committee on vital statistics.—The special committee, appointed by the Secretary of Commerce, to advise the Bureau concerning its work in the field of vital statistics held one official meeting in Washington during the past year. Many of its recommendations have already been adopted in the Bureau's procedures and reports. The membership of this 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, Columbia University, New York City.
LOWELL J. REED, Johns Hopkins University, School of Hygiene and Public Health, Baltimore, Md.
ROBERT OLESEN, Assistant Surgeon General, United States Public Health Service, Washington, D. C.
W. A. DAVIS, State registrar of vital statistics, Austin, Tex.

J. V. DEPORTE, director, division of vital statistics, State department of health, Albany, N. Y.

A. J. CHESLEY, secretary and executive officer, State department of health, St. Paul, Minn.

ISADORE FALK, chief, health studies, Bureau of Research and Statistics, Social Security Board, Washington, D. C.

Revision of annual vital statistics volumes.—A survey of the form and use of the vital statistics volumes, Mortality Statistics, and Birth, Stillbirth, and Infant Mortality Statistics, was made during the past year. On the basis of this survey these two volumes will be discontinued and two other volumes will take their place. This revision will modernize the published tables and present the data most needed for current problems without destroying the essential comparability of the summary statistics. One new volume, Vital Statistics of the United States—Part 1, will consist of revised tabulations based on place of birth or death. The second volume, Vital Statistics of the United States—Part 2, will consist of new tabulations based on place of residence. The first data to be published in this new form will be for the year 1937.

In order to give an indication of widespread epidemics and current trends in natality a new publication called the Monthly Vital Statistics Bulletin is now compiled. This bulletin gives each month the number of birth and death certificates received in each State health department.

Revision of the international lists of causes of deaths.—In order to secure comparability between the different nations compiling mortality statistics an internationally accepted list of causes of death based upon a standard and uniform system of classification was adopted in 1900. This list has since been revised at the end of each decennial period. The next international conference for such revision will convene in Paris in October 1938, and will be attended by the chief statistician for vital statistics, Bureau of the Census.

In preparation for this conference the Bureau has conducted studies and has prepared tabulations relating to the general problem of cause of death classification, and the equally important question of primary cause selection when multiple causes are reported. The following are the most important of these studies and tabulations:

1. The 7,000 or more terms comprising the international list have been placed on printed punch cards and have been listed according to their acceptability and the degree of fatality which they represent.

2. A study is now in progress which will disclose the frequency of actual medical terms used by doctors in reporting some 20,000 deaths during 1935. These data are essential for the inclusion of proper terminology in the revision of the international list.

3. A table has been prepared showing the reporting of multiple causes of death for all States and the United States by all 200 causes included in the list. Similar tables are being received from various foreign countries for comparative purposes, according to a plan suggested by this Division.

4. An extensive tabulation has been prepared on contributory causes of death. This is in the nature of an association table. For the United States only two such tables have ever been published before, viz, those for 1917 and 1925.

5. A detailed tabulation has been prepared on contributory causes involved in maternal mortality.

6. An assemblage of 1,032 death certificates showing more than one cause, submitted to 42 foreign countries in 1935, is being analyzed for comparison of coding procedures followed by the countries concerned.

Revision of birth, death, and stillbirth certificates.—New forms for the United States standard certificates of birth and death are prepared by the Division of Vital Statistics every decade. Basic work on the 1939 revision was started in 1937. After surveying the State certificates now in use, a set of three questionnaires was sent to physicians, health officers, nurses, midwives, and others in the field of vital statistics. An analysis of the replies, together with recommendations based thereon, was presented to the Vital Statistics Special Advisory Committee. The approval of other technical groups and organizations will be secured in the next 6 months.

Nonresidence study on cancer, tuberculosis, and maternal mortality.—Accurate residence death figures for cancer, tuberculosis, and maternal mortality have been in great demand by health agencies and research organizations. In November 1937, with funds provided by the Works Progress Administration, the Bureau initiated a project to make a special tabulation of these data.

Institutional code.—In cooperation with the American Medical Association, the Bureau is now compiling a classified list of all institutions within the United States from which deaths may be reported. This list at present contains over 12,000 entries, and within another year it will contain nearly 20,000. It will be made available to other governmental departments, to State health departments, private institutions, and universities, and all others engaged in work involving medical institutions and their classification. If this list is accepted and adopted by State and local agencies, it will make possible direct comparability among various reports on institutional morbidity, mortality, and population.

POPULATION

Estimates of population.—During the past year the Bureau has prepared and issued estimates of the population of the United States, by States, as of January 1 and July 1, 1937, with comparative estimates for each year from 1933 to 1936. An estimate of the population of the outlying territories and possessions of the United States as of January 1, 1937, and July 1, 1937, was issued.

On account of the difficulty in obtaining satisfactory data on internal migration and the near approach of the Sixteenth Decennial Census, estimates of population will be made only for the United States as a whole until after 1940.

Special population censuses.—Several special censuses, under the supervision of representatives of this Bureau, were taken during the year.

Censuses of Sterling and Rock Falls, Ill., and certain adjacent township areas, taken as of June 30, 1937, showed a total population of 19,178.

A census of Poplar Bluff, Mo., taken as of April 14, 1938, revealed a population of 10,809.

Puerto Rico census.—The results of the special Census of Puerto Rico, taken under the auspices of the Puerto Rico Reconstruction Administration and the immediate direction of an official of the Census Bureau in December 1935, were published in one volume. This volume comprised the three bulletins (bilingual in form) giving number and distribution of inhabitants, characteristics of the population, including occupations, and data on agriculture.

Institutional population.—The annual reports on Patients in Hospitals for Mental Disease and on Mental Defectives and Epileptics in Institutions have been completed and will be issued early in September. These reports cover private and "other public," as well as State and Federal, institutions. The change in the form of the schedules for 1936, at the request of the National Committee on Mental Hygiene, delayed the printing and mailing of the schedules and somewhat retarded the compilation and publication of the results.

Requests have been received from a number of organizations for the earlier publication of statistics for Patients in Hospitals for Mental Disease and Mental Defectives and Epileptics in Institutions. This has not been possible because of the failure of some institutions to return the schedules promptly to this Bureau. Although institutional staffs have cooperated splendidly in furnishing the statistics requested, a few have been unable to meet the desired time schedule. Reports for 1937 had not been received at the close of the fiscal year for about 14 percent of the institutions canvassed.

Social-economic classification of workers.—A special report giving "A Social-Economic Grouping of Gainful Workers in the United States, 1930," was issued in February. This is the first report of the kind published by the Census Bureau and represents a marked departure from the form of presentation of occupation statistics during the past century. The publication of this additional grouping of the 1930 figures was in response to a growing demand for the classification of gainful workers by social-economic groups. The first edition of the report was exhausted in a short time and a second edition is now available.

STATISTICS OF CRIME

The report on Prisoners in State and Federal Prisons and Reformatories for 1936 was issued during the year, and also the report on Judicial Criminal Statistics for 1935. The report on Judicial Criminal Statistics for 1936 will be issued in July. This report, like the report for 1935, covered 30 States.

An experiment in a new method of reporting judicial criminal statistics was undertaken during the past year in cooperation with the clerks of court in 50 Ohio counties. Individual reports were sent in by these clerks on each criminal case filed and disposed of during the year, instead of the usual annual tally sheet summary. This method of reporting greatly increases the reliability of the statistics and permits uniform classification and treatment of the returns from all counties. It also makes possible a much more intensive analysis of the data collected. A special report was prepared, analyzing the statistics received from the 43 counties that furnished complete returns for 1937 by this method. This report will be published at an early date.

POPULATION INDEXES

With the passage of Federal and State legislation providing for old age pensions, and with the increasingly frequent requirements of age certification by schools, insurance companies, employment agencies, and other organizations, it became impossible for the Bureau to keep abreast of its work of conducting age searches under the existing system. The Bureau's population list from which the desired personal information was obtained was in the form of bound volumes of original census schedules made out by enumerators in their house-to-house canvass. To locate a given individual in these volumes it was first necessary to ascertain his exact place of residence in terms of the political boundaries existing at the time of the census. While this could be done in some cases in a few minutes, in others it took days or even weeks of careful searching.

In order to reduce the time and cost of each search, to meet the increased demand and to prevent the utter destruction of the priceless census records it became necessary to construct alphabetical indexes of the population. The first such index, containing more than 31,000,000 family (or individual) cards, and relating to the decennial census of 1900, was undertaken in 1935 and completed in 1937 with funds provided by the Works Progress Administration. This index is now in use in the Bureau and has greatly reduced the cost of record searches.

Although the index for the census of 1900 was very useful, it did not, of course, give data for persons who are now less than 37 years of age. Therefore, a similar index of persons enumerated in the census of 1920 was undertaken in New York City with funds provided by the Works Progress Administration. The compilation of this index is now in progress. On June 30, 3,029 persons were at work transcribing, verifying, and indexing the nearly 58,000,000 cards which will be required by this index. When completed this will be the largest name file in the world and will make readily available age records and other information for the 105,000,000 persons enumerated in January 1920.

In order to increase its availability and reduce the space required for its retention in the Bureau, the index of 1900 has been completely recorded on 16 mm michrofilm in the Bureau's laboratory. This valuable device has also been used to prevent the wearing out of original documents. The original schedules for the population censuses of 1840, 1850, 1860, and 1870 have been photographed, and the filming of the 1880 census is now in process.

SEARCHING OF POPULATION RECORDS

The need for legally acceptable evidence concerning age and other personal facts by applicants for old-age pensions, annuities, retirement benefits, working papers, passports, etc., have been evidenced by the 104,564 requests for such information received by the Bureau during the past year. In addition, 8,160 visitors called either to make personal requests for age information or to examine those records which are open for public inspection. On June 30 there were on hand 48,211 unanswered applications requiring record searches. Because of 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.

CENSUS OF RELIGIOUS BODIES

In conformity with the provisions of the permanent Census Act passed in 1902, the Bureau is now taking the Fourth Decennial Census of Religious Bodies. This census will give data as to the membership, denominational affiliation, property and other fiscal matters, and an authentic summary of the history of each sect. By June 30, 1938, a total of 167,654 schedules had been received from churches and other religious organizations throughout the United States. It is expected that reports will be received from 266 separate denominations, all but a few of which were included in the 1926 census.

MECHANICAL LABORATORY

The Bureau's mechanical laboratory was engaged during the year in the maintenance of the Bureau's mechanical equipment, the rebuilding of unit tabulators, sorters, counting units, key punches, and verifiers, and the building of new sorters, gang punches, and counting units for the 1940 census.

PUBLICATIONS

Statistical Abstract of the United States.—The compilation of this standard reference work on governmental statistics was transferred from the Bureau of Foreign and Domestic Commerce to the Bureau of the Census in October 1937. The more than 800 pages of statistics in this publication are derived from publications and special reports of various departments and contain practically all of the important series relating to social, economic, and industrial life of the United States. The scope of this volume is being studied with a view to making this compilation the equivalent of a national statistical yearbook.

National censuses and special reports.—

Biennial Census of Manufactures, 1935—Fifty-three industry reports.
A social-economic grouping of the gainful workers of the United States, 1930.
Part-time farming in the United States, 1935.
Wage earners in manufacturing establishments, by size of establishment and industry, 1933 and 1935.
Wage earners, by months, for all manufacturing industries, 1929 to 1935.
Nonwage earner personnel in manufacturing establishments, 1935.
Cost of materials and containers, fuel, and purchased electric energy for all industries, 1929 and 1935.

Other publications.—

ANNUAL REPORTS

Vital statistics:
Birth, stillbirth, and infant mortality statistics, 1935.
Mortality statistics, 1935.
Vital statistics—Special reports—Volumes III and IV.
Financial statistics of cities of over 100,000, 1935.
Financial statistics of cities of over 100,000, 1936.
Judicial criminal statistics, 1935.
Prisoners in State and Federal prisons and reformatories, 1936.
Cotton production and distribution—Season of 1936–37.
Cotton production—Crop year 1937.
Animal and vegetable fats and oils, 1933 to 1937.

Manufacture and sale of farm equipment and related products, 1937.
Clay products, nonclay refractories, and sand-lime brick, 1936.
Production of lumber, lath, and shingles, 1936.
Lumber cut by 1,018 identical mills, 1937 (preliminary report).
Paper production, 1936.
Pulpwood and wood pulp, 1936.

MONTHLY BUSINESS AND INDUSTRIAL REPORTS

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

QUARTERLY BUSINESS AND INDUSTRIAL REPORTS

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

WORK DONE FOR OTHER FEDERAL OFFICES AND OUTSIDE ORGANIZATIONS

Unemployment census, 1937.—This national, voluntary registration of unemployed and partly unemployed persons in the United States was taken by a special organization under the direction of Administrator John D. Biggers. The field work for this registration was conducted by employees of the Post Office Department, and the editing and tabulating of data and the preparing of final tables for publication were done in the Bureau of the Census. This was the largest editing and tabulating job done for another agency during the past decade. It involved the examination, coding, and preparing of punch cards of nearly 13,000,000 registration schedules, the tabulation of 165,000,000 machine card units, and the preparation of more than 2,500 typewritten tables for offset reproduction. In addition to the registration phase of the unemployment census of 1937, the Bureau also edited

and tabulated the data for the enumerative check census in which a complete house-to-house canvass was made of over 2,000,000 persons residing on a sample of 1,640 postal routes throughout the United States. Several members of the technical and administrative staff of the Bureau devoted full time to this work and contributed materially to the prompt completion and excellent presentation of the unemployment reports.

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 from approximately 2,500 monthly camp reports, 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. Similar tabulations are made quarterly, by types of land for each service, and an annual tabulation by States and outlying possessions.

Tabulation data for other agencies.—The Bureau's position as custodian of confidential census reports, together with its staff of trained statisticians and its unique tabulating equipment, enables it to make many extremely valuable special tabulations for particular areas and for particular subjects. In addition to its services in making special tabulations of census data for other Federal agencies and for private agencies and individuals the Bureau serves as a "tabulating service" agency for other organizations. During the past year the Bureau did special tabulating jobs for the following governmental agencies: Bureau of Foreign and Domestic Commerce, Federal Power Commission, Emegency Conservation Work, Federal Reserve Board, Department of Agriculture, Department of Justice, and Bureau of Air Commerce. In addition, special tabulations of census data were made for the following State and private organizations: Colorado State College; Connecticut State College; Virginia Agricultural College; City Planning Commission of Memphis, Tenn.; Baltimore, Md., City Health Department; Massachusetts State Planning Board; National Association of Leather Glove Manufacturers; International Association of Garment Manufacturers; Food Research Institute of Stanford University; Tanners' Council of America; United Shoe Machinery Corporation; Du Pont de Nemours & Co.; United States Steel Corporation; General Electric Co.; Association of American Producers of Domestic Inedible Fats; Industrial Council of Cloak, Suit, and Skirt Manufacturers, Inc.; Devoe & Raynolds, Inc.; National Association of Wool Manufacturers; Scripps-Howard Newspapers; A. C. Nielson Co.; Western Electric Co.; several telephone companies in Wisconsin, Council for Social Agencies, Hartford, Conn.; and Market Data Bureau, New York City.

PERSONNEL

Training courses for employees.—During the past year the in-service training program for Bureau employees, inaugurated early in 1935, had a total enrollment of more than 100 students. Courses were given in the following subjects: Elementary statistical methods, principles

of statistical research, accounting, economic geography, and Bureau correspondence and business English. These courses are taught by members of the technical staff. Through the affiliation of these courses with the in-service program of a local university it was possible to give academic credit to students enrolled in the Bureau's classes.

Appointments and separations.—In addition to the number of Bureau employees shown in the following table, there were on the rolls on June 30, 1938, 4,498 temporary special agents (493 in the Washington office and 4,005 outside of Washington) appointed for limited periods at $1 per annum, or without compensation (employees of other Government services). Of this number, 368 special agents without compensation were employed on the four Works Progress Administration projects in the Washington office, 418 on the project in Philadelphia, and 3,034 on the project in New York City. There were 594 appointments of special agents at $1 per annum, or without compensation, made during the fiscal year in the Washington office and 5,035 outside of Washington, with 243 and 1,258 separations, respectively.

	Bureau total	Washington office	Field
Total employees on roll, June 30, 1938	2,196	1,075	1,121
Permanent	1,496	700	[1] 796
Temporary	700	375	325
Total appointments, fiscal year	2,706	2,172	534
Permanent	156	43	113
Temporary	2,550	2,129	421
Total separations, fiscal year	3,042	2,381	661
Terminations	1,380	1,309	71
Expirations of appointments	1,181	686	495
Transferals	202	195	7
Resignations	250	166	84
Retirements	16	16	----
Deaths	13	9	4

[1] Includes special agents for cotton and for vital statistics, and the Bureau's advisory committee.

APPROPRIATIONS

Appropriations and other funds made available to the Bureau of the Census, by source, fiscal year ended June 30, 1938

Purpose	Total	Source of funds		
		Bureau appropriations	Allotted or transferred from other Federal agencies	Non-governmental
All Bureau work	$3,110,752	$2,065,000	$1,035,397	$10,355
Regular salaries and expenses	2,065,000	2,065,000	----	----
Work relief projects:				
Census of Business	33,000	----	33,000	----
Alphabetical index	50,000	----	50,000	----
Work for other Federal agencies:				
Unemployment Census	850,000	----	850,000	----
Other	102,397	----	102,397	----
Work for outside organizations or individuals	10,355	----	----	10,355

BUREAU OF FOREIGN AND DOMESTIC COMMERCE

INTRODUCTION

The past fiscal year has been marked by an unusual number of broad-scale changes in world affairs—involving alterations in commercial and economic conditions—and since these have had an immediate effect upon the conduct of American business, the Bureau of Foreign and Domestic Commerce has been called upon to respond to many demands for reliable data and for interpretations of the new developments. In the Bureau's offices at home and abroad the result of this has been apparent in a variety of ways. The work has, of necessity, been speeded up. The volume of factual studies and of correspondence and personal interviews has increased to a notable degree. Intimacy of touch with the flow of events, and timeliness in the dissemination of the data ascertained, have become ever more vital. Totally unexpected circumstances have arisen in various quarters of the business world, both abroad and in this country, and in certain cases this has made it necessary for the Bureau to initiate new surveys of a novel nature, or to establish new units in its staff to handle matters that have been the subject of keen and immediate interest.

Naturally, one of the major factors influencing the Bureau's work during the fiscal year 1937–38 has been the domestic recession in business, together with the recuperative forces that have made themselves felt in recent months. One notable characteristic of American business during the recession has been the excellent manner in which our export trade has been sustained; relatively, it has enjoyed a really remarkable prosperity. Realizing this encouraging fact, and searching zealously for orders to compensate for the diminution in the volume of domestic sales, many producers have turned to the foreign field with new eagerness and vigor. Inevitably their efforts to attain success in that promising field have meant a great increase in demands upon this Bureau for service—since manufacturers have long been aware of the effective trade-promotion facilities afforded by the Bureau and its foreign offices. Not in many years has there been such a lively demand for foreign-trade facts and for help in the establishment of actual business-building contacts. There is ample testimony to the effect that the Bureau's response during the past year has been a source of gratification to the business community at large.

In the domestic field the Bureau has, as always, striven diligently to strengthen all the forces working toward the stimulation of current business activity and the reinforcing of the broad bases of the economic structure. Thus, in 1937–38, its several divisions have been exceptionally active in keeping most intimately in touch with day-to-day developments, and in broadening the scope of their fact-finding in the ways most directly calculated to bring salutary results quickly. At the

same time the Bureau has deemed it wise to direct its attention increasingly to various studies of long-range usefulness.

COOPERATION WITH OTHER GOVERNMENTAL AGENCIES

As in other recent years, the Bureau has cooperated frequently and intimately with other units and agencies of the Federal Government and, to a certain degree, with branches of the State governments. Such collaboration has embraced practically every one of the important governmental units in Washington. It has been concerned (among other subjects) with such topics as the national defense; the obtaining of essential raw materials from abroad; technical advice on specifications and purchases; customs problems; loans by the Reconstruction Finance Corporation; resources of the United States; the organization and financial structure of American firms; fair-trade practices; commercial standards; aviation subsidies abroad; foreign tax laws and social legislation; reciprocal trade agreements; and countless other diverse matters.

TRADE-AGREEMENT ACTIVITIES

This Bureau has from the beginning played a vital role in the development of the trade-agreements program. The Bureau's representatives on the interdepartmental committees which comprise the trade-agreements organization, as well as its special Trade-Agreements Unit, were particularly active during the past year and, through their expert knowledge, were able to make an extremely valuable contribution. To this work a number of the Bureau's most competent and experienced officers, with long terms of practical service in the foreign field, have been assigned.

In addition to sharing the general responsibility for carrying on the trade-agreements program, the Bureau continued to prepare the detailed studies which serve as the basis for determining the concessions that should be requested from the foreign government when a decision to undertake the negotiation of a trade agreement with a particular country is reached. Although these studies are prepared by the Trade-Agreements Unit, all of the divisions of the Bureau, both industrial and technical, which might be able to supply material or information regarding existing obstacles to the development of trade with the country in question, are called upon to contribute their specialized knowledge. When all pertinent information, including that submitted by interested firms or individuals through the Committee for Reciprocity Information, has been assembled, it is carefully analyzed from every angle and prepared for submission to the appropriate interdepartmental committees.

Studies covering hundreds of individual commodities were completed during the year for the trade agreement with Czechoslovakia, signed on March 7, 1938, and also in anticipation of agreements with the United Kingdom, Canada, Turkey, Ecuador, and Venezuela, for which countries official announcement of intention to negotiate has been made. The negotiations with the United Kingdom and Canada—now under way—are of exceptional importance and required unusually thorough preparation. In addition, similar studies were made of a large number of other countries throughout the world where there

appear to be opportunities for obtaining the removal of existing barriers to the sale of American products and where the conditions essential to the conclusion of a reciprocal trade agreement seem to exist. Thus, for these countries the ground work has been completed and the necessary data are already available, if and when it should be found feasible to undertake trade-agreement negotiations.

INDUSTRIAL DIVISIONS

AUTOMOTIVE-AERONAUTICS TRADE

The Automotive-Aeronautics Trade Division has devoted a substantial amount of time and effort to consultation with manufacturers and exporters as to the most profitable means of utilizing the Bureau's services. Three phases of this program which have been stressed during the year are: The purpose and "mechanics" of the trade-agreements program and the manner in which it would benefit the automotive and aeronautical industries; familiarizing the aeronautical industry with the advisability of detailed information covering export possibilities and actual shipments and the consequent necessity for the organization within that industry of an export department; and the importance to exporters and shipping brokers of furnishing accurate export declarations.

An investigation of the classification of automotive parts for assembly was made, and certain changes were effected in the export classification for engines. A study on the manufacture of refrigerator bodies was completed. A survey was begun as to the type of safety glass required for use in motor vehicles abroad. A great number of plans covering the scrapping of obsolete automobiles were reviewed. An American company secured an order for trucks valued at $500,000 through the Bureau's intercession with a foreign government in arranging for an extension of the time allotted for certain trials. Recently an important firm of aircraft manufacturers credited this Division with rendering services which assisted them in obtaining export orders and thus enabled them to reopen their plant after a shutdown of several months.

During the first 6 months of 1938, the oversea demand accounted for 21 percent of the total American output of automotive vehicles, whereas the customary ratio of exports to production is approximately 11 percent. Aeronautic shipments advanced by 128 percent over the January-June totals of 1937.

The Division participated in the Convention and Road Show of the American Road Builders Association, the International Aircraft Show, the Automotive Service Industries Show, and the National Automobile Show. Exhibits were prepared and maintained at the first two mentioned.

CHEMICAL

The Chemical Division made a significant contribution on the printing-ink situation as a part of the World Graphic Arts Survey, a joint study by four industrial divisions. Work was continued over the year on a world survey covering the synthetic organic chemical situation, with a view to amassing confidential and other facts on national preparedness, public health, and other vital factors related to synthetic

organic chemicals. The results of this study will be published so far as is practicable. A world survey was made of industrial explosives, results of this study being made available to interested business firms and to several Government departments. On behalf of the American medicinal industry, a world-wide study has been under way of pharmaceutical, medicinal, and proprietary preparations, availability of essential raw materials, markets for finished goods, and other economic, commercial, and quasi-scientific facts. Because of the growing interest throughout the world and particularly in the United States in the chemical use of agricultural products, a study of the world situation has been under way, particular emphasis being placed on synthetic fuels.

The Division has furnished information on the establishment of tung-oil production in the United States, notably in certain parts of Alabama, Florida, Georgia, Louisiana, Mississippi, and Texas. This enterprise may become an important source of new wealth for the South—the United States having imported from China during the past year more than $20,000,000 worth of this essential raw material.

The annual survey of World Chemical Developments, a 200-page printed publication, was issued, receiving the same enthusiastic "reader acceptance" which exhausted previous editions.

The Division has carried on its work in the field of essential raw materials, especially those for supplies of which this country is dependent upon a foreign source. It has followed scientific and technical developments abroad, and such developments have been brought to the attention of interested parties, with complete information and samples whenever possible.

During the year the Division received 6,000 letters of inquiry and 700 visitors presenting problems of production, distribution, and consumption, both foreign and domestic.

The following comments are only two from many that might be quoted:

(1) We believe it will interest you to know that the Brazilian Trade Opportunity you furnished on rosin and turpentine resulted in orders in a short time amounting to $118,927.67, and we have $10,000 more awaiting shipment.

(2) Upon receipt of your trade opportunity we immediately contacted your Paris office and consummated a contract for 25,000 tons of sulphur, valued at $450,000. (Since then the Division has been advised that this firm is probably going to negotiate an agency connection in France with a firm suggested by the Bureau.)

ELECTRICAL

The Electrical Division's significant work on short-wave broadcasting began with a survey made through the cooperation of the Bureau's Latin American offices. A report on this was issued in October. This survey, as well as a world-wide survey of a similar character bringing out further specific details, was undertaken in cooperation with a subcommittee of the Business Advisory Council.

Another feature of this short-wave-broadcast activity was the getting together in New York in December of executives from seven of the nine American short-wave broadcasting stations. Twenty such executives met for the first time on the invitation of the Chief of the Electrical Division and discussed their problems of mutual interest, particularly the question of how to make American short-wave broadcasting more useful and effective.

Still another service having to do primarily with international short-wave broadcasting was the participation by the Chief of the Division as a technical adviser to the U. S. Government delegation at the International Telecommunication Conference at Cairo during February and March 1938. The results of this conference will be beneficial to the short-wave broadcasting industry, as well as improving the technique of international procedure on world radio, telegraph, and telephone activities.

At the beginning of the last fiscal year World Power Manual and Electrical Exporters' Handbook was given the new name of World Electrical Markets. During the year 15 sections have been published covering the latest electrical market statistics for that number of countries. Supplemental sections have been issued in connection with 14 other countries.

The World Radio Markets series was completely revised during the year through the issuance of 101 sections covering that number of countries. All countries of the world in which there is an appreciable radio market are covered.

Electrical and Radio World Trade News, published three times a month, covering news items of general interest to the electrical and radio industries, has proved particularly popular and helpful to the industry. Considerable new demand has been shown for all of these publications.

Advance Features of the United States Short-Wave Programs has been continued in improved form throughout the year.

A revised edition of the Glossary of Electrical and Radio Terms and Instructions for Exporters was completed and issued.

The main activity of the Division, that of cooperating closely with industry in connection with export problems involving sales and foreign agencies, has been carried on aggressively. In many instances this activity is carried on in connection with the trade associations. New assignments were arranged for analysis of export commodities, to include new classifications, such as electric razors, portable air conditioners, wind-driven generators, etc.

Hundreds of trade opportunities have been brought to the attention of American manufacturers, including such items as traffic lights for Cairo, Egypt; portable tools required in the Netherlands; airport lighting for Norway; convention language-phone system for Peru.

An Annual Statistical Number was issued in May covering world statistics for the year 1937. Its value was attested by the keen appreciation expressed by the electrical industry.

FOODSTUFFS

The Foodstuffs Division continued to devote attention to improving the speed and timeliness with which foreign-market information is brought to the attention of food industries and trades.

The outstanding accomplishment in this direction was the combination of six former biweekly mimeographed foreign market report services into one weekly periodical, thus reducing by 50 percent the time between receipt of reports and their publication. In addition to this improvement in timeliness, this remodeled weekly, Foodstuffs Round the World, has been made, in many ways, a more interesting,

more easily readable, and more comprehensive summary of foreign market conditions for United States food products.

The number of export and import commodities included in the Division's monthly analyses of the United States foreign trade in food products was expanded, so that this service constitutes a comprehensive picture of current trade statistics.

A series of 12 "year-end reviews" analyzing United States foreign trade in foodstuffs by commodity groups was published, giving foodstuffs trades detailed trade analyses and figures on exports and imports by countries approximately 1 year in advance of their final publication in Foreign Commerce and Navigation of the United States. The groups of commodities were: Fats and oils; meats and meat products; fresh fruits; fresh vegetables; sugar and molasses; edible nuts; grains and grain products; bananas; coffee, cocoa beans and products, and tea; spices and flavorings; beverages; canned fruits and vegetables, and dried fruits.

Special studies included a publication on Quick-Frozen Foods, timed to coincide with the rapid developments in this industry and the increasing interest in the subject; nearly 6,000 copies were distributed throughout the trade, to cold-storage warehouses, transportation companies, investment houses, various branches of the Federal and State Governments, and others.

Other special studies included Confectionery Production and Distribution, 1937 (a domestic questionnaire survey of manufacturers' sales and methods of distribution), Retail and Wholesale Prices of Refined Sugar in 27 Selected Countries of the World and a Survey of Current Business article entitled "Fats and Oils: Their Adaptability and Uses," which has been the object of commendation from outstanding authorities in this field.

Other special studies included one on the United Kingdom market for pecans, one on yerba mate, another on starch, the continuation of the monthly confectionery dollar-sales reports, and the inauguration of a series of monthly reports on poundage sales of confectionery manufacturers. This latter report, inaugurated at the specific request of the industry, made possible the furnishing for the first time of data on monthly trends in average values per pound received by manufacturers for confectionery. The Foodstuffs Division also continued the collection from packers and wholesalers and the publication of its quarterly reports on stocks of principal canned foods.

Foreign-market surveys included a world-wide survey on distilled spirits, anticipating the growing needs of this industry for export markets, and limited foreign-market surveys for seed potatoes, wheat gluten, canned citrus products, dried peas and beans, and others.

Material was developed for presentation of radio broadcasts in the Department of Commerce series for a number of food industries; they were the canning industry, coffee and tea, grain milling, and the dairy-products industry.

FOREST PRODUCTS

The Forest Products Division represents two major industries in the United States (lumber and timber products; pulp and paper products) the products of which are valued at almost 3¼ billions of dollars and are exceeded by only 5 other major industries. Normally,

more than $100,000,000 worth of forest products are exported yearly to 80 countries of the world.

This Division has redoubled its efforts in trade-promotion work, both domestic and foreign. One outstanding project in this connection is the development of trade-promotion use bulletins. During the past year, the Division has prepared and is publishing the following:

American Douglas Fir Plywood and Its Uses.
California Redwood and Its Uses.
American Pulp and Paper Industry.
American Hardwoods and Their Uses.
American Western Pines and Their Uses.
American Hardwood Flooring and Its Uses.
American Wooden Boxes and Crates and Their Uses.

The Government Printing Office has sold more than 60,000 copies of the first two bulletins, which were released for distribution last year.

The Division has also concentrated on the preparation of special market surveys at the request of industry, as follows: World markets for small-dimension hardwood stock; wallboards, insulating boards, and wall tile; used whisky barrels and containers; egg-case fillers and egg-case flats; leatherboard; and clay-coated boxboards.

There was published for the first time an Annual Review of World Exports and Imports of Pulp and Paper Products, 1,000 copies of which have been requested thus far.

The Division has cooperated with the Special Lumber Survey Committee in the preparation of its quarterly reports; the Chief of the Division serves as secretary to this committee. These quarterly reports were favorably cited by the President at a press conference as an example of cooperative steps and findings by industry in working out production and inventory problems.

Numerous foreign statistical analyses were made, many of which were printed in trade journals and papers, covering such features as exports of specialty wood products—wooden handles, ties, boxes, crates, and containers, etc.

Special monthly reports were made on imports of Canadian red-cedar shingles; also Douglas fir and west-coast hemlock under the quota. Monthly statistics were compiled and issued to the trade on plywood and specialty pulp and paper products.

As a result of a survey for the box and shook industry, there was recently established a Webb-Pomerene corporation for the exportation of wooden boxes and shooks.

As a direct result of the Division's work in trade opportunities, it was instrumental in assisting a large paper company in San Francisco to secure $16,000 worth of new foreign business. It assisted in the direct sale of 66,000 modern connectors for wood construction in the United Kingdom—having a value of over $7,000. It also assisted in the actual sale of $200,000 worth of wood pulp in Turkey by a New York concern. Many other individual companies, by personal letter, have indicated the value of the Division's work in trade opportunities, which has definitely resulted in business to these firms.

The pulp and paper section of the Division designed, prepared, and displayed at the celebration of Florida Industries Day in Jacksonville, Fla., charts, maps, graphs, etc., depicting the expansion and continued growth of the kraft industry in the South.

During the fiscal year 10,721 inquiries were replied to by the Forest Products Division; 1,333 personal visitors were received and furnished information; 255 Trade Opportunities were issued; 42 special circulars were issued.

LEATHER AND RUBBER

Export trade was better maintained than domestic business during the past year, and the business contacts of the Leather and Rubber Division have been made to realize the sustaining influence of export markets. This Division has definitely aided shoe manufacturers to maintain the value of shoe exports above that of the increased imports during the first 5 months of 1938; has initiated a monthly periodical, Rubber Products Foreign Trade Notes, to report foreign-trade developments in this field; has brought up to date the Rubber Tariff Manual, providing rates of import duty for all rubber products in foreign countries; and has materially aided exporters of shoe polishes by foreign-market research and trade promotion, in response to and in cooperation with trade contacts.

Declining domestic business in rubber and tires led to the carrying out of quarterly (instead of semiannual) surveys to enable the tire industry to follow retail sales with greater accuracy, and a special survey on capacity of the rubber-reclaiming industry was conducted to enable that industry to judge the advisability of plant extensions. The Division has published data indicating the growing importance of new applications of rubber, and various tire companies desirous of entering new fields have used the Division's research facilities in gathering data on the prospective market for projected new lines of production, particularly tires for agricultural machinery and implements, and certain fields of application of rubber latex.

The Division initiated and promoted monthly meetings in this Department with Federal employees engaged on rubber work in various departments, for exchange of information and assistance—industry speakers on important industry subjects having been obtained for this group on two occasions. Assistance was given the Procurement Division, of the Treasury Department, in its procurement studies on sole leather, synthetic rubber, and leather (other than sole).

Besides the Rubber News Letter and Tariff Manual, the Division now publishes the Leather Fortnightly, the Leather Raw Materials Bulletin monthly (including during the past year a series of studies on International Trade in Sheep and Lamb Skins, which has won trade commendation), and Rubber Products Foreign Trade Notes monthly. The Division's foreign-trade statistical statements now cover imports and exports of all commodities that come within its purview, whereas in 1933 only incomplete data were published.

MACHINERY

Confronted with increasing competition in the world's export markets, the Machinery Division maintained a vigorous program for the promotion of American equipment sales abroad.

Representations to foreign governments (through the proper intermediaries) in situations unfavorable to United States commerce were in a number of cases successful. Data were obtained on hundreds

of opportunities to sell American machinery in export markets, and this information was widely disseminated throughout the machinery industries.

The staff of the Machinery Division cooperated with the representatives of other governments in working out highly technical plans for the modernization of their industries and for the building of complete plants, and gave notice of these developments to the 130 branches of the domestic machinery industries.

The Division printed its monthly publication, World Machinery News, on an expanded scale, which had the effect of making available to machinery builders advance market information and sales trends abroad. Supplementary distribution of data on these developments was attained through papers and magazines of the trade. Basic and thorough studies, world-wide in scope, were published on the subjects of road machinery, Diesel engines, printing machinery, and all types of farm implements.

Members of the Division made known to the machinery industries facts on competitive situations in world markets through the medium of radio addresses, platform discussions, and conferences. Many of these resulted in concrete accomplishment for the expansion of United States commerce.

Individual equipment manufacturers were aided in instances involving discrimination against them by foreign governments or other entities, and several developments abroad detrimental to American interests were effectively opposed.

Trade associations and machinery firms were given aid in their problems of supplying material to the Federal Government on export markets and procedures, and in long-range foreign sales programs.

The Division rendered significant services in connection with exchanges of students and young machinists from other American republics. With the Bureau of Standards, it aided materially in a program to combat restrictive commercial standards in certain countries and in the promotion of American standards abroad.

METALS AND MINERALS

Last year the export commodities for which the Metals and Minerals Division is responsible comprised, in value, nearly 30 percent of the total American exports. Its constructive efforts have resulted in a steadily increasing reliance and confidence in the Division's work by both Government and industry, and consequently a steadily increasing volume and broadening scope of the Division's activities.

The four major divisional publications, the Iron and Steel Fortnightly, Foreign Metals and Minerals, Construction Abroad, and the Hardware Trade Bulletin, have met an increasing demand during the year. While, in order to avoid duplication of work being done by the Bureau of Mines, the fuels section has not published any regular bulletins, its work with the trade associations, the trade press, and with individual coal and petroleum companies has produced substantial results.

A considerable amount of work has been carried out in cooperation with the War-Navy Munitions Board in its study of plans for industrial mobilization and with the State Department in its effort to keep thoroughly informed on problems concerned with "strategic materials."

MOTION PICTURES

During the past fiscal year the Motion Picture Division has assisted in organizing export departments for two large equipment companies, and information received from these companies indicates that their foreign business since these departments were established has amounted to nearly $100,000.

In cooperation with foreign offices of the Bureau and at the direct request of the industry, the Division has assisted in having foreign censorship boards approve a number of pictures which had previously been denied the sanction of these authorities. It is reasonable to estimate that this assistance during the past year returned $50,000 to the American motion-picture industry which ordinarily would have been lost without the Bureau's intervention.

Requests on the part of the motion-picture industry for data from this Division with respect to foreign markets have increased greatly in consequence of the increasing trade barriers and legislation aimed at the importation of American motion pictures abroad. Because of these rapidly changing trade conditions, the Division has made a special effort to insure that the reports from the foreign offices of the Bureau contain the particular type of information which will be of maximum service to the motion-picture industry.

In recent years foreign production has been given considerable impetus by governmental assistance through direct subsidy, drastic censorship regulations, quotas and contingent restrictions, high duties and taxes. These restrictive barriers have resulted in the loss of play dates for American films. The American motion-picture industry, therefore, now more than ever, must be kept currently informed of competitive data, such as prices of admissions, theater receipts, taxes, distribution methods, censorship regulations, legislative impositions, number of theaters, number of studios, number of films produced, and types of films best liked in the different foreign countries. Without this type of data American companies are at a loss to determine the most effective sales methods to be employed in meeting foreign competition effectively. The Division has kept the industry constantly informed of these changes through its bulletins, press releases, and correspondence. Thus the activities of the Division have been greatly increased.

The Division, during the past year, completed a comprehensive survey of 90 foreign motion-picture markets; this was released in bulletin form, comprising 296 pages of material describing market conditions for the sale of American motion pictures and equipment.

SPECIALTIES

In serving thirty-odd related and unrelated industries, the Specialties Division was required to supply an unusual amount of trade-promotional assistance to meet the widely varied demands from this group. The Division compiled and published 180 separate bulletins, covering special foreign-market surveys for and international trade in "specialties" commodities; six printed Trade Promotion bulletins on printing, publishing, etc., glass, pottery, children's wheeled goods, toys (in process), meteorological instruments, and coin-operated musical instruments; four Trade Information Bulletins on advertising in

Sweden, advertising in Brazil, production and trade in cork and cork products, and sources of supply for fresh-water shell; and a number of other special trade analyses and trade studies. The Division wrote a total of 5,907 letters, answering 3,500 inquiries on every phase of foreign and domestic trade promotion.

Of particular importance were the following trade-promotional studies and surveys: A comprehensive world-wide survey of the printing, publishing, and allied industries, analyzing foreign markets for books, lithographic, and other printed matter; a complete study of the Latin American glass industry and trade, designed to develop new outlets and increase the participation of domestic glass manufacturers in the markets of that area; a survey of potential foreign markets for American pottery; a series of bulletins on foreign production and international trade in office machines and equipment; and a special study of possible export markets for meteorological instruments. In addition, export trade information and assistance was furnished to many other industries through the publication of special market surveys for various products covering more than 100 foreign areas. Projects begun but not yet completed include a survey of international trade in and foreign markets for American toys; international trade in and export markets for brushes; and a comprehensive survey of the protection and promotion of health, and dental, medical, and hospital facilities in foreign countries, in which will be incorporated an analysis of potential foreign markets for American dental, surgical, and hospital instruments, equipment, and supplies.

Special endeavors were made to encourage and assist several industrial groups to enter foreign markets where opportunities for their particular products appeared to exist but apparently have been neglected by domestic manufacturers. The initial results have been so encouraging that further efforts along this line will be continued.

An important service of the Division was the compilation and publication of foreign advertising media lists and the publication of studies of advertising and sales promotion in Brazil and Sweden. The foreign media lists are particularly valuable to exporters in connection with their foreign advertising.

TEXTILE

By reason of a more favorable competitive position and the reemphasis on foreign-trade promotion as a result of the reciprocal-trade-agreements program, export markets for many manufactured textile products have improved. Sales abroad of manufactured goods increased by about $12,000,000 in the fiscal year just ended. An increase of more than 57,000,000 square yards in the export of cotton goods alone is noted for the first 6 months of 1938.

With this development of added business and renewed interest in export markets, it became necessary for the Textile Division to give greater attention to detailed reporting and recommendations involved in requests for individual foreign-market surveys. At the same time the general information service of the Division was improved. More detailed data on foreign production, stocks, sales, and competition in a wide range of textile raw materials and manufactured products were released. This information was disseminated through press

releases and the two weekly news bulletins: Textiles and Allied Products, and Textile Raw Materials.

The volume of Foreign Trade Opportunities increased materially, necessitating considerable follow-up with domestic suppliers in order that this important phase of trade promotion might be most effective.

Shifts in world trade centers and the development of new areas of production or consumption for essential raw materials, particularly cotton and wool, required much closer attention to, and detailed reporting on, the elements affecting the growth and marketing of these commodities. World conditions in respect to cotton were summarized by the regular annual study: World Survey on the Supply and Distribution of Raw Cotton.

It was necessary to give an increased amount of time to requests from the general public for information dealing with the many phases of this group of industries. To meet the demand for general data the following informational bulletins were prepared: Raw Silk and the Silk Industry of the United States; Textile Reading List; Lanital—Artificial Wool from Casein (revised).

The Textile Committee of the Federal Specifications Executive Committee, of which members of the Textile Division are chairman and secretary, revised and promulgated many Federal specifications covering textile fabrics and products purchased by the several Federal departments and agencies.

TOBACCO

During the fiscal year 1937–38 the tobacco industry was beset with exceptional problems, many of which were major problems confronting individual firms.

The Tobacco Division carried on its customary cooperation with the tobacco industry during the year in a successful manner, as evidenced by the opinion of the Tobacco Association of the United States to the effect that the Division was "a tremendous aid" to all tobacconists desiring information on foreign trade.

In addition to a number of routine matters, the Division successfully worked out six major problems, four of which involved Chinese and Japanese questions.

The promotional services of this Division are for the most part individual services.

FOREIGN COMMERCE SERVICE

Despite difficulties arising from economic and political developments abroad, as well as limitations imposed by budgetary considerations, the fiscal year ended June 30, 1938, was a particularly successful one for the Foreign Commerce Service. Outstanding in its direct and practical aid to American commerce, its accomplishments during the year serve to reemphasize the Bureau's position as a vital instrumentality in the administration's program of enlarging and revivifying international trade.

The expanding interest in foreign trade, so noticeable during the preceding year, continued during the period under review and was relatively unaffected by the business recession in the United States. Direct requests from American businessmen for market surveys, as-

sistance in securing sales outlets, economic information of a specific nature, and general trade data poured into the foreign offices in a steadily increasing volume that taxed their facilities to the limit. This expanding interest was further demonstrated by the number and type of the American visitors calling at the foreign offices for information and assistance, and by the steadily increasing number of letters of appreciation received by the Bureau from American businessmen.

The efforts of a considerable proportion of the commercially important nations of the world to regulate and direct the flow of their foreign commerce through the imposition of many restrictive devices, together with the continuation of civil strife in Spain, the outbreak of hostilities in the Far East, and such international political developments as the absorption of Austria by the German Reich, have served to render the work of Foreign Commerce officers progressively involved and intricate. These same circumstances, however, have in corresponding measure indicated the merit of maintaining abroad a corps of trained specialists who combine with a quickened consciousness of the needs of American industry a sure and intimate knowledge of conditions in their respective areas.

Foreign Commerce offices were maintained in 33 of the world's most important trading areas. By reason of the continued unsettled conditions in Spain, the Madrid office was not operative in 1937–38, but its immediate resumption upon the termination of the Spanish civil strife is planned. Because of Austria's annexation by Germany in March 1938, it was felt that a separate office covering that territory was no longer necessary, and accordingly the Vienna office was closed on June 30, 1938, ending an existence of over 17 years. An office in Bucharest, Rumania, where the Bureau formerly maintained an office, will be opened early in the fiscal year 1938–39.

Twenty-nine field officers were brought back to the United States during the year. Most of these officers were sent to many of the more important commercial and manufacturing centers throughout the United States for consultation with chambers of commerce, foreign-trade clubs, credit associations, export managers, and other businessmen. This advisory function is recognizedly among the most valuable the Bureau can perform.

Continuing the practical policy of giving the greatest possible service to individual American firms engaging in foreign trade, the field organization of the Foreign Commerce Service prepared well over 14,000 trade letters in response to inquiries from American firms. As stated in this chapter last year, direct communication between our exporting firms and the Bureau's foreign offices was reestablished by agreement with the Department of State in February 1937. Responses to inquiries from American firms are always of direct and practical interest, since each involves a specific problem; in addition, many of these letters represent very complete and informative surveys of market possibilities for particular commodities. The information contained in them is made available not only to the inquiring firm but also, when of general interest, to American industry as a whole, through Bureau publications and releases.

Nearly 19,000 written reports on commercial developments abroad were prepared and transmitted by Foreign Commerce officers during

the year under review, as well as more than 3,000 cables of an economic nature, 1,500 specific opportunities for the sale of American products abroad (one of which alone involved products valued in excess of $500,000), and innumerable confidential dispatches designed to provide the Bureau with background information.

Practically all foreign offices report a considerably heightened number of American business visitors as compared with the previous year, this increased activity being undoubtedly both a cause and a result of the 36 percent increase of 1937 export trade over 1936. With this welcome increase in commercial callers has come an increase in correspondence as well as in consultative services, since most travelers preface their visit with letters and there are invariably last details which must be consummated through correspondence.

Among the most effective services performed by Foreign Commerce officers abroad is the assistance rendered in obtaining suitable agents for American exporters. The Bureau's files are replete with instances in which satisfactory agents for American firms have been secured by commercial attachés and trade commissioners abroad. The Bureau's accomplishments in this respect have been especially satisfactory since the resumption of direct trade-letter work—this latter activity being in every way an essential factor in producing results.

The Foreign Commerce Service has been especially active during the year in reporting on, and in some cases being instrumental in securing modification of, foreign laws and regulations prejudicial to United States trade, in securing import permits and enlargement of import quotas, in obtaining the release of blocked foreign exchange, and in other ways facilitating American commerce with countries employing mechanisms restrictive to normal trade. The Service has been equally alert in giving impartial assistance in the friendly solution of the misunderstandings which sometimes arise between American suppliers and foreign buyers, its efforts in this direction having added materially to the prestige of the American business community.

Deserving of specific mention is the part played by Foreign Commerce Service personnel in the successful prosecution of the trade-agreements program. Not only have these officers supplied essential basic data and technical information from their vantage points in the field, but several have been detailed to duty on a full-time basis in Washington in connection with trade-agreement work; others have devoted the major portion of their time to the negotiations abroad.

Some change in the administrative organization of the Foreign Commerce Service in Washington also occurred during the year. The former Foreign Service Division became, on August 3, 1937, the office of the Chief of the Foreign Commerce Service, with the man in charge to be designated from the senior officers in the field service. In addition to the administration of this service, the Chief of the Foreign Commerce Service also acts in a liaison capacity between the Bureau of Foreign and Domestic Commerce and the Department of State.

Results achieved by the inspector service inaugurated during the year under review have proved very satisfactory. The incumbent inspector is the former commercial attaché at Prague, Czechoslovakia. The first year of operations in this field amply justifies the project

and demonstrates the advisability of extending the service to other geographical areas.

During the past year the established system of evaluating and grading reports prepared by Foreign Commerce officers was further refined and simplified. These officers now have the benefit of constructive criticism of all their major reports. Further progress also was made in revising the schedules of reports required from the foreign offices, with a view to the elimination of any unnecessary reporting.

More effective utilization of the services of the foreign officers, both in the field and in the United States while on itinerary, was secured by the development of a more efficient analysis and control of allotments and expenditures.

FOREIGN TRADE STATISTICS

The outstanding achievement of the Division of Foreign Trade Statistics, in the fiscal year ended June 1938, has been the complete elimination of the delays in the compilation and publication of the monthly statistics. Compared with the closing months of the fiscal year 1937, the foreign-trade services of the Division are now available to the business public from 3 to 4 weeks earlier.

In order to serve the demands for current statistical data, 19 separate statements were issued on the United States trade with individual foreign countries in 1937. Principal agreement countries, as well as nonagreement, were included in the series.

A monthly report on imports for consumption by commodity and by country, as well as by customs district of entry, was supplied regularly to the Tariff Commission.

With the assistance of other divisions of the Bureau of Foreign and Domestic Commerce, the export schedule B (list of commodities which are distinguished separately in the statistics of foreign trade) was revised. In connection with this revision an extensive campaign was conducted urging exporters to submit the data on the exporter's declaration in accordance with the export schedule. A special bulletin was issued during the year revising import schedule A, in accordance with the changes made necessary in connection with the Czechoslovakian trade agreement.

The annual, Foreign Commerce and Navigation of the United States, 1936, issued in two volumes, contained the country-by-commodity detail (for 1935 and 1936) which is published in the even years. The Monthly Summary, formerly printed, was issued in a new process method which represents a saving to the Department in printing costs. The annual bulletins on foreign trade were issued: Trade Promotion Series No. 174, Foreign Trade of the United States, Calendar Year 1936, and Trade Information Bulletin No. 839, Summary of United States Trade with World, 1937. Statistical material was prepared for inclusion in the annual issue of the Statistical Abstract.

The compilation and issuance of the weekly and monthly gold and silver exports and imports were continued, as were the analyses of foreign trade for Commerce Reports and for the Survey of Current Business.

The first release on foreign trade to be made available each month (in the form of a press statement), which had previously been compiled on a commodity group basis, was changed to show the commodity break-down by economic classes. This new form of presentation indicates more readily the economic character of export and import trade movements. The other regular analyses of foreign trade were released in the usual form.

A special table was prepared each month, for the use of the Bureau's trade-agreements section, as well as that section of the Department of State, showing trade with "trade-agreement" and "non-trade-agreement" countries.

REGIONAL INFORMATION

The work of the Division of Regional Information can be divided into two classes—first, its service to American business, largely in the form of statistical and economic information on foreign countries, and, second, cooperation with other Government departments, especially participation in the reciprocal-trade-agreements program and other interdepartmental committee work.

The trade-agreements work consisted of the continued compilation of statistical data and market analyses for use in the negotiation of reciprocal trade agreements, and representation by the Division on all of the individual country committees. The Chief of the Division represented the Department of Commerce on the Joint Preparatory Committee on Philippine Affairs, which held public hearings in Washington, San Francisco, and in Manila during a 5-months' survey in the Philippine Islands. A report was prepared upon the return of the joint committee to Washington and was submitted to the President. Other active interdepartmental committees were the Interdepartmental Philippine Committee and the Committee on Japanese Trade Relations.

The continued intensive and long-range study of international economic movements included problems of international trade, national and international cartels, American branch factories in foreign countries, and exchange and trade controls. Current economic conditions throughout the world were analyzed with a view to assisting American exporters in their interpretation of markets in foreign countries.

The 1937 Foreign Commerce Yearbook was released and work started on the 1938 volume. The World Economic Review, Foreign Countries, covering the year 1937 was completed. An increasing demand was noted during the fiscal year for the subscription services of the Division: Economic and trade reports on China, Japan, southeastern Asia, the Philippines, Canada, and France, and the Russian Economic Notes, consisting of material from the Soviet press of interest to American exporters and importers and students of Soviet economy. The Commercial Travelers' Guide to Latin America, which is to be published in four sections, was initiated, and parts I and II, covering the east and west coasts of South America, were completed and sent to the Government Printing Office. Fifteen processed circulars were issued on a sales basis, dealing with a variety of economic subjects and individual foreign countries, on which frequent inquires are received.

In connection with the Inquiry on Cooperative Enterprises in Europe, 1937, the Division released considerable information on the development of cooperatives abroad, with special emphasis on the Scandinavian countries, this service being rendered through the press and to such organizations as the Consumer Distribution Corporation and the Cooperative League of New York City. The economic significance of the absorption of Austria by Germany was analyzed with particular relation to its effect upon American trade.

The public interest manifested in Latin America resulted in numerous studies of national income and trade trends in that area.

During the early critical period of the conflict in the Far East, the Division maintained daily contact with our offices in China and Japan, and kept the American business public fully informed by radio and air mail, through special releases to the district offices for use as background information in advising businessmen in their communities of current conditions in China and Japan.

Numerous inquiries were received from leading American firms on orders from the Soviet Union, covering every field of export activity, and Soviet monthly trade statistics were furnished to a number of interested firms and commercial bodies.

FOREIGN TARIFFS

During the year, in addition to its regular and continuing function as the official source of information on foreign-tariff and trade-restriction problems and developments of concern to American trade, the Division of Foreign Tariffs has contributed toward the Bureau work in the preparations for potential trade-agreement negotiations or revisions, broad studies of the import tariff systems, and other forms of trade control of 19 foreign countries, not counting separately the British colonial areas. In addition to heavy demands from the Department of State, the Tariff Commission, and the Department of Agriculture, the various experts of the Division have carried out extensive tariff researches for individual companies and trade organizations, the results of which have been included in their briefs. In September 1937 a new unit, the trade-agreement result section, was set up in the Division to study the operation and effects on American trade of the reciprocal-trade-agreements program.

The Division has received a constant stream of inquiries from American manufacturers and exporters dealing with current changes in foreign tariffs, trade regulations, import quotas, and license requirements. The demand for the Division's published material, circulars, and monographs has continued at a high peak, especially the annual review of trends in foreign tariffs and commercial policies and a summary of the 1937 developments under the trade-agreements program, both of which were published as special articles in Commerce Reports and widely distributed as reprints.

Among the outstanding services rendered in the foreign-tariff field during the year, often involving the assistance of American Government officers abroad and cooperation with other branches of the Government, as well as other divisions of the Bureau, the following may be mentioned: The free entry into Mexico of approximately 30,000 tons of American wheat; reclassification of American oatmeal at lower duty rates into Cuba; obtaining permit for the importation

into Italy of 3,000 tons of phosphate rock from Florida; assistance in allaying a boycott of American products in the Union of South Africa; reclassification of American plywood at lower rates of duty for entry into Colombia; assistance in making possible the entry of large shipments of American flour into Brazil; entry of $140,000 of American machinery into Greece; clearance of apples into Egypt in shipments ranging up to 10,000 boxes; the retention of transshipment trade in mahogany logs from British colonies; and advice and information on dutiable-value problems in a number of British areas.

FINANCE

The principal achievements of the Finance Division were: (1) The publication of two important studies, namely, Foreign Investments in the United States and American Direct Investments in Foreign Countries, 1936; (2) a fuller and wider distribution of information on foreign-exchange restrictions abroad; and (3) the limitation of efforts of a fraudulent European investment enterprise to exploit unsuspecting Americans.

Representing as it does the completion of the first comprehensive investigation of the subject ever made and one on which a number of the Division's staff had been engaged for several years, the publication of the study on Foreign Investments in the United States attracted widespread attention. The publication was particularly timely in view of the general discussion as to the significance of the heavy inflow of foreign capital in recent years.

The study on American Direct Investments in Foreign Countries, 1936, was likewise timely, since there was much conjecture as to the changes that had occurred in the 7 years since the Division's first study on the subject was prepared.

These two reports provide improved bases for estimating important items in the annual study of the Balance of International Payments of the United States.

Since there were frequent and significant changes in foreign regulations governing the release of exchange to cover imports, special efforts were made to disseminate as rapidly and fully as possible to interested persons all incoming information on the subject. For this purpose a wider use was made of telegraph, teletype, and radio, particularly for the benefit of the Bureau's district offices on the Pacific coast. An increasing tendency to consult the Division by long-distance telephone was noted. By these means a considerable number of American exporters were able to avoid losses. In addition, commercial attachés in several countries were successful in securing the release of large amounts of American funds blocked by exchange restrictions and in inducing the exchange-control authorities to grant increased allotments of exchange for American goods.

FOREIGN COMMERCIAL LAW

Approximately 6,000 inquiries relating to foreign legal problems were answered by direct correspondence during the past fiscal year. Innumerable legal inquiries are anticipated by information published weekly in Commerce Reports and monthly in the Comparative Law Series.

The Comparative Law Series, a monthly world-wide legislative review, has been "revamped" and revitalized. This publication has now taken its place as an outstanding official publication in the field of comparative law.

Detailed studies of the commercial laws of Brazil and Canada have been completed and will be published in the near future.

The intimate relation between the maintenance of American insurance services, covering all classes of risks throughout the world, and the smooth flow of American foreign commerce is the basis for service rendered by the Bureau to the insurance industry. During the past year the activities of the Division have resulted in the modification or softening of restrictive legislation proposed against American insurance companies in Greece, Puerto Rico, and Cuba. World-wide statistics on insurance have been collected and tabulated, and the results utilized by the Association of Life Insurance Presidents and other organizations and publications. Trade opportunities in excess of $1,000,000 were disseminated to American aviation insurers. The Division actively cooperated and participated in the Annual Message of Life Insurance Week.

The well-established service operated by the Division for the adjustment of international trade disputes through the cooperation of the district offices of the Bureau and the American Foreign Commerce and Consular Services increased more than 15 percent during the past year. Lists of attorneys in foreign countries qualified to represent American interests in the collection of accounts and other legal matters were furnished to a greatly increased number of inquirers.

Approximately 500 specific services have been rendered personally or through correspondence in the field of industrial property, which includes trade-marks, patents, copyrights, unfair competition, price maintenance, and industrial combinations. In more than 1,000 instances the Division notified American manufacturers of possible attempts to pirate their trade-marks in foreign jurisdictions.

The importance of apprising American businessmen of domestic legislation has led to the preparation of articles three times each month on current Federal legislation affecting business, published in the Bureau publication, Domestic Commerce. A digest of legislation of the Seventy-fifth Congress was published in the Comparative Law Series. Several thousand reprints of this digest were requested by interested inquirers. Numerous requests of businessmen for information regarding the text and operation of current Federal legislation were either answered directly or forwarded to the appropriate Federal or State agency for reply. The Division also assists in the preparation of opinions of the Bureau respecting proposed legislation in response to requests from congressional committees and the Bureau of the Budget. A recent assignment has been the codification of rules and regulations of the Bureau as required by the act of June 19, 1937.

COMMERCIAL INTELLIGENCE

Sharply increased interest in foreign trade was indicated by the continued increasing demand for the Commercial Intelligence Division's publications and services. Export and Import Practice (Trade

Promotion Series No. 175), a step-by-step description of the best foreign selling and buying practice in use in the United States today, exhausted a first edition of 6,000 copies in a little over 1 month. More Sales Information Reports were sold during the 1937–38 fiscal year than ever before. As each of the 32,911 of these reports sold represented either an inquiry or an order from abroad received by some exporter, the increased demand for them by 13 percent over the 1936–37 fiscal year was a definite indication of the foreign-trade trend. Likewise, the demand for trade lists showed a 10 percent increase over last year, reaching 48,114 sold during the 1937–38 fiscal year. The most significant increase, however, was in the number of Trade Opportunities from abroad, where the 5,671 received represented a 34 percent increase over the previous fiscal year.

American exporters and importers found in the services rendered by the Division practical help in solving their problems. The information readily available on 650,000 foreign firms indicates how they do business, their distributive capacity, and size. Each report also contains a list of American and foreign agencies held and American and local banking and trade references. Opinions from local credit sources are often quoted. This information is kept current by constant revisions so that, in two out of every three requests, a current report, less than a year old, was found in our files on the foreign firm. Where the information is not current, a revision is obtained without additional charge.

American foreign traders who are seeking new outlets for their products abroad have now available 7,926 lists of foreign buyers and agents representing the names of approximately 400,000 different foreign firms. These lists are made up by commodity and country and are 86 percent current—that is, less than 2 years old. They are being revised at the rate of 3,000 lists per year. After each name and address the method of doing business, special types of commodities handled, location of selling outlets, and nationality are shown. These lists are used extensively to carry on direct-by-mail sales campaigns, as calling lists for foreign travelers, and to check existing sales outlets abroad. Most of the names on these lists indicate by asterisk the existence in the Division's files of a more detailed Sales Information Report.

Foreign buyers and agents who wish to contact American firms send in their requests through field officers or direct, and, after careful investigation of their standing and sales ability, these are published as Trade Opportunities under a key number in Commerce Reports or are given direct distribution. That these trade leads bring increased business to foreign firms utilizing this service is evidenced by the 34 percent greater use made of it during the past fiscal year.

A finger was kept on the credit pulse of the world during the year by the weekly publication in Commerce Reports of monthly advices received by cable, radio, and air mail from 85 reporting offices abroad on the facility with which mercantile credit is obtainable and the celerity with which mercantile collections are being made. The Credit Situation Abroad was depicted graphically on maps included as a Commerce Reports supplement every 2 months.

Being perhaps the largest pool of foreign-credit source information in the country, the Division's World Trade Directory files were constantly used by other governmental agencies during the year. The Export-Import Bank, the Department of Agriculture, and the State Department all made use of the Division's reports and lists for the checking of foreign firms.

TRANSPORTATION AND COMMUNICATIONS

The Transportation and Communications Division functioned in accordance with a five-point program developed during the previous year. In connection with its domestic transportation activity, it inaugurated a new service to traffic men and shippers in the form of a monthly news bulletin entitled "Traffic Items." It is primarily concerned with the work of the various Federal departments, State governmental bureaus, and agencies which release at intervals reports giving detailed information that can be made a valuable part of a freight traffic manager's files. A brief analysis of rail and highway transportation in the United States was released in processed form, setting forth the major factors and developments. This bulletin will be revised during the current year.

The Division published a statistical analysis of the various United States inland and intercoastal waterways with their connecting channels. This bulletin is being revised and will be reissued during the coming year in such a form as to incorporate recommendations made by interested individuals in the waterways industry. The Division also assisted the Maritime Commission in an investigation of traffic conditions on the Great Lakes—which conditions were diverting American grain from American ships and channels. This investigation is still in progress and will be continued during the coming year.

Preliminary work was undertaken in connection with the proposed revision of Packing for Foreign Markets (issued in 1924), and in the meantime many shippers were provided with technical information on current packing and packaging procedure.

In furtherance of the standards work being carried on in the Division, the Chief is now serving as a member of the American Standards Association sectional committee on loading platforms, created to consider all factors preliminary to the adoption of uniform loading-platform standards.

The large increase during the year in the subscriptions to the Division's three news letters—Foreign Shipping News, Foreign Railway News, and Foreign Communications News—clearly indicates the value of this information to the transportation and communications industries. Special issues of Foreign Railway News were released during the year, containing detailed analyses of the Nationalization of French Railways, Argentine Coordination of Transport Law, and Expropriation of National Railways of Mexico by the Mexican Government.

In the foreign shipping field, a handbook was completed on the Control of Ocean Freight Rates in Foreign Trade, which constitutes a world survey of existing policies and practices and which will be of value alike to American exporters, importers, ship operators, and Government agencies, particularly in view of the fundamental

changes which have evolved out of the unprecedented circumstances of recent years. The Division provided throughout the year a continuous service of shipping research and intelligence whereby the shipping, shipbuilding, and allied industries as well as Government agencies were kept informed of important developments in the various countries of the world. In carrying on this work, liaison was maintained especially with the American Merchant Marine Institute, the National Council of American Shipbuilders, and the Maritime Commission, which agencies were furnished with various reports from American Foreign Service officers and other sources. Among some of its special activities in this field, the Division aided an American insurance company in the settlement of a heavy claim for marine loss; assisted the Far East Conference in analyzing the ocean freight-rate situation with respect to the exports of condensed evaporated milk to the Far East; guided the Pacific Forest Industries in a study of the transportation problem confronting American exporters of plywood; furnished the Foreign Policy Association with information as to the carriage of American foreign trade by American and foreign vessels; cooperated with the Maritime Commission in maintaining the prestige of American-flag ships in the east-coast South American trade, while temporarily suspended services were being reestablished, etc.

In the foreign railway and highway transportation field, work progressed on the revision of the Division's study on Railway and Highway Transportation Abroad. It is expected that this publication, which will include a brief review of all forms of transportation taxation, will be released during the coming year.

Among some of the special work undertaken in this field might be mentioned the cooperation with the Association of American Railroads on foreign railway problems; assistance to the Automobile Manufacturers Association in matters pertaining to foreign highway legislation; the supplying of financial analyses on foreign railways for interested manufacturers and Government agencies, particularly the Export-Import Bank, etc.

In the industrial field the Division continued its cooperation with the railway-supply manufacturers in promoting the sale of their equipment abroad—following foreign market conditions to prevent the exclusion of American equipment through the introduction of unnatural barriers and the submission of tenders on equipment in instances where the manufacturer has no opportunity of obtaining the order and is being solicited only for price-comparison purposes. As illustrations: The Division cooperated with interested American suppliers of railway materials and the American Standards Association in the matter of establishment of standards by the Argentine State Railways, and an agreement was arrived at whereby a representative is now being sent to Buenos Aires as a member of the United States Chamber of Commerce in that city to further American interests in any standardization program to be established. American manufacturers of railway equipment were saved many thousands of dollars, in the form of expenses—blueprints and drawings, etc.—which they would have been required to furnish had they acceded to the request from foreign supply houses for quotations on locomotives, rolling stock, etc., for the Turkish State Railways;

information from the Bureau's Istanbul office already on file in this Division indicated that the orders had been placed elsewhere. As a result of efforts by this Division and the Bureau's commercial attaché in Santiago, an order for seven locomotives valued at $500,000 and subsequent materials at approximately $80,000 was placed in this country by the Chilean State Railways.

For the benefit of railway suppliers, the Division analyzed exports of railway equipment, by individual commodities and countries of destination, as well as shipments to noncontiguous territories during the 9-year period 1929 through 1937. This information, supplemented by charts indicating in graphic form our trade in these commodities, was released as a processed bulletin.

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 executive secretary of the Board is also the Chief of the Transportation Division.

During the year the Board issued a grant to the Alabama State Docks Commission to establish, operate, and maintain a foreign-trade zone in Mobile, the second grant to be made by the Board. The first grant was made to the city of New York, which during the past year employed, under an agency contract, the New York Foreign-Trade Zone Operators, Inc., a private corporation, to operate the zone at Stapleton, Staten Island. Substantial gains have been made under the private operator.

The staff under the executive secretary of the Board has formulated and had published in the Federal Register instructions concerning the publication, posting, and filing of schedules containing all the rules, regulations, rates, and charges for all services and privileges within foreign-trade zones. There has also been formulated a uniform system of accounts and records and directions for the preparation of annual reports to be adopted by the foreign-trade-zone operators. Pursuant to the Regulations for the Codification of Executive and Administrative Documents, promulgated by the administrative committee of the Federal Register, the Regulations of the Foreign-Trade Zones Board, with subsequent documents promulgated by the Board, were codified and submitted to the Codification Board.

CONFERENCES AND EXPOSITIONS

The number of projects handled by the conferences and expositions section, the functions of which include coordination of activities of all bureaus in the Department of Commerce in the furtherance of conferences, expositions, fairs, and related undertakings, showed definite growth during the past fiscal year. Cooperative relations between the section and other units of the Department, as well as with Federal and nongovernmental agencies, have increased steadily. Membership on interdepartmental committees has required more than double the

usual time because of international events scheduled to be held in this country.

A large number of international conferences in which the Bureau was interested took place abroad during the past fiscal year, but for various reasons it was expedient in most instances to nominate Foreign Commerce officers of the Bureau as delegates. Preparations for more than 20 conferences to be held in 1939–40 in other countries on subjects coming within the scope of the Bureau's activities are already under way.

The Bureau has been represented at approximately 120 national and regional conferences and meetings in the United States, many of which are mentioned specifically elsewhere in this report.

In addition to displays at certain of these meetings, the Bureau contributed exhibits to several conventions in specific industries, elsewhere reported. Exhibits at such general expositions as the Detroit-Michigan Exposition and the Muskegon Centennial Exposition also required its attention. The Bureau's exhibits at the two international expositions at Cleveland and Dallas (reopened for the summer of 1937) and at the International Exposition of Paris (which ran for one season only) required supervision and preparation of final reports. This section has cooperated with other Federal agencies and with bureaus of this Department on a number of small expositions projected in foreign countries.

For the past fiscal year the section has cooperated with the New York World's Fair and the Golden Gate International Exposition (San Francisco) organizations and with Foreign Commerce offices of the Bureau in collecting and disseminating information on these projects. It has likewise answered a vast number of inquiries from potential exhibitors, both in the United States and foreign countries. Preparation for Bureau participation has been in hand for several months. Activities in connection with the Pan American Exposition, Tampa, Fla., 1939, of which the Director of this Bureau is Federal Commissioner, and preliminary work on the Seventh World's Poultry Congress, Cleveland, Ohio, 1939, in which the Bureau is vitally interested, have required much attention over the past several months.

DISTRICT OFFICES

Despite the depressed business conditions prevailing during the past year, the Bureau's district offices showed a very marked increase in the volume of service rendered the business community. Much of this was due to the desire of businessmen to enlarge the market possibilities of their respective products.

There was a marked increase in the number of Trade Opportunities distributed by the district offices. These increased from 99,000 to 168,000, an increase of 69 percent. About 12 percent more trade lists were sold by those offices and about 10 percent more Sales Information Reports. The sale of Bureau publications declined 9 percent, but the increase in the Superintendent of Documents' cash account amounted to 24 percent.

During the past year the domestic phase of the Bureau's work became an increasingly important factor in the activities of the district offices. One of its features was the continued development of the retail sales reporting program, which has been extended to cover

the 11 far Western States. Excellent cooperation has been secured from trade associations and local merchants, and the material published is in demand, not only by these people but by manufacturers and distributors who have come to rely more and more on these reports.

In the foreign field the district offices continued to be the principal outlets for the vast amount of commercial information collected by the Bureau's offices abroad and by the American Consular Service.

As a result of a number of important exchange developments in foreign countries, the district offices were called upon to convey to manufacturers certain advance information, which undoubtedly resulted in saving businessmen many thousands of dollars.

One feature of the work in the district-office service was the compilation of an economic report on each district, which it hopes to publish as soon as funds are available.

DOMESTIC-COMMERCE ACTIVITIES

The domestic-commerce activities of the Bureau have taken on new and added significance during the past fiscal year as a result of the set-back which business experienced during the latter part of 1937. Increased demands for information about business conditions taxed to the utmost the limited facilities of the Bureau in this field. Progress was made, however, in such directions as the initiating of new current series on inventories in the hands of manufacturers, wholesalers, and retailers, and in the expansion of the sales-reporting program in the Marketing Research Division. Similarly the work in the field of construction economics was expanded to meet better the demands from the construction industry.

Closer cooperation with other research agencies in the domestic field was initiated at the request of the State university bureaus of business research. The deans of the schools of commerce and business of these State universities met with officials of the Bureau in the interest of working out a broader program on a sounder basis for cooperation in the collection and analysis of business information.

The domestic commerce work in the Bureau was carried out in the two divisions, Economic Research and Marketing Research. Plans were formulated for the regrouping of this work early in the fiscal year 1938–39 to provide a third division, that of Business Review. This reorganization of the work was planned in the interest of increased efficiency and specialization in meeting the demands of the business community.

ECONOMIC RESEARCH

The services of the Division of Economic Research have been of two broad types—(1) the compilation, analysis, and publication of statistics on current business trends, and (2) investigations for the development of new statistics and other information upon a wide range of economic subjects, such as national income, long-term debt, and specific studies of construction and similar industries. The results of these activities have been made available in the form of current periodicals, special publications, and answers to a large number of current inquiries from private businessmen and from members of the Congress and other Government officials.

The principal publications and statistical services prepared and issued by the Division during the past fiscal year were as follows:

(1) The Survey of Current Business: Monthly issues of this publication contain more than 2,000 individual statistical series covering nearly all fields of economic activity. Each monthly issue also has included an analysis of the general business situation and studies of various aspects of business. The paid circulation of this publication has increased more than 25 percent during the year. The March issue this year contained a review of economic conditions in the United States during the calendar year 1937, replacing part 1 of the World Economic Review published in previous years.

(2) 1938 Supplement to the Survey of Current Business: This publication was prepared and sent to the Government Printing Office during the fiscal year. It continues the series carried in the 1936 Supplement to the Survey of Current Business, adds many new series, and embodies the complete revision and modernization of descriptive material relating to the individual series.

(3) The Statistical Abstract of the United States, 1937: This publication brings together under one cover each year a very large number of statistics that are of great importance to businessmen, Government officials, economists, and students.

(4) National Income, 1929 to 1936: This bulletin incorporates the estimates of national income paid out and produced by major industrial divisions for this period.

(5) Monthly Income Payments: In connection with the activities of the national-income section of the Division, a monthly index of income payments for the Nation as a whole has been compiled and is carried forward each month as a regular feature of the Survey of Current Business. This index is the most comprehensive and inclusive measure of economic conditions that is available at the present time.

(6) Construction Activity in the United States, 1915–37: This bulletin presents estimates of construction activity in great detail by type of use of structures, by ownership, and, in the case of public construction, separate tabulations showing the source of financing. This bulletin also contains an analysis of the major characteristics of construction activity in the United States and compares employment in this industry with that in other industries.

During the year the Division of Economic Research has improved its facilities in several fields. The construction and real-property section has expanded its activities in connection with the analysis of residential building and has made substantial progress in the study of the various interrelated factors that affect the volume of building. The work in the national-debt section has been revived in response to numerous requests from governmental agencies and businessmen. At the present time estimates of total long-term debt are being prepared, bringing the data published in Long-Term Debts in the United States, 1912–34, forward through the years 1935, 1936, and 1937. The national-income section is preparing estimates of income payments by States. Official data on this important subject have long been needed.

One of the regular services performed during the year has been the preparation of a Weekly Review of Business Conditions for the use of Federal Government officials.

MARKETING RESEARCH

During the past year the Marketing Research Division continued to serve manufacturers, wholesalers, retailers, trade-association executives, and others interested in the complex problems of distribution. Help has been received from and given to many other governmental agencies. The outstanding achievement was the further expansion of the current reporting service of the market-data section, and the increasing demand for the resulting information. During the past fiscal year the number of independent retailers who voluntarily contributed requested data increased from slightly less than 13,000 to 26,000. This part of the service now covers 26 States, as against 15 a year ago. Some 27 reports on independent retail sales are issued monthly and mailed to more than 68,000 businessmen who have requested this service—an increase of more than 40,000 for the year. Coverage in the chain-store field has been extended to include a 50 percent sample, based on sales.

The number of wholesalers reporting dollar sales, accounts receivable, collections, and dollar inventories has increased from 1,100 to more than 2,000 during the year, and the number of manufacturers from 500 to 1,100. Three new releases containing current statistical analyses in the electrical, hardware, and food trades are now published monthly. Others will follow. For the first time within recent years wholesale inventory figures have been available on a monthly basis since last January. They have attracted more favorable general attention than any other current domestic data issued by the Division.

On January 1 the market-data section took over all of the current wholesale reporting work of the Board of Governors of the Federal Reserve System. Preparations are being made to assume complete responsibility for the remaining portion of their trade-reporting work in order to consolidate this work in one agency.

During the past year a new edition of Wholesale Grocery Trading Areas was issued. In order to reduce duplication and give wider use to regional statistics now collected throughout the country, such data have been collected and classified for the purpose of publishing a source book in the near future.

The last in the series of reports on Consumer Use of Selected Goods and Services by Income Classes, covering 50 cities throughout the United States, was published during the past fiscal year. These data, covering more than 228,000 families, were widely and intensively used by advertisers, manufacturers, distributors, and publishers.

The 1938 edition of the Consumer Market Data Handbook was practically completed by the end of the fiscal year by members of the consumer-market section. This edition, planned with the aid of many sales managers and marketing executives, contains what is believed to be the most comprehensive manual of consumer marketing statistics ever assembled, broken down by counties and cities. It contains 82 items, or nearly three times as many as were in the last edition.

A new edition of Suggestions for Use in Making a City Survey has been completed for publication. The major part of this report is an outline for the survey of the industrial and commercial status

of individual cities, which will be used in making local studies leading to a more exact understanding of local needs and to the eventual improvement of employment, purchasing power, and consumption.

The industrial-marketing unit issued three reports during the past year. Of them, the Effect of City Water and Sewerage Facilities on Industrial Markets attracted much attention among city officials, manufacturers, and distributors of equipment and supplies used in this large industrial market. Another Basic Industrial Series report was completed, The Pulp and Paper Industry. An increasing number of manufacturers are turning to the unit for information concerning industrial markets, location of new plants, selling policies and methods, and related questions.

The installment-credit unit, which was established during the past year, has already assembled much information on this subject. In cooperation with the Associated Credit Bureaus of America, it conducted and issued a detailed study of installment terms in more than 100 cities throughout the United States. Estimates of installment sales volume and of outstanding credit on that account covering 1937 were also released shortly after the close of the calendar year. The Annual Retail Credit Survey has been continued and elaborated to give more data on installment selling, collections, and bad-debts losses in 14 retail trades in 86 cities.

Lists of State and local trade associations have been published during the past year for all 48 States, the District of Columbia, and the cities of New York and Chicago. There are 5,800 State and local associations in 2,200 cities. Of this total, 1,100 are organizations of manufacturers; 400 are of wholesalers; 2,600 of retailers; and 1,700 are associations of business organizations in the service fields.

The interests of small businessmen have been served during the past year by the publication of Small-Scale Retailing, a statistical study of two-thirds of the retailers who account for less than 15 percent of dollar sales; Store-Arrangement Principles, which was completed for publication; and Patterns of Stores, Sales, and Population in the United States. Other short, clearly written, well-illustrated reports, prepared for small retailers, their trade associations and trade papers, will follow.

A new edition (the seventh) of Market Research Sources was published, presenting another periodical inventory of the activities of research agencies in marketing; it constitutes a handbook which not only shows the sources of available material and the sponsors of current projects but also prevents much waste that might result from duplication of efforts because of ignorance of the work of other organizations.

In addition to the reports, many other services have been rendered businessmen and others interested in distribution. More than 20,000 inquiries necessitating search and research were received and answered. Total installations of the Business Information File, an abstracting service available free to trade associations, chambers of commerce, and business libraries, and at a charge to private business houses, increased from 476 to 562. Paid installations increased 38 percent.

As a result of the high editorial standards of Domestic Commerce, the number of paid subscribers to this 22-page publication, appearing every 10 days, increased from 2,495 to 3,153 during the year. It carried an increasing amount of original data not found elsewhere.

EDITORIAL AND PUBLICATION WORK

Supervision over the publication work of the Bureau has been exercised by the Editorial Division. Printing funds having been available in slightly larger amount, an increase was again recorded in the quantity of work performed. The Division has, as usual, appraised the merits of any suggested publication and given an opinion as to the desirability of issuing it; has evaluated, and often recast, the method of presentation, so as to insure a maximum of accuracy and effectiveness; and has made the material conform to high typographical standards. Members of other divisions who have been concerned in the preparation of manuscript designed for publication have found it necessary to confer with the staff of the Editorial Division. Detailed printing problems—often of a highly technical nature—call for the constant attention and counsel of the Division. During the past year the Division has given special attention to an effort to improve the general appearance of Bureau publications and thereby heighten their "reader-appeal"; the use of rather striking art work on the covers of the monographs has been one of the principal means employed. Upon the Editorial Division falls the duty of scrutinizing, and revising if necessary, all of the Bureau's processed publications before they are reproduced. On various occasions, original writing (of statements, articles, and other informational material) has been done in the Division.

Steady effort has been devoted by the publications-distribution section to the task of augmenting the circulation of all the publications of the Bureau, by making the business community more acutely conscious of the practical help that can be obtained from them. Noteworthy increases in subscriptions and sales have resulted; for example, there has been an increase of 30 percent in the paid subscriptions to the Survey of Current Business and of 20 percent in the subscriptions to Commerce Reports, with satisfactory increases also in the renewal rate. The section cooperated with the special committee for Foreign Trade Week, and in like manner has cooperated in the devising of exhibit material designed to show the work of the Bureau graphically. Successful efforts have been made to develop the use of Bureau material in schools of business administration throughout the country.

NATIONAL BUREAU OF STANDARDS

GENERAL ACTIVITIES

Finances and personnel.—The Bureau's appropriation for 1938 was $2,118,000. This included $198,000 for a special investigation of building materials and structures, with particular reference to low-cost housing. The sum of $22,825 for travel was allotted from the consolidated funds of the Department of Commerce. If this amount is added to the regular appropriation, the total represents an increase of $196,925 over the funds available for expenditure in 1937, the increase being confined wholly to the special appropriation for studying building materials. The regular staff at the close of the year (including temporary employees) numbered 929. In addition, 59 research associates, supported by national engineering societies and trade associations, were engaged on technical problems of mutual interest to the Government and industry.

Testing.—The testing of supplies purchased by the Federal Government—a primary function of the Bureau—again has required the entire time of about one-half of the Bureau staff. This service is rendered for practically every governmental agency, and is worth many times its cost, since it insures that the quality of supplies purchased is in strict accordance with the Federal specifications.

Publications.—The results of the year's work have been made available through 254 publications and articles. In addition, over 100 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. William D. Coolidge, director of the research laboratories of the General Electric Co.; Dr. Frank B. Jewett, president of the Bell Telephone Laboratories; Dr. Karl T. Compton, president of the Massachusetts Institute of Technology; and Gano Dunn, chairman of the J. G. White Engineering Corporation. The committee's advice on many important subjects has proved of great value.

New photometric units.—Several divisions of the Bureau have cooperated in experimental work directed toward the establishment of practical photometric standards embodying the new system of units adopted in 1937 by the International Committee on Weights and Measures. In this system the primary standard is a black body at the temperature of freezing platinum, and the magnitude of the basic unit of luminous intensity, called the "new candle," is fixed by taking the brightness of the primary standard as 60 candles per square centimeter. Filament lamps are used as working standards to maintain the units. The luminous intensity (candlepower) of 8 carbon-filament standards, operated so as to give light of the same color as the primary

standard, has been determined by comparing them directly with the black body.

For practical purposes standards operating at higher temperatures and at different colors are essential. Such standards are to be established on the basis of spectral factors of luminosity adopted by the international committee. As one method of applying these factors, blue filters have been used to pass from carbon-filament to vacuum tungsten lamps and then to gas-filled lamps. A more direct method of establishing gas-filled standards has been developed by using the radiation from a black body at the temperature of freezing iridium and calculating its intensity by means of the standard luminosity factors. Six gas-filled tungsten-filament lamps have thus been calibrated by direct comparison with the black body at the iridium point (2727° K, 4449° F). The acceptance of the luminosity factors as the basis for measuring lights of all colors gives new importance to physical photometers. A combination of filters with a nonselective radiometer has been developed which promises to be a practical means of measuring lamps of all types.

It is also necessary to have standards of light flux, as well as of intensity. Special standard lamps have been obtained and measured in various ways in order to determine accurately the relation between the directional candlepower and the total light output.

In order to assure international uniformity among the new standards, lamps embodying the several parts of the new system as set up experimentally in different countries are to be compared at the British National Physical Laboratory. The Bureau has submitted three groups of standards for this purpose. Reports from other countries have not been received, but it is expected that the new units will be generally used beginning January 1, 1940.

Twenty-eighth National Conference on Weights and Measures.—This conference, attended by weights and measures officers of States, cities, and counties, by representatives of the Federal Government, and by manufacturers of weighing and measuring devices, met at the Bureau on May 31 to June 3. More than 140 State and local officials were in attendance from 27 States and the District of Columbia, out of a total registration of approximately 250. Special attention was given to the Bureau's report on more than 100 vehicle-scale tests, made in cooperation with the States during the past 2 years. In this report definite recommendations were made for improvement of conditions in this field. Special testing equipments for large-capacity scales operated by States and cities were studied, and a city-owned equipment for the testing of fuel-oil meters was demonstrated. Numerous subjects relating to the administrative and technical aspects of weights and measures administration were discussed, and some amendments to codes of specifications, tolerances, and regulations previously approved were adopted by the conference.

Conference of public utility engineers.—Thirty-nine commission engineers from 25 States and the District of Columbia, together with representatives of the Federal Government concerned with the technical aspects of public utilities' regulations, attended their sixteenth annual conference at the Bureau on May 17 to 19, inclusive. Thirteen formal papers were presented and discussed.

American Standards Association.—The Bureau takes an active part in the work of this association. In addition to representation on

over 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 1,162 specifications have been prepared for the use of executive departments and establishments of the Government.

ELECTRICITY

Fundamental units and standards.—In accordance with decisions of the International Committee on Weights and Measures, new values of the electrical units based upon "absolute" measurements are to be used beginning January 1, 1940, and determinations of the relation which the absolute ampere and ohm have to the present "international" units are to be reported by national laboratories by the end of 1938. The Bureau published results of such determinations in 1934 and 1936, but has now constructed improved apparatus for both units. The new equipment includes a very accurately constructed inductance coil from which the henry (and ohm) will be derived, and new coils wound with anodized aluminum ribbon, instead of wire, for the ampere balance. A precise mutual inductor intended for use in establishing the value of the ohm by another method has also been constructed.

Resistance coils of the new type developed at the Bureau have continued to show remarkable constancy. Two 10-ohm resistors loaned to the International Bureau of Weights and Measures were compared by that Bureau with the 1-ohm standard furnished last year, and the values were found to be consistent within less than a part in a million.

Saturated standard cells have been made in which a portion of the normal water is replaced by deuterium oxide (commonly called "heavy water"). These cells are fully as reproducible and constant as cells made in the ordinary manner, and in some respects they may be superior. The electromotive force is decreased slightly as the proportion of heavy water is increased. (RP1094).[1]

[1] Parentheses identify the serial number of the paper and the Bureau publication in which it appeared. RP refers to a paper in the Journal of Research of the National Bureau of Standards; TNB, Technical News Bulletin; BMS, Building Materials and Structures; R, Simplified Practice Recommendation; CS, Commercial Standard; M, Miscellaneous Series.

High-voltage laboratory.—The appropriation for the fiscal year 1939 provides for a new laboratory for high-voltage work, including X-ray investigations, as well as measurement of voltages and studies of materials under high electrical stresses (RP1078 and RP1079). Plans for the equipment of this building are already well under way.

Radio.—Throughout the year the Bureau broadcast regularly from its own station, on an expanded schedule, standards of radio frequency, seconds intervals, and the American standard of musical pitch. The last, a tone of 440 cycles per second, was broadcast for 10 hours daily. In addition, various highly accurate standard frequencies between 1 and 100,000 cycles per second were made continuously available, principally within the Bureau, by wire line.

As a result of the Bureau's research on radio wave transmission, means were developed for determining long-distance transmission conditions from ionosphere data, and vice versa (RP1096). The radio effects of three types of irregularities in the ionosphere were segregated, permitting better control of long-distance operations during periods of bad transmission. The Bureau furnished ionosphere data to the public regularly by weekly radio broadcasts and monthly publication. Extensive use was made of these data in preparing proposals for the Inter-American Radio Conference held in Habana in 1937 and the International Conference in Cairo in 1938.

The radio meteorograph developed by the Bureau for the Navy was brought to a practical operating stage, and was adopted for use by that Department and by the Weather Bureau (RP1082 and RP1102). It gives continuous radio transmission of data on temperature, pressure, humidity, and other elements as desired, from instruments carried by small unmanned balloons.

Storage-battery research.—Measurements of the solubility of lead sulphate in sulphuric-acid solutions have been made by a new method of titration, using a color indicator (diphenylthiocarbazone) in conjunction with a photronic cell. By this method amounts of lead as small as one millionth of a gram produce measurable effects. The newly determined values differ somewhat from those previously reported, and a maximum in the solubility curve is shown to occur at 0.1 normal acid concentration.

Experiments on various lead alloys as substitutes for the customary lead-antimony alloys have been continued. Cells containing no antimony are comparatively free from local action and show greatly reduced evolution of hydrogen, but have the disadvantages of corrosion of the positive grids and higher charging potentials. The lead-alloy problem remains one of the most important subjects in battery research.

Aviation lighting.—The program of tests and development of aeronautic lighting equipment, for the Bureau of Air Commerce, Department of Commerce, and the Bureau of Aeronautics, Navy Department, has included studies of position and landing lights and instrument lighting on airplanes; and beacon, approach, contact, flood, and boundary lights for airways and airports.

A special study has been made of silver-plated reflectors as used in position and landing lights. Lights using experimental reflectors plated with 0.0001 inch of silver applied over nickel plate 0.0001 inch thick were exposed to sea air and operated intermittently by a

flasher to simulate operating and corrosion conditions in service. After 8 months of such exposure the experimental reflectors are in good condition, whereas commercial silver-plated reflectors similarly exposed have begun to fail. The suitability of newly developed transparent lacquers for protecting silver-plated reflectors against corrosion by sea air is also being tested.

Corrosion of pipe lines.—As an outgrowth of earlier work on damage to pipe lines by stray electric currents, the Bureau has studied the corrosive effects of soils on metals buried underground. The results have shown that no material which it is practicable to use for pipe lines will resist corrosion in all soils, and that protective coatings are therefore essential in some cases (RP1058). An electrolytic test has been developed to determine in advance whether soils are sufficiently corrosive to justify the use of coatings on pipes laid in them. Indications given by this test agree reasonably well with actual experience on certain lines for which records of leaks and repairs have been kept.

A 3-day conference on underground corrosion was held at the Bureau in November, at which 82 papers were presented. These were received from seven countries besides the United States, and representatives of five of these countries attended the conference.

WEIGHTS AND MEASURES

Proposed legislation relating to weights and measures.—The bill introduced in Congress (H. R. 7869) to define certain units and to fix the standards of weights and measures of the United States has been superseded by H. R. 8974, which, in addition to the original provisions, contains an explicit definition of the inch in terms of cadmium light waves. The revised bill has the approval of standardizing bodies, engineering societies, weights and measures officials, and manufacturers concerned with precision length measurements in industry, especially those employed in interchangeable manufacture. It has since developed that very large numbers are sometimes involved in conversions from meters to feet in the Federal system of plane coordinates, and that a change as small as 1 part in 500,000 would lead to discrepancies. A further amendment has been proposed authorizing the continued use of the present constants in computing Federal and State systems of plane coordinates, elevations, and other map data.

Testing railway track scales.—Sixteen master track scale calibrations were made, one scale being calibrated twice. On 14 of these calibrations the scales were found not only to be within the maintenance tolerances, but to be within the adjustment tolerances as well. All scales were left weighing well within the adjustment tolerances, weighing errors in all cases being less than 0.01 percent.

The Bureau's three railway track scale testing equipments tested 1,160 commercial track scales, operating on the tracks of 104 railroads in 29 States. Of these scales, 592 were owned by railroads and the remaining 568 fell in the classification of industry-owned scales. The tolerance according to which railway track scales are classified as accurate or inaccurate is ± 0.20 percent of the applied load. Of all scales tested, 940, or 81 percent, were found to be weighing within

this tolerance. The corresponding percentage for the preceding fiscal year was 75.3 percent.

Testing vehicle scales.—In continuation of the project, inaugurated in 1936, of testing vehicle scales in cooperation with State and local weights and measures officials, the Bureau tested 652 motor-truck and wagon scales. The large majority of these scales were owned by companies or individuals engaged in retail business; the remainder were owned by Federal, State, or local governmental agencies.

This testing project contemplates the examination, in each State where a testing program is undertaken, of a representative number of scales, so that the results of the tests may be indicative of the conditions prevailing generally throughout the State. Such programs were completed during the year in Delaware, Rhode Island, Maine, New Hampshire, Vermont, New York, Alabama, Louisiana, Mississippi, Tennessee, and West Virginia.

Vehicle scales are classified as accurate or inaccurate upon the basis of a tolerance which, in general, may be stated as ± 0.2 percent of the standard-weight loads applied. One hundred and forty-six scales, or only 22.4 percent of those tested, gave accurate weights within this tolerance; the remaining 77.6 percent of the scales tested were inaccurate, in extreme cases being in error by as much as 100 pounds in a ton.

Test and certification of apparatus.—In addition to the extensive field work in the testing of railway track scales and vehicle scales already mentioned, this Division devotes a large part of its time to the testing and certification of many types of weighing and measuring apparatus, such as line standards of length, geodetic tapes, haemacytometer chambers, sieves, graduated circles, analytical weights and balances, watches, clocks, glass volumetric apparatus, hydrometers, metal capacity measures, gas meters, screw threads, precision gage blocks, and limit gages. This work has, in most cases, increased materially during the past year. The number of pieces of glass volumetric apparatus tested, 16,452, was 31.2 percent greater than for the preceding year, and 10.5 percent greater than for any other year in the history of the Bureau.

Parking meters.—At the request of the Department of Vehicles and Traffic, District of Columbia, the Bureau tested a representative group of parking meters and assisted in drawing up specifications to be used in purchasing 310 meters for experimental use in Washington.

Research on flow nozzles.—As part of the cooperative research on flow nozzles, sponsored by the American Society of Mechanical Engineers' Special Committee on Fluid Meters, data have been secured on 108 nozzles, with pipe sizes ranging from 2 to 24 inches, and with water, oil, steam, and air as test fluids. A preliminary paper was published in the Transactions of the ASME for April 1938.

Dental research.—Researches in cooperation with the Research Commission and the American Dental Association on the composition and physical properties of dental materials have covered tooth pastes, impression materials, silicate cements, synthetic dental resins, model plastics, and the testing of dental materials for compliance with ADA and Federal specifications.

Identification.—The identification of signatures and other work on documents have been heavier than in any previous year. About 75 cases have been handled, most of them at the request of the Interior, Treasury, or Post Office Departments. Testimony presented by the Bureau's expert has saved the Government large sums of money, and has served the ends of justice in other ways.

HEAT AND POWER

Heats of combustion.—An exact knowledge of the heats of combustion of the various forms of carbon is important in thermochemical problems. As published data in this field were not sufficiently accurate to meet modern requirements, new determinations have been made of the heats of combustion of carbon in the form of graphite and diamond. One sample of artificial graphite, two samples of natural graphite, and two samples of diamond, all carefully purified for the purpose, were used. The data obtained are believed to represent a substantial contribution to our knowledge of the thermochemistry of carbon. A paper on the heat of combustion of isoprene (RP1093) and another on apparatus and methods of determining thermal properties of petroleum products have been published.

Low temperature measurement.—The establishment of a scale of temperatures between −190 and −262° C. to serve as a basis for the calibration of thermometers in this range of temperatures is nearly completed. Already requests have been received for such calibrations, and thermocouples are being accepted for test.

Standardization of base metal thermocouples.—The most important and widely used device for the industrial measurement of temperatures beyond the range of mercurial thermometers is the thermocouple. During the past year standard curves were determined for base metal thermocouples (iron-constantan and copper-constantan) (RP1080). Standard curves have now been published for all principal types of thermocouples, those previously determined for chromelalumel (RP767) and for platinum-rhodium (RP530) being now in general use.

Fire-resistance tests.—Materials and devices in considerable variety were tested for other Government services. These include flammability tests of deck and floor coverings, roofing materials, materials for ship bulkheads, insulated electrical conductors, treated canvas, insulating and acoustical materials, fire retardant surface coatings for wood (RP1076), and various materials subject to ignition from impacts or spontaneous heating. Tests and examinations were made of fire detecting and automatic extinguishing equipments, some of them representative of existing installations on ships. Fire-resistance tests were conducted of floor and column constructions.

Primary standards for knock testing.—Specifications for normal heptane and iso-octane have been developed by the Bureau, approved by the Cooperative Fuel Research Committee, and adopted by the American Society for Testing Materials. A report was published on paraffin hydrocarbons isolated from crude synthetic iso-octane (RP1027), and further work is to be done on the impurities in synthetic heptane.

Ignition investigations.—A report was published on the electrical character of the spark discharge in automotive ignition systems (RP1032). Development work in progress for the Navy Department embraces spark plugs, magnetos, cable, and other components of the aircraft engine ignition system. Routine temperature surveys have been made in flight on all types of aircraft to guard against overheating of engines and their accessories.

Lubrication of aviation engines.—Supplementing current work on improved lubricating oils for high output aviation engines, inspection forms have been compiled to be used by the Bureau and the industry in recording qualitatively, at the time of overhaul, the condition of all parts of aviation engines affected by lubricating oil characteristics. Thus, comparable records of engine condition will be maintained, and it will be possible for the first time to make a systematic comparison of the performance characteristics of aviation lubricating oils in service. An inspection committee of the Society of Automotive Engineers is making a series of cooperative aviation engine inspections as a basis for standardizing the forms and to further their use by the industry and by airplane operators.

OPTICS

Optical rotations of the sugars.—In aqueous solution the various sugars rotate the "plane of polarization" of light by characteristic amounts, and this rotation is employed for the chemical analysis of sugar products. The purity of a sugar can be tested with high accuracy by measuring its "optical rotation"; consequently, the Bureau obtains optical rotatory data on the sugars, the information being also valuable for research on the creation of new substances.

The reducing sugars exist in several modifications, or molecular forms, which, being mutually interconvertible in water solution, tend to establish there an equilibrium concentration. Since each modification has its own characteristic optical rotation independent of the others present, the measured rotation is the sum of that of each component acting alone. This change in optical rotation, called mutarotation, furnishes a simple and potent means for following quantitatively the interconversion as it progresses. By studying the mutarotations of the various sugars the Bureau has found that two fundamentally different reactions take place: One, known for a long time, is the interconversion of the alpha and beta normal sugars; and the other a change from one ring modification of the molecule to another. The mutarotations of certain sugars, for example, galactose, reveal the presence of both reactions; the mutarotation of glucose is caused by the interconversion of the alpha and beta six-membered ring forms; while the mutarotation of levulose is caused by a shift from the six-membered ring form of molecule to a five-membered form. The presence of a large proportion of the five-membered modification accounts for many of the distinctive properties of levulose, the sweetest of all sugars. During the past year, two new crystalline sugars, alpha-delta-beta mannoheptose and beta-delta-alpha guloheptose were prepared (RP1052 and RP1069); and copper reduction and bromine oxidation measurements were made on 10 rare sugars.

Railroad signal glasses.—Continuing its cooperation with the Association of American Railroads, signal section, and with Corning Glass

Works, the Bureau has assisted in formulating the colorimetric parts of Association of American Railroads signal section specification 59–38 for hand-lantern globes, and in the revision of specification 69–35 (now 69–38) for other signal glasses. A majority of the glasses examined for conformity to the colorimetric requirements of 59–38, were acceptable as limits and can be issued to manufacturers, with certificates to serve as standards in the manufacture of hand-lantern globes.

Standardization of color names.—In cooperation with the American Pharmaceutical Association, the United States Pharmacopoeial Revision Committee, and the Inter-Society Color Council, a system of deriving color names has been worked out on a logical scientific basis. The 320 names are made up of common color terms and are easily understood. The definition of the group of colors to be known by each name is on a fundamental basis which makes it possible for color designation by this system to have a legal meaning.

Airplane mapping.—Equations have been derived giving the relation between errors of calibration of an airplane mapping camera and the consequent errors in the resulting map produced by photogrammetric methods. This will serve as a basis for the preparation of specifications to govern the certification of precision mapping cameras and will undoubtedly stimulate the production of better instruments.

Index of refraction of distilled water.—For accurate testing of refractometric instruments, refractive-index measurements of distilled water have been made and analyzed by representing them as a function of temperature and wave length; and comprehensive tables, with no indication of accidental or systematic error in excess of one or two parts per million, were published (RP1085) for temperatures from 0° to 60° C. and for wave lengths from 4,000 to 7,250 angstroms.

Standard wave lengths.—Precise standards of wave length being greatly needed in the ultraviolet, all of the ultraviolet lines of neon, argon, and krypton, intense enough to observe with interferometers were measured relative to the adopted standards. Tested by means of the combination principle, the average error in the relative value of these results appears to be 1 part in 20 millions.

Atomic emission spectra.—New descriptions of arc and spark spectra characteristic of two rare earths, ytterbium and lutecium, were published (RP1053 and RP1071), and the completion of a new description of the silicon arc spectrum (RP1124) permitted correction and extension of its structural analysis, as well as explanation of many heretofore unidentified lines in the solar spectrum.

Ultraviolet measurements in the stratosphere.—Signals giving ultraviolet intensities in the stratosphere were transmitted to a fixed ground station by radio from apparatus carried by unmanned balloons. This apparatus consisted of a cadmium photoelectric cell and filter radiometer, a barograph, and a radio transmitting apparatus, all operated on dry cells. Data were obtained to a height of 19 kilometers (12 miles), at which height the results indicated that an appreciable portion of the ozone layer had been penetrated (RP1075).

Radioactive materials.—A new set of microgram radium standards has been prepared, ranging from 1 to 50 micrograms of radium.

These have been checked at the Massachusetts Institute of Technology and found to agree with their preparations to within 1.5 percent; 1,630 radioactive preparations, having a radium content of approximately 10,000 milligrams, were certified; and 15 samples of luminous material were tested for brightness. Cosmic ray intensities were measured by radio equipment carried by balloons to a new high altitude of approximately 110,000 feet.

X-rays.—High voltage equipment has been built and an X-ray standard developed for measuring X-ray dosage for excitation voltages up to and above 400,000. The X-ray protective properties of concrete have also been investigated.

Micro-hardness instrument.—An instrument based on the indentation produced by a diamond ground in the form of an elongated pyramid has been developed primarily for making quantitative measurements of the relative hardness of brittle materials, such as glasses and enamels, crystals, thin platings, and the crystalline structure of metals. It has been used to study the effect of varying the form of the indentor, the plastic and elastic movement of the material, the load, and time of application of the load. The results were also correlated with those obtained with the ball, cone, and square pyramid indentors which are in general use.

CHEMISTRY

Physical constants of pure substances.—In a recent report the Bureau recommends the use of water as a primary reference standard for comparative determinations of boiling points, vapor pressures, rates of change of vapor pressure with temperature, and densities of liquid substances (RP1088). The boiling points and vapor pressures of specially purified benzene, ethylene chloride, *n*-heptane, and 2, 2, 4-trimethylpentane have been measured precisely over the pressure range 660 to 860 mm of mercury, and the results expressed in the form of equations suitable for use in calculations (RP1097).

An investigation of the composition of the troposphere with respect to meteorological conditions was initiated. This study should contribute to theories of diffusion in the stratosphere, and to the mass movement of upper air currents upon which weather predictions are based. It should also define the degree of constancy of air as a standard reference gas in physical measurements.

Information on the behavior of iridium when subjected to various treatments has been secured. It is hoped that this work will lead to a satisfactory procedure for the preparation of this metal in a state sufficiently pure to permit a determination of its physical constants. So far iridium has proved to be the most difficult to refine of all the metals of the platinum group.

The study of the structure of rubber was continued. The polarizing microscope showed that four other species behave like Hevea rubber on freezing and melting. X-ray patterns, made at the University of Illinois, of stretched sol and gel Manihot rubber, resemble those of Hevea rubber.

The development of a suitable technic for the precise determination of the freezing range of nearly pure substances has been nearly completed. In this connection benzoic acid of extraordinarily high purity

has been prepared by several methods, including fractional sublimation, fractional freezing, and crystallization from benzene and from water. The comparative purity of the products was determined from their freezing ranges.

The general details of a new accurate method for determining the optical properties of crystalline particles were worked out.

Thermochemistry.—The heat of combustion of tetramethylmethane, the most symmetrical isomer of pentane, was measured, and its energy of isomerization into normal pentane was calculated.

The existing data on the heats of formation of the simple organic compounds were reviewed to ascertain which of these compounds is in most urgent need of investigation.

Constitution of petroleum.—Work on the chemical constitution of petroleum, in cooperation with the American Petroleum Institute, led to the following results: The fractionation, by distillation and extraction, of the "extract" portion of the "lubricant" fraction from a midcontinent petroleum and the hydrogenation of certain of these fractions; the assembly of a continuous high-vacuum still and of a boiling-point apparatus for low pressures; the separation, by distillation with acetic acid, of the aromatic hydrocarbons, as a group, from the paraffin and naphthene hydrocarbons in the petroleum distillate of the boiling range, 154° to 162° C.

Methods of analysis.—New and improved methods of chemical analyses were published on: The use of arsenious oxide for standardizing permanganate solutions (RP1057); analysis of phosphate rock (RP1095); determination of arsenic, antimony, and tin in lead-, tin-, and copper-base alloys (RP1116); improved method for the determination of aluminum in nonferrous alloys (RP1117); and preparation of ammonium aurintricarboxylate (RP1118).

Work on the analytical chemistry of the platinum metals led to the completion of a new procedure for the analysis of dental gold alloys (RP1103), which is also adaptable to the refining of gold and to reclaiming gold and platinum metals from alloys of these metals. Progress has been made in devising methods of separation from the platinum metals of base metals other than those encountered in dental gold alloys.

Four methods of gas analysis were developed or investigated: (1) A new method for the analysis of the mixture ethylene oxide + carbon dioxide has been developed. The mixture is widely used as a fumigant, and no satisfactory method of analysis has previously existed (RP in preparation); (2) the determination of oxygen by chromous solutions was reported (RP1112); (3) the solubility relationships existing between nitrogen and various aqueous reagents were reported (RP1113); and (4) the limiting accuracy of the determination of carbon monoxide by iodine pentoxide was measured.

Electroplating.—The magnetic method and instrument for measuring the thickness of nickel coatings on nonmagnetic base metals have been adapted (RP1081) to measurement of the thickness of coatings on steel and cast iron. The coatings may consist of nonmagnetic metals such as copper, zinc, or chromium; magnetic metals such as nickel; or nonmetallic materials such as paint and enamel. As the method is nondestructive, it may be applied to all, or to a large

proportion, of manufactured products, and thereby assure conformity with appropriate specifications.

Special investigations.—The most dependable type of pilot for use in lighthouse and airway beacons was determined, and specifications for a satisfactory aircraft welding torch were developed.

Work on airship fabrics included a critical study of the properties of synthetic rubberlike materials, physical tests of fabrics for a nonrigid ship, and assistance in the revision of specifications for coated fabrics.

The durabilities of filled and unfilled coating asphalts were determined in both outdoor and accelerated exposures. The data demonstrate the similarity of effects obtained in the two types of exposure, and show that, in general, the resistance of coated asphalt to weathering is improved by the addition of mineral filler, and that there is a difference in the effectiveness of various sizes and types of fillers.

Standard samples.—During the year the Bureau prepared renewal samples of Tennessee phosphate rock and acid potassium phthalate and added eight new standard samples to its stock. These comprised three samples of spelter, two of chromium-nickel stainless steels, one high-silicon steel, one car-wheel cast iron, and one Florida pebble phosphate rock. Stocks are now on hand representing standard samples of 112 different kinds. Approximately 8,500 individual samples were sold during the year.

MECHANICS AND SOUND

Cross connections in plumbing systems.—For several decades, cross connections in plumbing systems (connections between piping carrying polluted water and the piping carrying water for human consumption) and their menace to health, have been subjects of active interest to engineering, public health, and trade organizations. The most publicized epidemic attributed to cross connections was the outbreak of amoebic dysentery in a hotel during the World's Fair in Chicago in 1933. In spite of much study of the problem by numerous agencies, no generally satisfactory conclusions as to the extent to which cross connections may be a menace to health, or as to practical regulatory measures for controlling this condition have yet been reached.

No complete and satisfactory solution of the problem can be expected from the work of a single agency or individual. Since any legal regulations will affect many different groups—property owners, public officials, architects, sanitary engineers, manufacturers, contractors, workmen, and the general public—these groups should have a voice in the formulation of the regulations. There is, however, an underlying basis of technical fact, on which general agreement should be possible. The Bureau has been engaged in a study of the technical aspects of the subject and has published an extensive progress report (RP1086).

Monocoque structures for aircraft.—In cooperation with the National Advisory Committee for Aeronautics and the Bureau of Aeronautics of the Navy Department, experimental studies have been made of the strength and deformation of important elements of monocoque or stiffened skin structures used in all modern aircraft.

Reports have been completed on the column strength of a stiffener of symmetrical section, giving sufficient information for the analysis of panels stiffened with stringers of this type, and on the strength and deformation of sheet-stringer panels of typical design loaded in end compression. The results on the sheet-stringer panels were compared in detail with a number of current theories. An extended study of a typical monocoque box beam is scheduled during the coming year.

Numerous other projects relating to monocoque structures are under way, including tests of riveted joints in thin sheet material, and tests on sheet stringer panels to determine the effect of spacing of rivets and spot welds on the compressive strength.

Engineering mechanics.—Numerous tests were made for other Federal bureaus, including those made for the Bureau of Marine Inspection and Navigation in connection with the qualification of welding operators, and tests of 10 full-sized riveted joints for naval vessels made in cooperation with the Navy Department.

Engineering instruments and appliances.—The number of engineering instruments calibrated during the fiscal year was about 1,500. 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; numbering machines, door closers, 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.

Aircraft instruments.—Development of new instruments was continued for the Bureau of Aeronautics, Navy Department, including superheat meters, a stick force indicator, and a distant indicating fuel flow meter. Assistance was given in preparing specifications, in developing test methods, and in making acceptance tests.

In cooperation with the National Advisory Committee for Aeronautics, investigations of the effect of vibration on aircraft instruments and of the performance of corrugated diaphragms have been continued. A report on gyroscopic instruments for instrument flying was submitted for publication.

Acoustics.—Measurements of sound absorption have been made on 57 large and 80 small samples, and measurements of sound transmission have been made for 29 panels, indicating the continued interest in noise reduction. Equipment for absolute sound measurements was completed and several calibrations have been made of microphones and sound meters.

Hydraulics.—Ten main investigations have been continued for the United States Geological Survey, the Corps of Engineers of the United States Army, the Office of Indian Affairs, the United States Forest Service, the Procurement Division of the Treasury, and the United States Weather Bureau. These include two model tests of flood spillways for dams, pressure losses in pipe bends, aging of pipes, density currents, flow in open channels, and theory of flood waves.

ORGANIC AND FIBROUS MATERIALS

Physical constants of rubber.—Reports on the physical constants of rubber prepared for publication in a technical encyclopedia and for presentation at the World Conference on Rubber Technology included values for mechanical, thermal, optical, and electrical constants. These show many gaps in our present knowledge, and many places where constants should be redetermined to bring them into line with today's requirements as to precision.

An investigation, by photoelastic methods, of the stresses around a circular inclusion in rubber (RP1083) was designed as the fundamental basis for a study of the behavior of filler particles in rubber compounds. Incidentally, it demonstrated the usefulness of the photoelastic method for studying the behavior of rubber under strain, and also the value of rubber as a material for making models of engineering structures.

Measurements were completed during the year on the heat capacity and heat of combustion of isoprene (RP1093). From these the free energy was computed, which can now be used for further study of the reversible relationship between isoprene and rubber. This reaction is thought to be the basis for the formation of rubber in nature.

Wear of carpets.—The machine for testing the resistance to wear of carpets and rugs, developed by the Bureau, has been generally accepted by manufacturers for mill control and research. Before it can be made a basis for the purchase of carpets, the variables of the machine test must be standardized and the wear of carpets on the machine must be compared with their wear in service. This work has been started.

Twenty-five different kinds of carpets have been laid in one strip in a hall in the Federal Warehouse where, according to a photoelectric counter, more than 2,000 persons walk over them daily. The carpets are cleaned at 24-hour intervals, and the rate of wear determined from thickness measurements made every few days. The results to date indicate good agreement between the service and machine wear tests.

A systematic study of machine variables has revealed that the amount of suction applied by the vacuum cleaner which is used to keep the carpets clean during the machine test, and the height of its suction nozzle above the carpet, have an important bearing on the results. This investigation has led to the adoption of optimum values and tolerances for strength of suction and nozzle height. The data also have a bearing on the effective vacuum cleaning of carpets.

Nine chenille carpets of different pile heights and densities have been tested on the machine and the effects of these factors on rate of wear have been measured. Similar tests are in progress on hard-twisted velvets, regular velvet, printed velvet, Axminster, and Wilton carpets. In these carpets, which were specially woven for the tests, each construction factor has been varied systematically.

Examples of the year's work in other lines.—Of the 48 items covered by reports issued during the year, the following have been selected as typical: Accelerated aging tests for organic materials; electrical properties of rubber; methods for testing color fastness of dyed textiles; evaluation of motion-picture film for permanent records (M158); method for determining the abrasive resistance of sole leather; hysteresis of calomel half cells (RP1018); permeability of synthetic resin aircraft finishes to moisture.

METALLURGY

Industrial uses for silver.—In cooperation with the American Silver Producers, new industrial uses for silver are being studied. Promising results obtained in preliminary surveys resulted in the establishment of fellowships at a number of universities, the Bureau acting as the supervisor and clearing house. On completing this initial study, a research program embodying specific items was mapped out, and a large part of the work is being conducted at the Bureau. Promising items which are being studied are: Silver electrical contacts, as for telephony; silver bearings; silver coatings for containers used in chemical processes and for the preservation of food; and the improvement of various industrial alloys by silver additions. The use of silver in fungicides and bactericides also presents interesting possibilities (TNB244, TNB249, and TNB254).

Nonferrous metals.—In cooperation with the Non-Ferrous Ingot Metal Institute, the study of nonferrous alloys of the red brass type has been continued, giving special attention to the effect of impurities normally occurring. The object is to establish reasonable maximum values in specifications. The incidental information obtained on the foundry characteristics of the alloy is also of importance.

The Copper and Brass Research Association and the American Standards Association have continued the study of soldered plumbing fittings at the Bureau. The relation between service temperature and maximum permissible shear stress on the soldered area for stability under long-time tensile loading has been established up to 325° F., and the advantages and limitations of various kinds of solders determined. As part of a series of long-time weather-exposure tests of wire and agricultural wire products sponsored by the American Society for Testing Materials, the initial characteristics of the wire and the coatings were determined. Tests will be repeated periodically as weathering of exposed samples proceeds.

Ferrous metals.—Of outstanding interest is the culmination of several years' work on the production of *pure* iron. Spectrographic examination of three of the finished ingots has shown traces of copper of the order of 0.0005 percent. This is the only metallic impurity. The fusion-in-vacuo method for determining oxygen in steel has been extended to the field of alloy steels, where it has been found to yield accurate results. Widespread interest in hydrogen in steel, and its possible association with serious internal defects, known as flakes, has prompted a critical study of methods for its determination. Cast iron is ordinarily thought of as possessing no elasticity, but in some of the new irons this is far from true. This subject, and the effects of superheating and pouring temperature, are covered in a report which will soon be published. In the physical metallurgy of steel, the determination of the effect of grain size is of great importance industrially. The current study of the quality of tool steels covers one aspect of the subject. A new investigation is under way to show whether "critical point" reactions, the basis of heat treatment, are influenced by inherent grain size.

Aircraft materials.—The needs of various Federal agencies interested in aircraft are reflected in the study of these materials. Numerous examinations of suspected materials have been made, considerable investigation often being entailed. Weathering tests of

aluminum and magnesium sheet alloys, exposed in marine and inland locations, have now been in progress for 5 years, and have furnished a dependable basis for the selection of these alloys. They have also shown that protective methods for the magnesium alloys are now available which ensure permanence for several years even under severe marine atmospheric exposure. Additional investigations, in which stainless steel sheet has been included, involve repeated wetting by sea water. The properties of welded steels at low temperatures are being studied, as well as grain-refining treatments to improve the normally low impact-resistance of steels under such conditions. Attempts to reveal any deleterious effect on propeller materials, of continued fatigue-stressing (short of failure), have failed to develop evidence of lowered mechanical properties. Aluminum alloys owe their superior mechanical properties to heat treatment, and if not properly carried out, the material may be susceptible to intercrystalline corrosion, with accompanying reduced ductility. A rapid method for detecting this condition shows considerable promise.

Special properties of metals.—Typical of the study of the ultimate structure of metals is the investigation of the "fiber" structure of copper, swaged cold from single crystals. Data secured support the little-known fact that orientation of the crystal fragments is directly related to the initial crystalline orientation of the specimen. Study of the fundamental factors in the creep of metals, a subject of vital interest in boilers, turbines, etc., has been revived; tests are about to begin with the newly constructed equipment. A monograph on spring materials, the subject of extensive library research, will be published in book form with the cooperation of the American Society of Mechanical Engineers.

CLAY AND SILICATE PRODUCTS

Optical and other glasses.—The new type of pot developed last year for the experimental melting of optical glass resulted in a 30-percent increase in the amount of first-quality optical glass obtained. Sixty-two melts of four different kinds of glass gave a total yield of 8,400 pounds, whereas last year 73 melts of the same kinds of glass yielded 7,530 pounds.

Studies of the relative solubility of glass indicate that this may be determined by noting the amount of certain dyes absorbed on the surface of the glass after it has been exposed to hot, dilute acid solutions. This test is of practical interest because many solutions of pharmaceuticals, chemicals, etc., deteriorate rapidly or are spoiled by storing them in glass which is too soluble.

Out of 19 types of automobile safety glass tested, 11 were found to comply with the requirements of a large number of States. Reports were made to the interested regulatory authorities. Tests to determine the characteristics of a satisfactory type of safety glass for aircraft are under way.

Electrically heated tunnel kiln.—An electrically heated tunnel kiln 45 feet in length and 6 feet high has been constructed, and its suitability for experimental heating of whiteware bisque and glost at various rates and temperatures has been demonstrated.

Ceramics.—An apparatus and test method for determining the resistance of vitreous enameled articles to abrasion have been developed, and the abrasion resistance of typical enamels has been determined. Equipment has been designed and built for measuring the impact resistance of various sizes and shapes of vitreous enameled articles in different controlled locations on their surfaces. A study of the thermal expansion and refractoriness of typical enamels was completed.

An investigation of low-cost glazes was undertaken to demonstrate how these can be produced for brick, tile, and other clay products. The principal ingredient of the glaze is the same clay as that of the product to which it is applied. Eight clays from three different States are being investigated. Glazes of good mat texture have been produced from three of the clays containing approximately 25 percent lime carbonate as the flux. Replacing about half the lime with silica gives a gloss glaze.

The expansion, contraction, endothermic, and exothermic changes were determined over the range 20° to 1,000° C. of eight flint clays, representing deposits all over the United States, one plastic fire clay, one each of Georgia hard and soft kaolins, one bauxitic kaolin, and a diaspore. Significant differences in the magnitude of these properties were found, not only between the same type of material but also between coarse particles and the same material finely pulverized and repressed.

Among other ceramic studies in progress are special low-temperature maturing glazes; the system PbO–B_2O_3–SiO_2; a cooperative study of fire-clay ladle sleeves (RP1084); a study of pore structure of building brick (TNB250); relation between water content and yield point pressure of plastic clay; glassy phase in clay materials; substitution of American for English china clays in whiteware bodies; causes of failure of boiler furnace refractories.

Cement, lime, and gypsum.—An electrical differentiating unit was developed for use with a vibrograph to measure vibration in fresh concrete in terms of acceleration as well as of particle velocity and amplitude (RP1101). Observed acceleration wave forms were found in most cases to be very complex. Preliminary work has been directed toward developing tests and equipment for evaluating the various factors contributing to the disintegration of concrete by freezing and thawing. Wear tests have been made of concrete floor mixes in which the water content, richness in cement, methods of troweling, and curing were varied. In some of the mixes metallic hardeners and other dust coats were used. Studies were made of test mortars compacted by vibration, using a specially designed machine in which the vibration characteristics could be varied. Thirty-five commercial portland cements were subjected to a recently proposed autoclave test. Concrete specimens made from these cements have been stored out of doors. Length changes and weathering characteristics are being compared with the autoclave results.

It has been found that the glass content of cement clinker depends on the composition of the clinker and on cooling conditions, rapidly cooled clinker having the highest glass content. The glass content of the clinker affects the properties of the cement; cements of high glass content give somewhat higher heats of hydration at 7 and 28

days and lower expansion when subjected to a high-pressure steam test (RP1066). The solid solution of ferric oxide and other mineral oxides in dicalcium silicate, one of the principal constituents of portland cement, is being investigated.

A study of the suitability of fiber insulating lath as a base for plaster was completed. As a result of experiments in which the sand content, strength, thickness, and time of set of plasters were varied independently, recommendations for plastering over insulating lath were formulated (BMS3).

Heats of hydration and transition of the various forms of calcium sulphite were determined from the heats of solution of gypsum, hemihydrate, natural anhydrite, and anhydrous calcium sulphate prepared at various temperatures (RP1107). From heats of solution in hydrochloric acid of lime and magnesia prepared at various temperatures and the heats of solution of calcium and magnesium hydroxides, the heats of hydration of lime and magnesia were determined. The plasticity of hydrated limes was found not to depend solely on either the particle size distribution or specific surface.

Branch laboratories.—Approximately the same amount of cement as last year—nearly 6,000,000 barrels—was tested for the Federal Government by the Bureau's branch laboratories at Seattle, Wash.; San Francisco and Riverside, Calif.; Denver, Colo.; and Allentown, Pa. The volume of cement testing at the Seattle laboratory for the Grand Coulee Dam is temporarily small, pending the starting of the high dam. The demands on the San Francisco laboratory for testing miscellaneous material purchased by Government agencies on the Pacific coast have been very heavy.

Cement Reference Laboratory.—The Cement Reference Laboratory, a cooperative project of the Bureau and the American Society for Testing Materials, completed the fifth inspection tour of cement-testing laboratories. As compared with previous tours, more laboratories were visited, and a larger number of the inspection reports were used by Government offices. A sample of cement for comparative test purposes was sent to 173 widely distributed cement laboratories. The tests of special cements, undertaken in the preceding year for the American Society for Testing Materials Committee C–1 on Cement, were completed.

Stone and masonry.—Further investigation of factors affecting rain penetration in masonry walls has confirmed the indications of previous tests. Resistance to rain penetration in walls of brick masonry depends largely upon the quality of workmanship and the absorptivity of the bricks when laid. If the absorptivity is reduced by wetting bricks before laying, the permeability of the walls is decreased. Permeability of walls retested after being exposed outdoors for 1 year has not increased; it decreased for those which had been repointed prior to exposure.

Measurements of the coefficient of thermal expansion of commercial grades of clay bricks between −10° and +40° C. (14° and 104° F.) yielded values between 3.0 and 8.5 millionths per degree centigrade; about 80 percent were between 5.0 and 7.0 millionths per degree centigrade. The coefficients were not closely related to other physical properties.

Some disintegration has taken place in the exposure panels of brick masonry erected in 1936, though the amount of disintegration is less than that for similar bricks partially embedded in the soil. A fair correlation exists between the indications of laboratory freezing and thawing tests and the effects of outdoor weathering. The severity of freezing and thawing tests is increased if the bricks are completely saturated at the time of freezing. The results of the 5-day wick test on individual bricks gave a good indication of their tendency to become sources of efflorescence on the exposed masonry panels.

The resistance of sand-lime bricks to freezing and thawing was found to be closely related to their strength.

Durability of stone.—Information has been obtained which indicates that the dense types of stone are not appreciably affected by frost; hence, studies have been made of the effects of other weathering agents on marble and granite. A test procedure with sulphur dioxide gas has been developed which causes deterioration of marble. Its characteristics are then very similar to those of marble found on old buildings and monuments. It has also been found that granite undergoes some change when tested by soaking in water followed by drying. Forty-four samples have been subjected to a large number of cycles, in which a few developed visible cracks, while determinations of absorption and water transmission rates have shown that nearly all samples suffered some deterioration.

SIMPLIFIED PRACTICE

Two things particularly characterize the Division's work this year: First, an increased percentage of established Simplified Practice Recommendations were reaffirmed rather than changed, denoting the thoroughness which attended their original development, and indicating a continuing satisfactory adherence to them by manufacturers, distributors, and consumers alike; and second, the pronounced interest in the general subject of containers, especially from the viewpoint of consumers.

Twenty-nine recommendations were surveyed and officially reaffirmed. Two of these, R37, Invoice, Purchase Order, and Inquiry Forms, and R50, Bank Checks, Notes, Drafts, etc., have enjoyed such long periods of use and general acceptance that they have become traditional.

Two new recommendations in the field of containers, were promulgated: R170, Spice Containers, and R171, Wooden Boxes for Canned Fruits and Vegetables, and work on a number of others was commenced. Also, a second revision of an existing recommendation, R155, Cans for Fruits and Vegetables, was undertaken, in cooperation with the industry, as a direct consequence of a hearing before the Committee on Coinage, Weights, and Measures of the House of Representatives, on H. R. 6964, a bill to fix certain standards of dimension and capacity for metal containers for canned fruits, vegetables, and milk. The Division is collecting data which will facilitate further consideration of this proposal, to provide a sound basis for specific conclusions in respect to the practical minimum number of can sizes needed by the industry in packing food products. Simplification of these containers should not only reduce

their cost but should result in substantial savings in handling, storing, loading, and unloading.

Among the 14 new and revised Simplified Practice Recommendations made available during the year was the new R169–37, which establishes a simplified schedule of stock-production sizes for machine, carriage, and lag bolts. According to an estimate by the sponsor organization, the adoption of this recommendation will make possible a reduction in the variety of sizes, from 896 to 584, or 35 percent. So widespread has been the approval of this project, on the part of the industry, that more than 12,000 copies were sold in a few weeks. Incidentally, this recommendation illustrates the usefulness of simplified practice in a field where technical standardization of a high order has been in effect for a long time.

TRADE STANDARDS

This Division serves consumer, industry, and business groups that request aid in the establishment of quality standards (consumer criteria) as a guide to commercial production, testing, grading, labeling, marketing, certification, and acceptance of manufactured commodities, other than foods and drugs. Many industries are unable, within themselves, to combat effectively the influence of increasing competition and economic pressure toward lower quality without regard for the needs of the consumer or the reputation of the industry as a whole. As a result of such tendencies, consumers are demanding assurance of quality in commodities and reliable information relating to performance in actual use.

Seventy-three commercial standards have been issued to date. Fifteen of these were promulgated during the year, covering wool and part-wool fabrics, walnut veneers, wood-slat venetian blinds, old-growth Douglas-fir-stock doors, colors for kitchen and bathroom accessories, marking of platinum, marking of karat gold, liquid hypochlorite disinfectant, pine-oil disinfectant, coal-tar disinfectant, cresylic disinfectants, and household insecticides (liquid spray type). Revisions were issued for Stoddard solvent (CS3–38) and for fuel oils (CS12–38). An amendment to book cloths (CS57–36) was promulgated.

These standards increase the confidence of the consumer in the products, result in better understanding between buyer and seller, and provide uniform basis for competition. They are made effective by means of voluntary guaranties on invoices, labels, or marks on the goods themselves, which are enforcible through the courts and the Federal Trade Commission with the aid of better business bureaus, testing laboratories, and central inspection agencies.

During the year, 46 conferences were held with groups interested in the establishment of voluntary standards for a wide range of commodities. Written acceptances of these commercial standards as the standard practice in buying and selling the products covered were received from responsible officers of 5,530 organizations.

The Commercial Standard entitled, "Marking Articles Made of Karat Gold" (CS67–38), supplements the requirements of the National Stamping Act. The objectives of the standard are as follows: (1) To establish a minimum of 10 karat for gold articles bearing a quality mark; (2) to require that the quality mark shall be accom-

panied by a trade-mark registered under United States laws to fix responsibility; (3) to prohibit loading or weighting of gold articles bearing quality marks; (4) to prevent the misrepresentation of other precious metals as gold; and (5) to eliminate the term "solid gold" except as applied to fine gold.

The standard records definitions for the terms, "gold," "karat gold," "fine gold," and "solid gold"; and includes a recommended wording of a certificate or label to indicate that the article is marked in strict conformity to the Commercial Standard.

CODES AND SPECIFICATIONS

Building and safety codes.—In cooperation with the American Standards Association, drafts of codes were prepared covering requirements for code administration, lighting and ventilation of buildings, and construction requirements for structural steel. The building code program of the American Standards Association has also been expanded through assumption of responsibility for sectional committees dealing with the subjects of grandstands and of exits for buildings, on each of which the Bureau holds membership. The Bureau has also accepted direct sponsorship of a new sectional committee dealing with permissible loads on floors.

A new edition of the Code for Protection Against Lightning was issued as Handbook H21. A revision of the American Standard Safety Code for the Protection of the Head, Eyes, and Respiratory Organs was completed, and the text for a new handbook prepared. The Bureau cooperated in the preparation of a new edition of the American Standard Safety Code for Elevators, Dumbwaiters, and Escalators, and the companion volume, Inspectors' Manual for the Inspection of Elevators, both of which are published by the American Society of Mechanical Engineers. Work was started on emergency rules for elevator operators, and was continued on a Safety Code for Cranes, Derricks, and Hoists, and a revised list of definitions was circulated.

Hankbook H22 was released in March. This is a revised edition of the specifications, tolerances, and regulations for commercial weighing and measuring devices, as adopted by the National Conference on Weights and Measures, and recommended by the Bureau for adoption by the States.

Revision of the National Electrical Safety Code progressed satisfactorily and one part has been completed and prepared for printing. Cooperation with the International Electrotechnical Commission was continued with respect to regulations for overhead lines.

Assistance has been given to State officials in connection with regulations for electric line construction, electric fences, elevator codes, and other subjects. Elevators in Government buildings in Washington have been inspected and tested from the point of view of safety and to determine compliance with specifications. Committee work has been carried on for the Federal Interdepartmental Safety Council.

Facilitating the use of specifications.—The total number of lists of sources of supply of commodities covered by Federal specifications and commercial standards was increased to 614, with requests for

listings from 13,381 firms. Information relating to the certification plan and willing-to-certify lists, and copies of Federal specifications were sent in compliance with 1,851 requests from interested purchasing agents, consumers, and manufacturers.

Services to tax-supported agencies and consumers.—The Division has cooperated with members of the governmental purchasing group, educational and institutional buyers group, and the educational committee of the National Association of Purchasing Agents in the preparation of commodity data sheets, material relating to standards and specifications, and purchasing problems. Information dealing with commodity standardization was sent to State purchasing officials, to approximately 400 county and municipal purchasing agents, and to about 200 educational institutions. More than 9,000 copies of the pamphlet Services of the National Bureau of Standards to the Consumer were sent, upon specific request, to colleges, universities, schools, and individuals throughout the country.

In aiding consumers throughout the country, particularly over-the-counter buyers, impetus was given to the labeling plan for encouraging manufacturers to identify commodities complying with the requirements of nationally recognized standards and specifications.

BUILDING MATERIALS AND STRUCTURES

Structural properties of constructions.—The structural properties of about 40 constructions intended for low-cost housing have been determined in cooperation with organizations working in this field. Using special equipment designed to expedite the work, the constructions are subjected to loads simulating those occurring in a house, and the deflection under load, the permanent set, and the maximum load are being determined. The Forest Products Laboratory has cooperated in the testing of various types of wood construction.

Rain penetration in masonry and waterproofing.—The effects of the following factors on the resistance of masonry walls to rain penetration were studied: Qualities of masonry units and mortars, methods of filling joints, pargeting of facing or backing, and arrangement of units. Of the 135 walls constructed, 40 have been tested. In order to determine the effectiveness of waterproofings, some of the walls, which have been found to be highly permeable, will be treated with bituminous or mineral materials on the interior surfaces or will be given exterior coatings, the behavior of which will then be studied. As the permeability of masonry depends largely upon the quality of the joints, the tests of walls were supplemented by a study of factors affecting the strength of these.

Structural properties of masonry walls.—Six different masonry wall constructions, three of brick, two of structural clay tile, and one of concrete masonry units, were tested for resistance to compressive, transverse, impact, racking (shearing), and concentrated (indenting) loads. The results not only provide information on the relations between properties of the materials and the load resistance of the walls, but also, because of their known service record, they should afford a basis for judging the stability of new constructions.

Caulking compounds.—Chemical and physical studies have been made on 98 samples of proprietary compounds selected as representative of the types on the market. Results indicate that one of the

undesirable variations in these products is the subordination of performance factors to workability. Although the present performance tests are sufficiently reliable to eliminate materials of poor quality they do not give enough information on the specific properties which are necessary for good performance. Tests for shrinkage, bond, and hardening rate are being developed. Efforts are being made to devise a test for the hardening rate which will also afford information on certain performance qualities such as filming and freedom from staining or slumping. Another phase of this work is the study of experimental mixtures in order to determine the desirable or undesirable effects of specific ingredients. About 100 trial mixtures have been made, some of which have given excellent results.

Floor coverings.—An accelerated service test has been completed on 12 floor coverings, ranging from random length hardwood to printed felt-base coverings, using 11 commercial varieties of adhesives. The properties of the floor coverings have been determined by laboratory tests which show the amount of expansion and contraction when subjected to changes of humidity, and the amount of indentation and recovery under load. The force necessary to separate the adhesive from the floor covering and from the concrete subfloor has been measured. Other materials are now being tested. When completed, this work should indicate the relative suitability and durability of different types of floor covering for low-cost housing.

Building boards and papers.—The important physical properties of 18 kinds of boards and 14 kinds of building papers have been determined. The same materials are now being subjected to various kinds of accelerated aging tests, at the completion of which their physical properties will again be measured to show how much they may have deteriorated. Thus it is hoped to learn not only the properties of these boards and papers when new, but also how well they may be expected to retain their properties under normal service conditions.

Roofing materials.—A report of studies covering the durability of roofing materials in service, as carried out in Washington and its environments, and in a survey throughout the Southeastern States, is nearly ready for publication. Data on the uses, durability, and trends in construction of roofing materials have been secured through cooperation with Federal agencies interested in housing problems. Results of inspections of 3,500 Government buildings throughout the country will form the basis of a report which should show the favored materials for different climatic conditions.

Protection of steel against corrosion.—The increasing use of sheet steel or of structural units constructed therefrom emphasizes the need for adequate surface protection. In many cases, as in built-in parts, the initial treatment must ensure permanence over a long period. Three types of short-time tests, the weatherometer, the controlled condensation chamber, and the salt spray, are being used to study the relative merits of different preliminary surface treatments and of various paint coatings. A method to improve the adherence of coatings on galvanized metals is receiving special attention.

Fire-resistance tests.—A comprehensive series of fire tests of light building partitions, comprising 143 wood or metal framed constructions, was nearly completed. Fire resistance, as determined by the time of failure under load or occurrence of flame or unduly high temperatures on the side not exposed to fire, was found to be in the range

10 minutes to 2¾ hours, and to be more dependent on the kind of materials in the body or facings and the mode of application than on the thickness or weight of the construction.

The initial tests in a series of about 30 fire tests of clay hollow tile partitions have been made.

A program of fire tests of roofings, covering the full range from combustible to incombustible materials, was completed. The tests indicated the susceptibility of these materials to ignition from flying brands, the time taken for flame to spread over the surface, the liability of producing burning brands, and the protection afforded a supporting wood construction.

Study of humidity in occupied dwelling houses.—With the cooperation of about 30 colleges, temperature and humidity measurements were made in 235 dwelling houses during a portion of the winter season. Analysis of these data is nearly completed. It was found in general that inside water vapor pressures were about twice as great within the houses as outside, even in houses where no means for artificial humidification was provided.

Heat transfer.—Modern houses, even of low cost, must be safe, durable, and comfortable if people are to be induced to live in them. Insulation against both heat and cold has much to do with comfort. A great variety of insulating materials has come on the market in the last few years, the cheapness of which permits their use in low-cost houses. The insulating value, costs, and relative merits of these materials are being determined, and certain engineering questions concerning their use under different conditions are being answered.

Studies are in progress on heating devices and temperature control with a view to establishing acceptable standards of performance so that the purchaser may judge what he is getting for his money. This applies not only to furnaces and boilers but to radiators, convectors, and other means of distributing the heat.

Summer comfort is coming to be more and more in demand. Aside from the use of refrigerating systems, which can not as yet be rated as an element in low-cost housing, there are important means of improving present conditions. Better insulation of walls and ceilings is useful, but in addition to this, systems of practical ventilation, either natural or forced, properly timed to cool the house with the colder night air, may make many degrees difference in the indoors temperature in the heat of the day.

Direct radiation from the sun is another source of heat in the house. Means of reducing this effect in summer are being given careful study.

Commercial standards.—A commercial standard for Douglas fir stock doors (CS73–38) has been developed in cooperation with the industry. Proposed commercial standards have been drafted, after careful investigation, for double hung wood windows and hardwood wall panels. Tentative drafts of standards for flush doors, hardwood interior trim, the water resistance of plywood, and fiber sheathing board were prepared, following the usual conferences.

New series of publications.—The first of a new series of publications, entitled "Building Materials and Structures," describing the general objectives, procedure, and scope of the program relating to low-cost housing was distributed to a mailing list of interested agencies, firms, and individuals (BMS1.)

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., 1938, 1937, and 1936 appropriations

Appropriations	Total appropriations [1]	Disbursements	Liabilities	Balance
Operation and administration [2]	$272,016.50	$263,949.35	$6,042.15	[a]$2,025.00
Testing, inspection, and information service [3]	1,143,483.00	1,071,762.86	45,756.00	[b]25,964.14
Research and development [4]	712,206.04	683,128.45	18,078.59	[c]10,999.00
Standards for commerce [5]	111,750.97	106,128.24	2,508.32	[d]3,114.41
Investigation of building materials [6]	198,015.44	150,810.98	4,634.46	[e]42,570.00
Appropriations transferred from other departments:				
Aviation, Navy [7]	124,282.65	123,051.07	805.69	425.89
Construction and repair, Bureau of Construction and Repair	6,052.00	6,047.46		4.54
Engineering, Bureau of Engineering [8]	23,770.10	19,799.99	3,653.73	316.38
Naval Supply Account Fund	2,000.00	1,786.60		213.40
Salaries and expenses, Bureau of Engraving and Printing	11,300.00	10,754.93	148.30	396.77
Distinctive paper for U. S. securities	2,000.00	1,947.50	11.80	40.70
Advisory Committee for Aeronautics	66,871.00	65,465.34	1,323.61	82.05
Aircraft in commerce	5,500.00	2,989.96	1,754.95	755.09
Safety and planning	8,055.00	4,427.91	3,411.92	215.17
Establishment of air navigation facilities	8,500.00	7,561.27	691.37	247.36
Incidental expenses of Army	10,000.00	9,931.01	25.76	43.23
Salaries and expenses, Weather Bureau	3,000.00	2,275.48	692.84	31.68
Air Corps, Army	18,833.00	17,669.33	1,050.31	113.36
Naval Research Laboratory	1,000.00	875.00	51.44	73.56
Salaries and expenses, Soil Conservation Service	1,000.00	870.46	118.66	10.88
Conservation and use of agricultural land reserves	1,000.00	897.38	90.60	12.02
Appropriations transferred from other departments under the provision of the Legislative Act approved June 30, 1932:				
Working fund: Navy, Armor, Armament, and Ammunition	27,000.00	22,395.08	179.85	4,425.07
Working fund: Navy—Ordnance	21,000.00	20,821.53	125.82	52.65
Working fund: Treasury—Internal Revenue	6,000.00	5,947.88		52.12
Working fund: Aviation—Navy	2,000.00	1,828.80	135.35	35.85
Total, 1938	2,786,635.70	2,603,123.86	91,291.52	92,220.32
Total, 1937	2,589,122.27	2,555,947.20	4,719.39	28,455.68
Total, 1936	2,497,387.57	2,455,436.22	155.00	41,796.35

[1] Includes transfers from other departments and also reimbursements received and pending as shown under the following footnotes:

[2] $16.50.

[3] $306,483.

[4] $11,206.04.

[5] $1,750.97.

[6] $15.44.

[7] $339.65.

[8] $20.10.

[a]	Administrative reserve included	$1,500
[b]	Administrative reserve included	17,100
[c]	Administrative reserve included	10,500
[d]	Administrative reserve included	2,540
[e]	Administrative reserve included	42,000
		73,640

BUREAU OF FISHERIES

Based on available statistics for 1936, there was a large increase in the catch of fishery products in the United States and Alaska as compared with the preceding year. Statistics of the catch were collected for both 1935 and 1936 in the Chesapeake, Pacific, and Lake States and in Alaska, and when considering the combined catch of these sections alone, an increase of 22 percent in the volume and 19 percent in the value of the catch is indicated. While these increases are reflected in each of the four geographical sections and in many species, they are especially important in increased catches of pilchard in California and salmon in Alaska.

Based on the most recent surveys, our commercial fisheries gave employment to about 129,000 fishermen, whose catch amounted to 4,840,299,000 pounds, valued at $92,823,000. The output of canned fishery products in 1936 amounted to 794,707,000 pounds, valued at $94,564,000, representing an increase of 18 percent in volume and 26 percent in value as compared with 1935; the output of fishery byproducts was valued at $34,976,000, representing an increase of 17 percent; and the production of frozen fishery byproducts, excluding packaged fishery products, amounted to 106,680,000 pounds, estimated to be valued at $8,700,000.

The production of fresh and frozen packaged fish, as based on the most recent surveys, amounted to 202,396,000 pounds, valued at $26,895,000; and cured fish 116,311,000 pounds, valued at $15,616,000. It is estimated that about 680,000,000 pounds of fresh fishery products (excluding fresh-packaged fish and shellfish), valued at about $55,000,000, were marketed during 1936. The total marketed value to domestic primary handlers of all fishery products in 1936 is estimated at about $236,000,000.

Imports of fishery products for consumption during the calendar year 1936 were valued at $41,873,000, which is 16 percent more than in 1935, while exports were valued at $13,214,000, or 8 percent less than in the previous year.

INTERNATIONAL RELATIONS

HALIBUT INVESTIGATIONS

The International Fisheries Commission continued the investigation of the life history of the Pacific halibut, and the investigation and regulation of the Pacific halibut fishery, under authority of the treaty of May 9, 1930, and the supplanting treaty of January 29, 1937. The new treaty, which invested the Commission with new powers and responsibilities, did not become effective until August.

Under authority of the 1937 treaty, new regulations were issued August 11, 1937. These differed from the previous ones in several

respects. They provided for the prohibition of clearance for area 3, when the boats already cleared for fishing were sufficient to catch the limit allowed, and for the setting of a subsequent date of last fishing. They also provided for the retention and sale of a limited proportion of halibut caught incidentally to fishing for other species with set lines in areas closed to halibut fishing. Other changes affected the dates of beginning and termination of the winter closed season.

The Commission recorded the catch from each area, forecast and announced the date of attainment of each area limit and closed the areas accordingly. It issued new regulations on February 26, 1938, changing the regulations of August 1937 by increasing the catch limits in areas 2 and 3 one million pounds each and prohibiting the use of set nets for the capture of halibut.

The investigations necessary for the fulfillment of the purposes of the treaty included the collection and analysis of the current statistical and biological data, which are necessary for the evaluation of the success of regulation and for continued intelligent control of the fishery.

Further improvement in the condition of the stocks of halibut was revealed by the investigations. In area 3, which includes the grounds north and west of Cape Spencer, Alaska, the catch per unit of effort was 19 percent greater than in the previous year and 73 percent greater than in 1930, the year when the abundance of halibut reached its lowest ebb. The catch per unit in area 2, which includes the grounds between Cape Spencer and Willapa Harbor, Wash., was slightly greater than in 1936, and 74 percent greater than in 1930.

Extensive market measurements showed that the reduction in the rate of capture of the fish resulting from regulation had produced a further small increase in the size of the fish landed, which, in conjunction with the general increase in abundance, indicated an increase in the spawning stock on the grounds from the previous year. Analysis of the catches of spawn taken in area 2, by means of quantitative net hauls made from a chartered vessel in the winter of 1936–37, showed an increase over the previous three winters. The net hauls were repeated in the winter of 1937–38 and the results are in process of analysis.

Four publications were issued during the year, one report and three circulars. The report, "Theory of the effect of fishing on the stock of halibut," dealt with the theory that explains the past decline of the fishery and its gradual recovery as a result of present regulation. The circulars "Why are there separate areas?", "Halibut tagging experiments," and "The early life history of the halibut," explain in simple form the results of the investigations of the Commission and their bearing on the regulation of the fishery.

The investigations of the Commission continued to explain the changes taking place in the stocks of halibut on the banks. They prove that the condition of the stocks is still improving, as a result of regulation, and offer new assurance of the ultimate success of the Commission in rebuilding the stocks of halibut to a higher level of productiveness.

JAPANESE ACTIVITIES IN THE BRISTOL BAY FISHERIES

Special attention was given during the past year to Japanese fishing operations in Bristol Bay. A number of floating crab canneries and reduction plants have been operated annually in this area by the Japanese since 1930. Their recent activities in the salmon fishery, however, aroused widespread alarm among the Bristol Bay packers and American fishermen. Grave concern was felt lest the interception of the salmon runs bound for Alaskan streams should jeopardize and eventually destroy the long-established Bristol Bay salmon industry.

Following an extensive investigation, this problem was made the subject of diplomatic negotiations between the State Department and the Japanese Government. As a result, assurances were obtained from Japan that it would suspend its official survey of the salmon fishery in Bristol Bay and would issue no licenses to vessels to take salmon in those waters. Continued attention and careful consideration will be given this development to assure the perpetuation of this important American fishery. Funds have been appropriated by Congress for an extensive survey of the Bristol Bay salmon resources, and plans have been made to start the work in the 1938 season.

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

The American members of the International Pacific Salmon Fisheries Commission were appointed by President Roosevelt on August 24, 1937, pursuant to ratification on July 28, 1937, of a convention between the United States and Canada for the protection, preservation, and extension of the sockeye salmon fishery of the Fraser River system, tributary of the Puget Sound area of Washington and British Columbia. The American members of the Commission are: Charles E. Jackson, United States Deputy Commissioner of Fisheries; B. M. Brennan, Director of Fisheries of the State of Washington; and E. W. Allen, of Seattle, who is also a member of the International Halibut Commission. The Canadian members who have been appointed are: W. A. Found, Deputy Minister of Fisheries; Tom Reid, Member of Parliament from British Columbia; and A. L. Hager, of Vancouver, B. C.

A. L. Hager was elected chairman and B. M. Brennan secretary at the first meeting of the Commission, held in Vancouver, B. C., on October 28 and 29, 1937. It was agreed that the positions of chairman and secretary of the Commission would alternate between the United States and Canada every 2 years. Dr. W. F. Thompson, Director of Investigations for the International Fisheries Commission, was loaned to the International Pacific Salmon Fisheries Commission on a part-time basis to initiate the biological investigations.

Studies by the United States Bureau of Fisheries on the condition and trend of the fisheries were discontinued in February 1938, since the work will hereafter be carried on under the International Pacific Salmon Fisheries Commission.

CONSERVATION OF WHALES

An international conference held in London on June 8, 1937, resulted in the signing of an agreement with respect to whaling. This agree-

ment supplements the International Whaling Convention of September 24, 1931, and provides greater protection for whales. On June 14, 1938, a further conference was called for the purpose of studying the results of the 1937–38 whaling season, and to consider modification or extension of the 1937 agreement. The conference concluded its business on June 24 by signing an agreement affording still further protection to whales. The Senate has not consented as yet to the ratification of the agreement.

A report on whaling statistics, made by the Bureau of Fisheries in accordance with the requirement of the Convention, was published in the consolidated whaling report of the world, International Whaling Statistics XI, issued at Oslo, Norway, June 2, 1938.

NORTH AMERICAN COUNCIL ON FISHERY INVESTIGATIONS

The twenty-fourth meeting of this Council was held at Montreal, Canada, on September 23, 24, and 25, 1937, with representatives from Canada, Newfoundland, and the United States present. Reports were presented by investigators of the various countries setting forth progress made in the long-time investigations of cod, mackerel, and haddock. New research projects sponsored by the Council and reported on for the first time included a study of the migrations of Atlantic salmon, conducted on a cooperative basis by Newfoundland and Canada, and an extensive program of lobster studies in Canadian waters.

The question of an international treaty for the control of mesh size in nets used by Canadian and United States vessels engaged in the haddock fishery has been under discussion by the Council for several years. Although the voluntary adoption of larger meshed gear by the majority of the New England operators during 1937 has relieved the situation to some extent, the Council continues to recommend coordinated international action.

A discussion of hydrology in relation to fisheries investigations emphasized the fact that this subject may prove to be quite separate from the general problem of oceanic circulation with which the physical oceanographer is principally concerned. The Council directed attention to the fact that routine temperature observations have seldom been available from the fishing banks and recommended that the United States, Canada, and Newfoundland devise means of collecting temperature data on the fishing grounds and also consider the advisability of reporting to the fishing fleet from time to time concerning general temperature trends in important areas.

GREAT LAKES FISHERIES CONFERENCE

Progress has been made toward the negotiation of a treaty for the control of the seriously depleted fisheries of the Great Lakes. After nearly 50 years of conferences among the various States attempting to secure uniform regulation by independent State action, a conference was held during February 1938 by members of commissions on interstate cooperation under the auspices of the Council of State Governments. This conference resulted in a definite request directed to the Congress and to the State Department for negotiation of such a treaty. The initial step would provide for the appointment of a

fact-finding commission which doubtless will be instrumental in the drafting of final regulations for the fisheries. At the same meeting progress was made toward the adoption of uniform regulations among the four States bordering on Lake Michigan. Congress subsequently passed legislation which authorized an interstate compact among the Great Lakes States for the preservation of their fisheries.

FISHERY ADVISORY COMMITTEE

The Fishery Advisory Committee, composed of leaders in the fishing industry, organized for the purpose of advising the Secretary of Commerce and the Commissioner of Fisheries concerning the development, promotion, and regulation of the fisheries, continued the study of fishery problems throughout the year.

The lack of current information on market conditions has long been apparent, and the actual establishment of a Market News Service by the Bureau of Fisheries owes much to the recommendations and interest of the committee which foresaw the advantages of this service in the development of a more orderly marketing program for sea foods.

One of the major objectives of the Bureau of Fisheries' investigations is to discover the earliest signs of depletion of a commercial species, since thousands of people are dependent, either directly or indirectly, upon the fishing industry for a livelihood. The problems confronting this group are national and international in scope; many are not easily solved. An outstanding study concerns the difficult problem of the wise exploitation of the pilchard or sardine fishery of the Pacific coast.

The committee has been formulating a long-range program with a view to increasing the year-round consumption of fishery products. A national fish week has been inaugurated and the committee has planned to hold one meeting in a city outside of Washington, D. C., each year. These conferences are resulting in the establishment of closer relations between the industry and Federal agencies concerned, and are affording a better understanding of the problems which the industry is attempting to meet.

DOMESTIC RELATIONS

COOPERATION WITH OTHER FEDERAL AGENCIES

Some half-dozen Federal agencies are concerned with the management of land and water areas where fisheries conservation may be a problem. Outstanding among these are the National Park Service, Forest Service, Tennessee Valley Authority, Farm Security Administration, Bureau of Reclamation, and the Indian Service. The Bureau has worked with each of these in the solution of their problems.

The Forest Service has constructed during the year more than one-half dozen rearing units which the Bureau operates for the protection of fish to stock park waters. More are under construction and being planned. The existing T. V. A. hatchery at Norris, Tenn., is of insufficient capacity and work has just been started on a large new unit on the Elk River in Alabama. This will be operated by the Bureau and the affiliations with this agency have been most beneficial. The Farm

Security Administration has made preliminary arrangements for transfer to the Bureau of the large hatchery unit at Welaka, Fla. The Bureau has in return supplied fish from its various hatcheries for stocking the waters of recreational projects. Close contact has been maintained in the development of a bass hatchery at Arcadia, R. I., and a program of joint development has been worked out. A hatchery at Hoffman, N. C., was taken over by the Bureau under a similar arrangement.

The Bureau has been the recipient of aid from other Federal agencies. Civilian Conservation Corps enrollees have contributed work at various hatcheries. The Works Progress Administration can, in a number of instances, be credited with improving the physical condition of the Bureau's properties and providing additional facilities for fish production.

During the past year, the Bureau's technologists gave courses in canning fishery products to State extension service workers at the request of the United States Department of Agriculture. They also rendered considerable assistance to the Bureau of Home Economics of the United States Department of Agriculture in assembling data on the chemical composition and food value of the leading commercial species of fish and shellfish. These data are to be incorporated by the Bureau of Home Economics in a revised publication on the composition of principal American food materials. Chemists of the Food and Drug Administration, United States Department of Agriculture, conferred at length with the Bureau's technologists for the purpose of obtaining information on methods of determining fatty acid in fish meal and the effect of the presence of relatively large amounts of fatty acid in fish meal on its feeding value. The Bureau also cooperated with the Federal Surplus Commodities Corporation in connection with its purchase of surplus fish for relief agencies and with the distribution of this fish to relief clients. The International Fisheries Commission at Seattle, Wash., cooperated in the conduct of several phases of the Bureau's economic and technological work. This included certain technical studies on halibut and halibut liver oil and the collection of economic and statistical data on the North Pacific halibut fishery.

The Division of Fishery Industries assisted the Rural Electrification Administration in studies of the commercial fisheries in certain areas of Virginia and North Carolina, and assisted the Bureau of Chemistry and Soils of the United States Department of Agriculture in assembling historical data relating to the domestic manufacture of fish scrap and meal.

The Bureau also has worked with various Federal agencies in obtaining statistical data on our fisheries. In a cooperative arrangement, the Bureau of Agricultural Economics, Department of Agriculture, furnished statistics on the volume of cold-storage holdings of fish and quantities frozen, and the health authorities in Washington, D. C., assisted in obtaining data on the volume of fish handled at the municipal fish wharf and market in this city. Cooperation was accorded the Bureau of the Census in obtaining for that Bureau figures on the volume of the quarterly production and holdings of fish oils in the United States.

COOPERATION WITH STATES AND OTHER AGENCIES

An important part of the duties of the field employees of the Division of Fish Culture has been to maintain close cooperation with State fish and game departments for the purpose of coordinating the fish propagation and distribution activities. Similar contacts were maintained with semipublic sportsmen's organizations.

Many State fish and game departments continued to check and review Federal fish applications for their waters. Others exchange eggs and fish with the Bureau or operate hatcheries on a joint basis. In a number of instances the distribution of fish produced at Federal hatcheries is handled by the State organizations.

New developments along the foregoing lines included the assignment of a skilled Bureau employee to take charge of a new bass hatchery constructed by the West Virginia Conservation Department at Palestine, W. Va. Part of the fish produced will be used for filling Federal applications in that State. When the Missouri Conservation Department was unable to continue operation of the Forest Park Hatchery in St. Louis, the Bureau assumed the obligation and placed an employee in charge.

A tripartite agreement for operations at the brook trout hatchery at York Pond, N. H., was continued in effect with New Hampshire and Vermont. Shad propagation was undertaken in Georgia, the State cooperating financially.

Sportsmen's organizations have looked to the Bureau for guidance in their stocking problems in an increasing degree. The opening of a trout-rearing and bass-propagating unit at Carpenters Brook, in Onondaga County, N. Y., was the culmination of protracted efforts on the part of the county authorities, the organized sportsmen, and the Bureau. With a Federal employee stationed there, the stocking requirements of this community will be adequately cared for. W. P. A. labor and funds were utilized for construction.

The National Planning Council of Commercial and Game Fish Commissioners, organized at St. Louis, Mo., in 1933, continued its cooperative work with the States.

The annual council meeting which was held during the week of June 20 at Asheville, N. C., was combined with the International Association of Game Fish and Conservation Commissioners and the American Fishery Society, with representatives from 46 States present.

Among the activities of the National Planning Council of special interest and importance, from the standpoint of State cooperation, has been the benefits to the Bureau resulting from the elimination and overlapping in fish distribution work.

Subjects of national importance before the organization at the present time are: Fish management, fish culture, shad conservation, pollution problems, Great Lakes fisheries, and the technical problems of fishery research.

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: Wash-

ington State College, Pullman, Wash.; University of Washington, Seattle, Wash.; University of Maryland and Maryland State Agricultural Experiment Station, College Park, Md.; and the Minnesota and Virginia State Departments of Markets.

CONSTRUCTION ACTIVITIES

The major construction activities during the year were concentrated upon five new hatcheries. In the Columbia National Forest, near Carson, Wash., a salmon and trout hatchery started during the fiscal year 1937 was completed as far as available appropriations would permit. A hatchery service building, two dwellings, the water system, and several rearing ponds were completed. This new project was necessitated by the partial overflow of the older Little White Salmon hatchery from the waters of the Bonneville Dam pool.

Work was also started on four new pondfish hatcheries located at Lyman, Miss., Marianna, Fla., Cohutta, Ga., and Las Vegas, Nev. These were established in conformity with the act of May 21, 1930, Congress having provided for a resumption of new hatchery development. The Mississippi hatchery was placed on an operating basis during the year, although the proposed pond system was not entirely completed. In Florida about 50 percent of the ponds were completed, and dwellings, service buildings, water supply facilities, etc., were well along toward completion at the end of the year. This hatchery is located in a State park, the site having been donated.

Due to delay in acquiring the site, the Georgia hatchery was less completely developed both as to ponds and buildings at the close of the year. The appropriation of additional funds permitted the construction to continue into the fiscal year 1939.

At Las Vegas, Nev., the Bureau took over a hatchery which had been started by the city of Las Vegas. The principal work required was the construction of a dwelling, shop, and garage, and extension of the pond system. The greater part of this had been accomplished by the close of the year. Output of this hatchery will be largely used in restocking Lake Mead.

A site suitable for a bass hatchery in Rhode Island was finally acquired from the Farm Security Administration. A little work was performed in clearing pond sites, but this was suspended for the purpose of developing a project of major construction by utilization of relief labor. W. P. A. aid was enlisted in providing for major improvements at three existing hatcheries. At Edenton, N. C., the work comprised a 100-percent increase in the bass-pond acreage and construction of two experimental rearing ponds for shad. At Hartsville, Mass., and White Sulphur Springs, W. Va., a complete rehabilitation of ponds, buildings, and grounds was undertaken. In addition, W. P. A. projects were set up to provide for minor specific repairs and improvements at a number of other hatcheries, notably at San Angelo, Tex., Rochester, Ind., Dexter, N. Mex., and Crawford, Nebr. By the same means, pond construction was continued in the Upper Mississippi Wild Life and Fish Refuge at Genoa, Wis.

A fine stone hatchery building was practically completed at Lamar, Pa., financed by Bureau funds and C. C. C. labor. A series of bass ponds was also started at this point. At York Pond, N. H., a com-

bination of C. C. C. and W. P. A. labor made possible the continuation of the long-range developmental program.

With the installation of hatching troughs and completion of the dwellings by the United States Forest Service, the Walhalla, S. C., hatchery reached its final stage of development.

ALASKA FISHERIES SERVICE

ADMINISTRATION OF FISHERY LAWS AND REGULATIONS

The excellent condition of the fisheries of Alaska in 1937 reflects the wisdom of conservation policies which have been in effect since 1924. The salmon industry, which is the backbone of Alaska's economic structure, produced the third largest pack on record, and other minor fisheries also continued on a high level of development. Commercial fishing operations in 1937 were closely checked in all areas, and regulations were amended where necessary to assure an adequate escapement of brood fish. The Deputy Commissioner of Fisheries and other officials spent several weeks in Alaska inspecting the fisheries and the Pribilof Islands fur-seal industry.

Revised fishery regulations for 1938, issued on February 15, contained only minor changes from the regulations in force in 1937. The restrictions on herring fishing in southeast Alaska were relaxed to some extent, while additional restrictions were placed on herring fishing in the Kodiak and Prince William Sound areas. In a few instances areas open to trap fishing were redefined in order to relieve the drain on certain runs and more nearly equalize the intensity of fishing operations. Clam-fishery regulations were modified to permit a slight increase in the take of razor clams in the Prince William Sound, Copper River, and Bering River areas.

A patrol of the fishing grounds was maintained by 14 Bureau vessels, 1 chartered vessel, and numerous small craft. Twelve statutory employees and 165 temporary stream guards and special workmen, in addition to the crews of the patrol vessels, were engaged in enforcing the fisheries laws and regulations in Alaska. As in previous years, some use was made of airplanes to supplement the vessel patrol and to transport Bureau employees to isolated districts.

No collection of salmon eggs for artificial propagation has been made in Alaska during the past 2 years. The conditions for natural propagation of salmon, however, have been improved by the removal of log jams and other obstructions that hindered the passage of salmon upstream, and by the destruction of predatory enemies of salmon. Funds were made available by the Territorial legislature and by local packers for the payment of a bounty on predatory trout taken in the Bristol Bay and Cook Inlet areas in 1937. In this connection also the Bureau began a scientific study of the migratory habits of Dolly Varden trout in order to provide a rational control program.

Biological studies of salmon and herring were continued and weirs were operated in 12 representative salmon streams to count the escapement of brood fish. The information obtained by weir counts is necessary in determining conservation measures and is also of great value in connection with the life-history studies of salmon.

PRODUCTS OF THE FISHERIES

The total output of Alaska fishery products in 1937 was 452,544,700 pounds, as compared with 523,652,500 pounds in 1936. Notwithstanding this decrease in volume, the value of fisheries products in 1937 was $51,743,200, an increase of $1,287,950 over the preceding year. Production of canned salmon in 1937 was the third largest ever recorded, having been exceeded only in 1934 and 1936, and the output of herring products set a new high record for the Territory. There were 30,331 persons engaged in the fishing industry of Alaska in 1937.

Salmon products accounted for 75 percent of the total weight and 90 percent of the total value of Alaska fisheries products in 1937. Ninety-four percent of the salmon production consisted of canned salmon, the pack amounting to 6,669,665 cases, valued at $44,547,769. This compares favorably in point of value with the record pack of the previous year, which amounted to 8,437,603 cases, valued at $44,751,633. Red salmon comprised 32 percent and pinks 54 percent of the total pack in 1937, as compared with 30 and 54 percent, respectively, in 1936. One hundred and thirteen canneries were operated, or four less than in the preceding year, and the number of persons employed declined from 25,221 to 24,865 in the same period.

Twenty herring plants were operated in 1937, a decrease of 7 from the preceding year, but the total production of herring meal and oil was the largest in the industry's history. Saltery operations, however, were sharply curtailed, chiefly as a result of unfavorable market conditions. There was a slight decrease in the volume of halibut landings, and the output of cod and shrimp products also declined, but production in other minor fisheries of the Territory, including crabs, clams, and sablefish, showed substantial increases. The two whaling plants which operated in 1937 also reported a slight increase in production over 1936.

ALASKA FUR-SEAL SERVICE

GENERAL ACTIVITIES

Sealing and foxing operations were carried on as usual by the native inhabitants of the Pribilof Islands under the direction of the Bureau's staff. Twenty-six skilled employees of the Fouke Fur Co. were detailed to the island for several months to assist in the curing and packing of the skins.

Construction activities on the island were rather limited in 1937. Work on the extension of roads was continued, and minor improvements were made on buildings and equipment. A substation was established on Amchitka Island, one of the western Aleutian group, to serve as a base for sea otter investigations and patrols.

The byproducts plant on St. Paul Island was operated for the utilization of fur-seal carcasses and produced 29,830 gallons of oil and 165 tons of meal. Small quantities of these products were retained at the islands to be used during the winter for fox feed, but most of the oil was sold in Seattle for the account of the Government, and meal was transferred to the Division of Fish Culture for use as fish food in Federal hatcheries.

The annual supplies for the Pribilof Islands were shipped from Seattle on the U. S. S. *Sirius*, through the cooperation of the Navy Department. On the return trip to Seattle this vessel carried the season's take of sealskins and 162 tons of seal meal from the by-products plant.

As the Navy Department's radio facilities at Dutch Harbor, Alaska, have recently been expanded, the maintenance of the St. Paul Island station as a link in the Coast Signal Service is no longer necessary. The St. Paul station was therefore transferred on August 10, 1937, to the Department of Commerce, under a revocable permit, and is being operated on a reduced scale by the Bureau of Fisheries.

In accordance with the terms of the fur-seal treaty of 1911, delivery of 8,277 fur-seal skins, or 15 percent of the season's take, was made to the Canadian Government. Japan continued to receive its 15 percent share in the take from the proceeds of sale of the remaining skins. The United States received a shipment of 210 Robben Island fur-seal skins, taken by Japan in 1937. This represented the annual 10 percent share due this country under the terms of the fur-seal treaty.

SEAL HERD

The total number of animals in the Pribilof Islands fur-seal herd on August 10, 1937, was computed as 1,839,119. This is an increase of 149,376 over the computed number in the preceding year.

TAKE OF SEALSKINS

In the calendar year 1937 there were taken on the Pribilof Islands 55,180 fur-seal skins, of which 44,068 were taken from St. Paul Island and 11,112 from St. George Island. This is an increase of 2,734 over the total taken in 1936. Insofar as possible, killings were from the 3-year-old males, a suitable number of this age class having been reserved for breeding stock.

SALE OF SEALSKINS

Two public auction sales of fur-seal skins were held at St. Louis, Mo., in the fiscal year 1938. At the sale on September 27, 1937, there were sold 7,000 skins dyed black, 12,580 skins dyed Safari brown, and 147 miscellaneous skins, for a gross total of $420,640. On May 2, 1938, 7,100 skins dyed black and 12,849 dyed Safari brown brought a gross sum of $432,622.25.

Sealskins sold at private sales under special authorization by the Secretary of Commerce consisted of 474 dyed black, 398 dyed Safari brown, and 2 raw salted skins, which brought a gross sum of $21,102.81. In all, 40,550 fur-seal skins were sold for the account of the Government in the fiscal year 1938, for a total gross sum of $874,365.06.

FOXES

The blue fox herds maintained on St. Paul and St. George Islands continued to thrive, and the taking of fox pelts provided the natives with employment during the relatively inactive winter months. The herds require very little attention and are a profitable adjunct to the

fur-seal industry. During the 1937–38 season 231 blue and 15 white foxskins were taken on St. Paul Island, and 616 blue and 1 white fox pelt were taken on St. George Island. Sufficient stocks were reserved on each island for breeding purposes.

One thousand blue and 12 white foxskins, taken on the Pribilof Islands in the 1936–37 season, were sold at public auction in the fiscal year 1938. The blue foxskins brought $25,934 and the white skins brought $146, a total gross sum of $26,080.

FUR-SEAL SKINS TAKEN BY NATIVES

Exercising the privilege granted them under the provisions of the North Pacific Sealing Convention of July 7, 1911, the aborigines dwelling on the coast of the North Pacific took a total of 2,832 fur-seal pelts in 1937. Indians under the jurisdiction of the United States took 161 skins and Canadian Indians took 2,671. All these fur-seal skins were duly authenticated by Government officials of the two countries.

FUR-SEAL PATROL

Vessels of the Coast Guard were again assigned by the Secretary of the Treasury to patrol the waters of the North Pacific and Bering Sea for the protection of the fur seals and sea otters in those areas. One vessel of the Bureau of Fisheries also participated in the fur-seal patrol during the northward migration of the herd.

PROTECTION OF SEA OTTERS, WALRUSES, AND SEA LIONS

A new edition of the regulations for the protection of walruses and sea lions was issued on July 1, 1937, extending the closed season on these animals for 2 years, although permitting their capture, as heretofore, under certain specified conditions. The killing of sea otters is prohibited at all times.

PROPAGATION AND DISTRIBUTION OF FOOD AND GAME FISHES

The hatcheries operated by the Division of Fish Culture released for the stocking of public waters during the fiscal year 1938 a total of 7,822,151,800 fish and eggs. This represents a slight regression, approximately 1.2 percent, from the comparable output of the previous year. The 1938 production has, however, been exceeded only twice during the period in which the Federal Government has operated fish hatcheries. In view of the effects of weather, and other factors beyond control, there is each year an inevitable fluctuation in the output of the hatcheries. Among the factors which may be cited as contributing to the reduction and output was the flooding of the Louisville, Ky., hatchery during the spring of 1937, thereby affecting the 1938 production. In the Madison River, Mont., a large supply of trout eggs was virtually eliminated because of drainage of a hydroelectric reservoir. The cyclical nature of the runs of Pacific salmon also contributed to a reduced egg take for those species. Altogether some 45 different species of fish were handled at the Bureau's hatcheries. The canalization of the upper Mississippi River has curtailed the rescue

work in the Upper Mississippi Wildlife Refuge. This was reflected in a reduction of distribution of warm-water pondfish and also in the distribution of a larger-size fish listed as fingerlings. The fingerling output of 118,105,000 was approximately 18,000,000 less than the previous year. The output of game fish as a whole held up most successfully. The demand for game fishes for stocking waters on Federal lands has increased to the extent that many applications from private applicants had to be carried over for subsequent attention.

PROPAGATION OF COMMERCIAL SPECIES

Marine species, Atlantic coast.—The output of haddock and pollock, and important species of the New England shore waters, was increased. This increase was balanced by a reduction in the propagation of cod and flatfish. Lobster propagation was prosecuted more vigorously at Boothbay Harbor, Maine, and Gloucester, Mass., with a resultant production of 6,800,000 fry. No mackerel were propagated by the marine stations during 1938. As usual, much of the propagation of marine species was concerned with the fertilization of eggs and their immediate planting on the natural spawning grounds. Over 4½ billion eggs were salvaged by this procedure.

Pacific salmon.—It is especially regretful that there was a notable drop in the propagation of chinook and sockeye, the most valuable species of the Pacific salmons. However, the annual fluctuation in the runs of these fish determines the egg take, which in turn controls the hatchery distribution. In connection with the salmon hatchery operation, steelhead trout were propagated in large numbers.

Anadromous species, Atlantic coast.—In line with an intensive study of the biology of the shad, and a definite program of rehabilitation of the species, the output of shad fry was materially increased to a total of 26,000,000. Increases were registered at the Fort Belvoir, Va., station and at Edenton, N. C., and scattering numbers were propagated in South Carolina and Georgia, the latter being a new activity conducted in cooperation with these States. Work with the Atlantic salmon was negligible, due to inability to obtain any worth-while quantity of eggs. Yellow perch and white perch were hatched in large numbers in the shad hatcheries, since these species can be handled at little additional cost in connection with the propagation of the more important shad. Effort was again made to propagate striped bass on the Roanoke River in cooperation with the State of North Carolina. Moderately successful results were obtained.

Commercial species, interior waters.—Several hundred million eggs and fry of the catfish, buffalo fish, and carp varieties were distributed, purely as a byproduct of the Bureau's other work in the upper Mississippi area. It would have been possible to increase the output of these had such action been deemed desirable. Owing to uncertainty as to the role of the hatcheries in maintaining the more valuable species of the Great Lakes, there was no increase in intensity of effort to hatch whitefish and lake herring. Seventy-four and one-half million whitefish fry represented a yield somewhat below the previous year. The propagation of pike-perch at the Put in Bay, Ohio, station, in cooperation with the State of Ohio, was resultant of

a reduced output. The feature seriously affecting the work on Lake Ontario is the fact that the most suitable spawning area for whitefish and lake trout is in Canadian waters and no satisfactory arrangements can be made whereby the Bureau can obtain eggs from that source. Similar limitations kept the production of lake trout at a low level.

Game species.—A large increase in the production of black-spotted trout was made possible through increased egg collections at Yellowstone Park. The greater portion of these fish were distributed in National Park waters. Fewer brook, rainbow, and loch-leven trout were distributed, but many of these were planted at large size, increasing their value for stocking purposes. Efforts to develop a satisfactory and economical trout food under actual operating practices have continued. An important feature of the Bureau's work with game fish is the assignment of trout eggs, particularly of the rainbow trout, to various other fish-cultural agencies. Shipments of rainbow trout eggs and panfish were made to Puerto Rico, while eggs of various species were supplied to Venezuela and Argentina. It is again gratifying to report that the production of bass, a species which merits its great popularity among the sportsmen, exceeded all previous records.

It should be pointed out that practically all new hatchery developments within recent years, exclusive of some minor developments in the Pacific salmon area, have been for the propagation of game species. This is due to the fact that the fishes sought for sport are largely denizens of the lesser fresh waters. They are consequently more vulnerable to the increased fishing pressure of recent years, and, further, suffer from environmental changes, such as pollution, which mark our national development.

Since hatchery efforts are wasted unless the fish are stocked properly, more intensive consideration was given to the distribution problem. Eight large trucks were acquired, as the nucleus of a fleet, and these were being equipped with special tanks and apparatus at the close of the year. Attempts to economize by inducing private applicants to transport their allotments of fish have been unsatisfactory, due chiefly to the applicants inexperience in handling live fish.

RESCUE OPERATIONS

Due to the development of the 9-foot channel in the Upper Mississippi River, the number of fish rescued in that area was below that of 1937. However, there were salvaged a total of 42,202,000 fish, comprising 10 species. Of this number over 41½ million were returned directly to the main river channels.

The canalization of the Mississippi to the Twin Cities will make the salvage work virtually unnecessary and impossible in the future. In lieu of this the Bureau is constructing large artificial ponds for the propagation of fish in the areas adjacent to the pools created by the new dams. The ponds already constructed and operated have proved very successful. The two in operation at Genoa, Wis., last year produced over 864,000 fingerling black bass alone.

FISHERY INDUSTRIES

ECONOMIC AND MARKETING INVESTIGATIONS

Surplus fish situation.—A study of the surplus fish situation showed that on March 15, 1938, holdings of frozen, cured, and canned fishery products in the United States amounted to approximately 260,000,000 pounds, which was about 80 to 100 million pounds greater than normal holdings.

Improved cold-storage statistics.—The Bureau of Fisheries, in cooperation with the Bureau of Agricultural Economics of the Department of Agriculture, has made several revisions in the species classifications of commodities frozen or held in cold storage in this country. These changes, which are reflected in the monthly and annual cold-storage bulletins published by the Bureau, increase the usefulness of these data to interested parties. Recently, separate classifications were adopted for fillets of various species, and new classifications were added for rosefish and swordfish. On July 15, 1938, additional classifications will be included for scallops, shrimp, and sea crawfish or spiny lobsters.

United States fisheries off foreign coasts.—A study made during the year shows that about 14 percent of the value of the catch of the domestic fisheries is represented by products taken off foreign coasts. Outstanding among such commodities are cod, haddock, and other groundfish taken off the coasts of Newfoundland and Nova Scotia, which were valued at $4,600,000, and tuna and tunalike fishes taken off the west coasts of Latin America, valued at $5,900,000. Other domestic fisheries off foreign coasts include those for salmon and halibut off British Columbia; the fishery for red snapper and groupers on Campeche Bank off Mexico; and the whale fishery off Australia. The total value of domestic fisheries off foreign coasts to domestic fisherman amounted to about $13,000,000.

Commercial fisheries of the world.—On the basis of the most recent available data, the world's annual commercial catch of fishery commodities amounts to about 30,000,000,000 pounds, valued at approximately $730,000,000. The United States, including Alaska, ranks first in value of the annual yield and is exceeded only by Japan in volume.

Fishery market news service.—Offices for the daily collection and dissemination of fishery market news were established at New York, N. Y., and Boston, Mass., during the past year. Plans for opening the third office, at Seattle, Wash., were nearing completion at the end of the fiscal year, and other offices, within the facilities of the Bureau, will be opened during next fiscal year. Essentially, this new service, which has proved most popular, constitutes an exchange of market information between the fishermen or producers in fishing areas and the middlemen in terminal markets, with the Bureau of Fisheries acting as the service agency; that is, the agency for collecting and disseminating the news.

Cooperative marketing.—In connection with the administration of Public, No. 464, "An Act authorizing associations of producers of aquatic products," investigations have been continued to determine

the cooperative status of fishery organizations in the United States, and the extent and nature of their activities. Studies pertaining to fishery associations and the financing of fishermen, which were begun in 1936 on the Pacific and Middle and North Atlantic coasts, have been extended to include the South Atlantic and Gulf coasts. It has been found among fishermen and associations visited that there is widespread interest in the possibilities of advancing cooperative marketing activities. This interest has been evidenced further by many requests for the Bureau to give aid of an advisory character concerning operations and management and financing problems. Wherever possible, such assistance has been supplied through correspondence, informative literature, or personal contact.

STATISTICAL INVESTIGATIONS

FISHERIES OF THE UNITED STATES, CALENDAR YEAR 1936

New England States.—No complete statistical survey of the commercial fisheries of this area was made for 1936. However, the total landings by United States fishing vessels at Boston and Gloucester, Mass., and Portland, Maine, amounted to 414,767,000 pounds, valued at $11,144,000, an increase of 11 percent in volume and 24 percent in value as compared with the preceding year.

Middle Atlantic States.—No complete survey for the catch of fishery products in these States was made for 1936. A survey made of the shad fishery of the Hudson River for 1936 showed that 476 fishermen took 2,468,000 pounds of shad, valued at $170,000, an increase of 191 percent in volume and 139 percent in value as compared with 1935.

Chesapeake Bay States.—The commercial fisheries of Maryland and Virginia in 1936 gave employment to 18,283 fishermen. Their catch amounted to 314,095,000 pounds, valued at $6,488,000, an increase of 18 percent in volume and 17 percent in value as compared with the catch in the previous year.

South Atlantic and Gulf States.—The commercial fisheries of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas, during 1936, gave employment to 29,006 fishermen. Their catch amounted to 556,993,000 pounds, valued at $13,542,000, an increase of 24 percent in volume and 36 percent in value as compared with the catch in 1934, when the last previous survey of catch was made.

Pacific Coast States.—During 1936 the commercial fisheries of Washington, Oregon, and California gave employment to 20,620 fishermen, whose catch amounted to 1,925,342,000 pounds, valued at $24,882,000, an increase of 15 percent in volume and 8 percent in value as compared with 1935. The total catch of halibut by United States and Canadian vessels amounted to 48,054,000 pounds, valued at $3,603,000, an increase of 5 percent in volume and 11 percent in value as compared with the catch in the preceding year.

Lake States.—In 1936 the commercial fisheries of the United States and Canada, in the Great Lakes and international lake of northern Minnesota (Lakes Ontario, Erie, Huron, Michigan, and Superior, and Namakan and Rainy Lakes, and Lake of the Woods), yielded 124,408,000 pounds of fishery products. Of the total, United States fishermen took 94,277,000 pounds, valued at $6,389,000, an increase of 4

percent in volume and 7 percent in value as compared with the catch in the previous year. The Lakes fisheries of the United States gave employment to 5,623 fishermen in 1936.

Mississippi River and tributaries.—No complete survey of the commercial fisheries of the Mississippi River and tributaries was made for 1936. The catch of Lake Pepin and Lake Keokuk, and the Mississippi River between the two lakes, in 1936, amounted to 8,181,000 pounds, valued at $378,000, an increase of 22 percent in volume and 34 percent in value as compared with the catch in these waters during 1935.

MANUFACTURED PRODUCTS OF THE UNITED STATES AND ALASKA, CALENDAR YEAR 1936

Fresh and frozen packaged fishery products.—Based on data for 1936, except in the case of packaged shellfish in the New England and Middle Atlantic States, which data are for 1935, the domestic production of fresh and frozen packaged fishery products amounted to 202,396,000 pounds, valued at $26,895,000. Important commodities in this group were fresh-shucked oysters, 6,758,000 gallons, valued at $9,249,000; packaged haddock, 41,187,000 pounds, valued at $4,266,000; and fresh-cooked crab meat, 7,095,000 pounds, valued at $2,535,000.

Frozen products.—In 1936 the production of frozen fishery products amounted to 179,274,000 pounds, estimated to be valued at $15,000,000. The volume of the production was 20 percent greater than in 1935. The most important products frozen were groundfish, whiting, halibut, salmon, and mackerel.

Cured products.—The production of cured fishery products, based on data for 1936 in all sections except the New England and Middle Atlantic States, which are for 1935, and the Mississippi River and its tributaries, which are for 1931, amounted to 116,311,000 pounds, valued at $15,616,000. Important products in this group were smoked salmon, 8,753,000 pounds, valued at $2,656,000; mild-cured salmon, 11,550,000 pounds, valued at $2,245,000; and salted boneless cod, 7,951,000 pounds, valued at $1,492,000.

Canned fishery products.—Canned fishery products produced in 1936 amounted to 794,707,000 pounds, valued at $94,564,000, an increase of 18 percent in volume and 26 percent in value, as compared with 1935. Canned salmon was the most important item, accounting for 430,328,000 pounds, valued at $50,061,000. Other leading canned fishery products were tuna and tunalike fishes, sardines, shrimp, mackerel, clam products, and oysters.

Byproducts.—Fishery byproducts produced in 1936 were valued at $34,976,000, an increase of 17 percent as compared with the previous 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 1937, studies in this field included a further development of electrometric tests for the freshness of fish and their practical or commercial application, studies of rancidity in fish, of lactic acid as a possible index of decomposition in frozen fish, of identification of canned salmon, of changes in the composition of pink salmon, and of the canning of aquatic products. Much interest was shown by the industry during the past year in the

commercial application of the electrometric method for determining the relative freshness of such nonoily fish as haddock developed several years ago by members of the Bureau's technological staff. Consequently, one of the Bureau's technologists was assigned to the laboratories of a large fishery producer, and, as a result, equipment has been designed which is as nearly automatic in operation as is possible and which enables the operator to make determinations upon 10 samples of fish at one time. In this way rapid tests for the freshness of fish purchased can be made without delaying packing activities or other commercial operations. At the present time this test is being used by this firm for the selection of fish which are to be used in fancy packs of quick-frozen products. These products are expected to remain in good condition over a longer period of time than is ordinarily expected where the fish are not selected for their prime condition. One of the changes occurring in fish immediately after death is an increase in the formation of lactic acid, which progresses for some time after death. Bureau technologists have begun a study of this formation of acid as a possible reliable index of the rate of decomposition in frozen fish.

Certain species of salmon undergo considerable apparent physical change during the course of the canning season and the quality and value of the canned product is at present judged somewhat on this basis. The Bureau has undertaken a chemical study of these changes in the hope of determining their true significance. In studying the characteristics of the oil in canned salmon, it was found that those for each species fell between quite definite and more or less separated limits. Regulatory bodies have shown interest in these data as a possible help in identifying the species of salmon after it is canned. During the year the Bureau published a report covering an investigation on the preservation of Pacific oysters. The information obtained during the conduct of this work has been helpful in the beginning of a new oyster-freezing industry in the Pacific Northwest. During the past year experiments have been continued in developing methods for canning fishery products, both in the home and for application on a commercial scale.

Bacteriological studies.—Since the preservation of fish is based on the prevention of spoilage through bacterial action, any device or method which can be found to serve this purpose is vitally important to both the fishing industry and ultimate consumer. Studies on other food products indicate that the use of ultraviolet light rays have been beneficial in lowering the number of spoilage bacteria in milk, meats, bread, etc., thus improving the quality of these foods. Late in 1937 the Bureau's bacteriologists began a study of these ultraviolet light rays in reducing the bacterial count of various fishery products. While this investigation is not yet completed, it has been found that the rays will kill marine bacteria, and we hope to work out a practical and commercially feasible application of this method in the treatment of fishery products.

Pharmacological studies.—In recent years scientific investigators have recognized the increasing importance of the role of minerals in foods and in feedstuffs for farm animals. Certain minerals have been found to be essential in nutrition, and it has been clearly demonstrated that there is need for a better understanding of other

physiological effects which these minerals may have on the animal organism. For this reason an investigator, trained in pharmacology, was assigned to the Bureau's technological staff several years ago. Studies of the arsenic and copper content of shrimp and oysters, and their physiological or pharmacological effect, have revealed that no deleterious effects are observed as a result of eating these products when these minerals occur in natural organic combination. Similar studies are now being conducted on the natural fluorine content of fishery products.

Preservation of fishery byproducts.—During the year additional data were obtained on the properties and composition of salmon oils. A simple method was developed for the commercial extraction of oil from lean fish livers which do not give up oil by normal treatment. Since the livers yielding the most potent vitamin oils come under this classification, the value of such information can be appreciated. The studies on liver oil extraction also led to practical suggestions on methods for fortifying low-vitamin fish oils. Fish oils and oil-bearing fishery products are subject to oxidative deterioration during storage, and the matter of preventing such changes is an important problem of the fishing industry. Further studies have been made on the effectiveness of various materials for inhibiting oxidative change. The oxidation of fat in fish meal causes it to become insoluble in normal fat solvents. This leads to errors in analysis and confusion when sales are based on analytical specifications. Studies are being made to devise an analytical procedure which will eliminate this difficulty. During the year the Bureau published a report on the distribution of vitamins in salmon cannery waste and contributed papers to scientific and trade magazines covering such subjects as the utilization of salmon cannery waste, cereal flours as antioxidants for fishery products, and the determination of fat in fish meal.

Fish cookery.—During the past year, the Bureau continued the development and testing of recipes for the preparation and cookery of fish and shellfish, and carried on practical demonstrations in fish cookery in cooperation with home economics workers and others in various parts of the country. In cooperation with the Federal Surplus Commodities Corporation, some practical demonstrations in fish cookery were conducted for relief workers and others interested in connection with the distribution of fish to persons on relief rolls.

BIOLOGICAL FISHERY INVESTIGATIONS

INVESTIGATIONS OF COMMERCIAL FISHES

North Atlantic fishery investigations.—Biological studies in the North Atlantic area are concerned chiefly with changes in abundance of the stocks of fish which support New England's extensive and varied fisheries. Specific problems investigated during the year dealt with the causes of the extreme fluctuations in abundance of mackerel and means of predicting such fluctuations; the relation between the existing stocks of haddock and the strain imposed by the present intensive fishery; the economic and biological significance of the extension of otter trawling to include several species in addition to cod and haddock; and the condition of the flounder fisheries in coastal waters from Massachusetts to New York.

In contrast to the record yield for the calendar year 1936, the catch of the New England vessel fisheries during 1937 declined by 6 percent and brought the fishermen a monetary return 12 percent below the value of the previous year's catch. With the exception of cod and flounders, the yield of all important species suffered a decline, and all species except halibut, mackerel, and redfish decreased sharply in value.

The outstanding event of the year in this area was the decline of the mackerel catch to an unforeseen low which was about one-third of the previous year's level. It is believed this small yield was the result of unusual oceanographic conditions which affected the movements of the mackerel and made them less available to the fishermen, rather than of an actual decline in abundance of corresponding magnitude. This view is supported by the peculiar distribution of the 1937 catch and by the good early season yield in 1938. Nevertheless, these developments emphasize the need for a more accurate mackerel catch forecast. Facilities are lacking for off-shore observations on conditions in the sea which affect migrations, survival of young, and availability of the mackerel to the fishermen.

Not only did the total catch of the haddock fleet decline in 1937 by 5 percent from 1936 level, but also the daily catches of trawlers showed a drop of about 20 percent in both major producing areas. The scrod haddock (the smallest commercial size) continued to be scarce on the Nova Scotian banks, being only about three-fourths as abundant on Georges as in 1936, and it is believed that the decline will continue. Without further information on the numbers and distribution of haddock of precommercial size, however, no definite prediction can be ventured for the 1938 season. Although facilities for such a survey were completely lacking in 1937, one experimental trawling trip was made in the spring of 1938 through the courtesy of the Woods Hole Oceanographic Institution in permitting the use of the vessel *Atlantis* for this purpose.

Because of recent sharp changes in the stock of flounders, a survey of the flounder fisheries from New York to Boston was carried to completion during the year, catch data from both sports and recreational fisheries being collected. Highly significant figures on the relative intensity of these two types of fisheries were obtained from the returns of tagging experiments carried out in cooperation with the States of Rhode Island, Connecticut, and New York. An average of about 70 percent of the returns have been made by sportsmen. The same experiments have supplied information on the extent and character of flounder migrations which will aid in devising effective conservation measures.

Middle and South Atlantic fishery investigations.—Headquarters for the investigation of the coastal fisheries from New York to Florida were transferred during the year from Cambridge, Mass., to College Park, Md., permitting a more centralized attack on the urgent problems of fishery management. In this area total production has not only failed to increase, but has actually declined during the present century, despite economic and technological developments which might have been expected to increase the yield of the fisheries.

Studies of the scup, squeteague, sea bass, and flounders have been designed to discover the size and age at which the greatest yield in

pounds can be taken at the lowest cost. These studies indicate that elimination of the present widespread practices of destroying fish below market size and of marketing fish that would be more valuable if allowed to grow to a larger size, offers the greatest promise of improving the condition of these fisheries. Sorting of the catches by pound nets, seines, and otter trawls, whenever possible, is urged.

Causes of the decline in abundance of the Atlantic coast shad, and measures for restoring the fishery, are being sought in an investigation which was initiated during the year. Because the Hudson River shad catch has staged a spectacular recovery under careful regulation from less than 100,000 pounds in 1917 to nearly 3,000,000 pounds in 1936, this area is being carefully studied to determine what conditions are responsible for the recovery. The fundamental question of the number of spawners necessary to maintain the fishery at a given level of abundance is being attacked by tagging spawning migrants and spent fish, studying scales, and deriving indices of abundance from catch data. The effectiveness of present methods of artificial propagation and the possibility of rearing fry to a greater size before liberation are also being investigated.

Widespread concern over the decline of the striped bass fishery in certain sections of the Atlantic coast during the years immediately preceding 1936 led the Division to undertake an investigation continuing and complementing work done by several of the States. Tagging experiments indicate that the fishery takes a heavy toll of the small sizes before they mature, and it is believed that restriction of the catch of these younger and smaller fish would increase the total yield and augment the number of spawners. Extensive seasonal migrations were also demonstrated by the tagging.

Shrimp investigations on the South Atlantic and Gulf coasts.—The problem of maintaining the present yield of the shrimp fishery without endangering future supplies was attacked by tagging experiments and the collection of catch records on both coasts and by exploratory trawling in the Gulf of Mexico to locate new supplies.

The discovery of large schools of shrimp in the deeper offshore areas of the Gulf, which was made by the vessel *Pelican* during the year, furnished proof of the theory long held by Bureau investigators that the shrimp congregate in deep water after they disappear from inshore fishing grounds in the fall and winter. Since it has been shown that some, at least, of these offshore aggregations are large enough to warrant commercial operations, it is believed that the strain on the immature shrimp inshore may be relieved by offshore fishing with beneficial results to the fishery. By taking more of the large shrimp and fewer of the small, immature stages, fishermen may take the same poundage, but fewer shrimp will be removed from the total available. Commercial fishermen began offshore operations in the early spring months as a result of the surveys by the *Pelican*.

The year's tagging operations resulted in the discovery that at least a portion of the shrimp from as far northward on the Atlantic coast as North Carolina migrate to Florida during the winter. From this fact it is clear that the South Atlantic shrimp fishery should be considered as a unit. The need of better protection of the young shrimp is strongly indicated by the fact that the total catch in this area remains at about the same level despite considerable increases in the number of boats and amount of gear.

North Pacific and Alaska fishery investigations.—Commercial fishery investigations in northern Pacific waters are concerned with recommending measures for the management and conservation of the salmon runs in the rivers of the Northwestern Coastal States and with maintaining at a productive level the salmon and herring fisheries of Alaska, over which the Federal Government has jurisdiction.

Rehabilitation of the Columbia River's $10,000,000 salmon industry is believed to depend in large measure upon the restoration of formerly productive spawning areas which are now unavailable or unsuitable. Approximately 2,500 miles of stream have been surveyed for the purpose of discovering additional spawning grounds that may be restored to use and of locating obstructions to upstream migrants and hazards to seaward migrating fingerlings, such as unscreened irrigation ditches. Data for 2,300 miles of stream which were tabulated during the winter showed a total of 418 dams, of which 288 are temporary and 104 are permanent. Five hundred ninety-five diversions were discovered, 563 of which are used for irrigation. On the basis of surveys covering north central, south central, and southeastern Washington, it is estimated that about 55 percent of the streams surveyed provide suitable spawning areas, but about half of this total is unavailable to fish at low water.

In Alaska, Government regulation of the commercial salmon catch is designed to allow a sufficient number of spawners to escape the fishery to maintain the runs of future years. The effectiveness of such regulations depends upon knowledge of the returns that may be expected from a given spawning escapement. Since past observations have established the fact that the ratio of spawning adults to returns several years later varies considerably, studies of the conditions which govern such fluctuations are of paramount importance. Continuing programs of research are therefore conducted on red salmon at Karluk River and on pink salmon at Little Port Walter in southeastern Alaska.

Additional evidence was secured during the year indicating that better returns are obtained from red salmon fingerlings that remain in fresh water until their third or fourth year than from those that migrate at an earlier age. It is therefore clear that the discovery of means to improve growth and survival of the young in fresh water will have a definite effect on the size of the runs. Major attention was given during the summers of 1937 and 1938 to an investigation of the effect of predatory Dolly Varden trout in reducing the numbers of young salmon. Little information being available about the migrations, growth rates, and age of this species, a series of marking experiments was carried out to supply such knowledge. Field observations throughout the spawning area showed that the heaviest toll is taken during the spring, at the time the young salmon are entering the lake from the spawning streams.

The long-term study of the pink salmon populations of southeastern Alaska deals chiefly with measuring the success of spawning in the streams each year, and with discovering the effect of various natural conditions on the survival of the young. Because the pink salmon, unlike the red, has a 2-year life cycle, the failure of 1 year's brood has serious effects on the fishery 2 years later. Continuous observations are therefore necessary in order to foresee such poor years and regu-

late the fisheries accordingly. These observations consist in counts of the spawning migrants so that the total egg production may be estimated, followed later in the season by counts of the migrating young. From these figures the fresh water mortality is computed. The total ocean mortality is determined by comparing the number of seaward migrants with the numbers returning 2 years later. Because the survival of eggs has been shown to be affected by the extreme seasonal variations in rainfall and temperature, a meteorological record has been kept during the year at the experimental stream at Little Port Walter to secure accurate data on weather conditions.

Studies of the coho salmon in Puget Sound are concerned with methods of rebuilding the runs which were formerly so important in this area. Studies have been carried on over a period of several years to determine the age at which hatchery reared fry may be released most advantageously. Results show conclusively that long periods of rearing bring much larger returns of adult fish. These studies are being continued and exact costs of rearing and handling are being computed.

The extensive tagging work of previous years of the Alaska herring was continued, with the result that the migratory habits of practically every commercially important population has been established. The electronic tag detector was again operated successfully for the recovery of tagged fish.

Herring in the Cape Ommaney area, from which the bulk of the catch in southeastern Alaska is made, have shown a marked decline in abundance during recent years. This decline is the result of a combination of factors—intensive fishing, migrations, and failure of spawning in 1932, 1933, and 1934. Continued observations on each of these conditions being essential to proper management of the fishery, tagging studies were supplemented by the collection of catch statistics and data on the size and age composition of the catch.

Pacific pilchard investigations.—The phenomenal increase in the landings of the Pacific pilchard fishery to a level three times as great as the total landings of all other kinds of fish in the Pacific Coast States has given rise to public concern over the ability of the resource to provide catches of this size without undergoing depletion. In response to this demand, the Bureau of Fisheries was provided with funds by Congress at the beginning of the fiscal year to investigate the condition of the resource.

Major attention is being given to the question of determining the intensity of fishing which will provide the maximum yield of fish of greatest commercial value, and, at the same time, leave an adequate spawning stock. Since accurate methods of determining age and estimating abundance are fundamental to the solution of these problems, the early months of the investigation have been devoted chiefly to developing a satisfactory technique of age determination and a method of estimating abundance from catch statistics or by aerial observation of schools. Preservation of an adequate spawning reserve, however, depends on an annual census of egg production which cannot be undertaken without a seagoing vessel.

Great Lakes fisheries investigations.—Because of the severe depletion of the Great Lakes fisheries, now generally recognized, problems of fishery research in this area are concerned chiefly with obtaining

an accurate measure of the abundance of certain species, studying the effect of various types of gear in commercial use, and supplying technical advice to aid State officials in the framing of commercial fisheries regulations.

An investigation was conducted on Lake Erie to determine the relation between the mesh size of gill nets and both the volume of the catch and the size of individual fish taken. On the basis of these and earlier gill-net studies, the Bureau will recommend a definite mesh size for gill nets used for all species commonly taken in small-meshed nets, and will recommend also an upward revision of present legal size limits for blue pike-perch and saugers in order to provide better protection for spawning females.

Because of the legal provision that net mesh must measure full size at all times, an investigation was carried out to determine the allowance that should be made for shrinkage. The differences among various methods of measuring gill-net meshes are also being determined experimentally. These two investigations will provide for more effective operation of the fundamental conservation measure of net regulation.

During the year a survey was made to determine the effect of commercial fishing on the game fishes of the Potasannissing Bay area. The findings will be made the basis of recommendations for the regulation of the fisheries.

Progress was made in compiling and analyzing the extensive collections of data from earlier years. These included a complete analysis of statistics of commercial fisheries of Great Lakes waters under jurisdiction of the State of Michigan, providing records of fluctuations in fishing intensity, yield, and abundance of important commercial species over an 8-year period; a study of the whitefish fisheries of Lake Michigan and Lake Huron; and a comprehensive report on the investigation of Lake Champlain fisheries conducted by the international fact-finding commission in 1930 and 1931.

Life history studies of the yellow perch and Lake Erie whitefish were resumed and studies of the competitive food habits of lake trout and lawyers were completed, the conclusion being reached that both species are predators of the commercially important whitefish family, and that the lawyer through its consumption of invertebrates is also a food competitor of the whitefish.

Important advances made during the year in State administration of the fisheries were the adoption of the flexible rule method of measuring gill-net meshes by four Great Lakes States and the Province of Ontario, and the passage of a discretionary power act by the Wisconsin Legislature, empowering State conservation officials to enact commercial fisheries regulations by decree.

AQUICULTURAL INVESTIGATIONS

Although the yearly output of fresh-water game fishes by State and Federal hatcheries amounts to several billion young fish, it is generally recognized that a commensurate return is not being realized by the several million anglers who seek sport in the Nation's streams. The conclusion is inescapable that some, at least, of the hatchery output is being wasted by being planted under conditions which do not favor survival. Scientific investigations being conducted in the field of

aquiculture are directly concerned with the reduction of this waste by determining at what age and under what conditions fish should be planted to insure maximum returns. Improvement of hatchery practices in feeding and selective breeding and the reduction of loss through disease are also under investigation.

Fish management practices which have been developed by many years' experimentation are being tested in various national forest areas throughout the country, which serve as excellent natural laboratories for this purpose. In the Pisgah National Forest project, operated in cooperation with the Forest Service, studies were carried out during the year to determine what size of fish and what intensity of stocking produce most satisfactory results. The effects of various stream improvements on the production of fish and food organisms are also the subject of studies which will find widespread application.

In California, experiments of an essentially similar nature were carried out during the summers of 1937 and 1938 in the Convict Creek Experimental Stream. The survival rates of various species, sizes, and numbers of trout were compared as a guide for stocking programs. Among the results obtained was the finding that hatchery fish of 2 inches or more show a surprisingly high survival in wild waters, and that there is a distinct species difference in ability to make adjustments to new conditions after planting.

The continued operation of test waters in Vermont shows conclusively that stocking alone is not enough to maintain the supply in the waters under observation, for, while the species stocked (brook trout) has shown a consistent decline, the rainbow trout, which is dependent on natural propagation, has held its own.

Fundamental studies in the science of fish nutrition have been continued at Cortland, N. Y. Two lines of attack were made on the problems presented. The first was concerned with improving current hatchery practices by introducing new foodstuffs that are readily available, and by improving the quality of the mixtures in current use. In this connection a process has been developed for freeing linseed meal of its toxic properties by steaming and pressure cooking, while retaining its important property of binding water or meat juices. Progress has been made toward keeping meats for long periods without loss of nutritive value or physical properties, a development which would decrease the labor and investment in refrigeration equipment and make it possible to purchase meat in quantity at periods of low prices.

Field studies in bass streams are concerned with much the same problems as trout studies in colder waters. Studies in selected waters of natural spawning, survival of the young, their food habits and growth, lead to the tentative conclusion that, in the case of bass, natural propagation is more efficient than artificial, and suggest that management practices should be directed chiefly to the improvement of natural conditions.

Experimental studies of fish diseases were continued. The value of routine preventive treatments is being tested, and records are being carefully kept of possible mortality from such treatments. No increase in mortality was found among fingerling trout. Controlled infection studies were also conducted with the object of learning more about the method of transmission of certain diseases in hatcheries.

The Disease Service continued to assist in the diagnosis of hatchery disease by examining preserved specimens sent to the Seattle and Washington laboratories. This service is extended to Federal, State, and private fish culturists.

POLLUTION INVESTIGATIONS

Every State and every major river system have now been included in the stream-pollution studies conducted from headquarters at Columbia, Mo. Over 150 new localities were investigated during the year and observations were continued at approximately 70 old stations. Data collected from these field and laboratory studies are being applied to the solution of practical fisheries problems. Forty-three major cases of stream pollution were investigated by the staff during the year and reports were prepared for the guidance of officials concerned. In addition, the staff has aided in the solution of some 200 lesser problems. Many manufacturers have cooperated to a gratifying degree in applying the findings of the staff.

Detailed surveys were made of several artificial impoundments of water, and practical applications of these studies have been made in connection with the stocking programs of various Western streams on which impoundments have been built or are contemplated.

SHELLFISH INVESTIGATIONS

Oysters continue to hold second place in value among all fishery products. The industry is troubled, however, by the increasing depletion of the natural beds, the destruction of valuable bottoms by pollution, and the losses caused by natural enemies.

In the New England area the principal problems are those of obtaining an adequate set of larval oysters and of protecting the beds from starfish. Information on the expected time of spawning and setting was distributed at weekly intervals during both the 1937 and 1938 seasons through the cooperation of the Connecticut Shellfisheries Commission. This information was based on systematic observations of water temperatures and the condition of oysters at selected points in Long Island Sound. It is hoped to extend this service to other areas in the near future.

The destruction of most of the early season set of oysters in 1937 by starfish demonstrates the importance of studies for their control which were carried on intensively from the Milford, Conn., laboratory during the winter and spring. A chemical method of control was applied under both field and laboratory conditions and its effectiveness in destroying starfish was established. Careful tests have revealed no injury to oysters.

Ecological observations were made by the staff during the year at other points on Long Island Sound and in the inshore waters of Virginia, North Carolina, Alabama, and Florida. These observations have guided State authorities and private oyster growers in transplanting seed and planting material for the collection of set. Plans were also prepared for the rehabilitation of several depleted areas.

Studies under way from the new marine laboratory at Pensacola, Fla., include surveys of the condition of local oyster beds and the collection of hydrographic data and plankton samples at selected points.

A preliminary report was published during the year setting forth the causes of the decline in oyster production which has been strikingly evident in the York River, Va. Field and laboratory studies have demonstrated that the effluent from a local pulp mill is toxic to oysters and that its discharge into the York River is primarily responsible for unfavorable conditions in this area. Further chemical studies of the effluent are being continued to determine which of its constituents are most toxic.

LAW ENFORCEMENT DIVISION

This Division is concerned with the enforcement of the act of 1931, regulating interstate commerce in black bass, and work incident to the Whaling Treaty Act of May 1, 1936, to give effect to whaling treaties. This Division also conducts an anglers' service, and issues permits for the taking of bait fish in the District of Columbia.

The black bass law.—There has been no change in the manner of administering the Federal black bass law since last year. In cooperation with the States, approximately 100 investigations have been made of alleged illegal shipments of black bass, many of which have resulted in obtaining evidence on which prosecutions can be based in either Federal or State courts. In many cases seizures of black bass were made, and objectives obtained without recourse to court procedure.

In connection with the administration of the black bass law, the Division assists the States in the improvement of their angling laws, and in bettering black bass conditions in other ways. The Bureau has received excellent cooperation from the States in this work. The usual publications on fish laws, angling, etc., have been renewed and distributed, to supply an increasing demand.

Whaling.—A total of 25 licenses to take and process whales were issued by the Secretary of Commerce to 2 floating factory ships, 1 shore station, and 22 catcher boats which are operated from the factory ships and shore stations. The total revenue received from these licenses was $7,000, which was turned over to the United States Treasury. One scientific permit was issued to import a Right Whale for scientific purposes.

The enforcement of the whaling laws is primarily the duty of the Coast Guard and the Bureau of Customs, with which the Bureau of Fisheries cooperates.

The Department is charged in the Whaling Treaty Act with the collection of statistical and biological whaling data in addition to the issuance of licenses. The Division has prepared two statistical reports covering the number of whales taken, species, sex, size, etc., which have been forwarded to the Association of Whaling Companies, Sandefjord, Norway, as required by treaty, and has completed biological examinations of a large number of samples of whale stomach contents from whales captured by United States whalers.

Angling.—A large part of the time of the Division is taken up in answering questions relative to how, when, and where to fish. Complete information on fishing tackle, fishing laws, etc., has been assembled in the Division for the use of anglers.

VESSELS

Fifteen vessels of the Alaska service cruised about 115,000 nautical miles in the fiscal year 1938, as compared with 131,000 miles in the preceding year. The *Penquin* covered approximately 30,000 miles, the *Brant* about 12,000 miles, and the *Crane*, *Scoter*, and *Teal* each about 10,000 miles.

The *Penguin* made five round trips between Seattle and the Pribilof Islands, transporting personnel and emergency supplies. Interisland service was performed, and native workmen from the Alaska Peninsula were transported to the Pribilof Islands to assist with the sealing activities. Two trips were made to the western Aleutians, one in July and one in September, in connection with the sea-otter patrol.

The *Auklet*, *Kittiwake*, *Merganser*, *Murre*, and *Widgeon* were engaged in fishery protective work in southeast Alaska during the 1937 season. The *Blue Wing* operated on Prince William Sound, the *Eider* in the Kodiak area, the *Ibis* at Chignik, the *Red Wing* in the Alaska Peninsula area, and the *Coot* on the Yukon River. The *Crane* transported personnel and supplies between Seattle and Bristol Bay in May and August and patrolled the Alaska Peninsula area during the intervening period.

The *Scoter* was used on Bristol Bay during the fishing season there and then participated in the patrol of the Alaska Peninsula area for a short time. From about the middle of August to the middle of September it was engaged in the patrol and stream-survey work in the Kodiak area; similar duty was performed later in the vicinity of Craig in southeast Alaska. The *Teal* was engaged in herring tagging operations in southeast Alaska in the spring, after which it carried on the patrol in Cook Inlet from May to August and on Prince William Sound for a few weeks in September.

The *Brant* was used primarily for general supervisory work, chiefly in southeast Alaska, although one cruise was made as far westward as Dutch Harbor in July.

In the spring of 1938 the *Scoter* assisted with the fur-seal patrol in the vicinity of Neah Bay, Wash.

The *Pelican*, which was reconditioned during the previous year for use in shrimp investigations in the South Atlantic and Gulf areas, was engaged in exploratory trawling in offshore waters in the Gulf of Mexico during the greater part of the winter and spring.

APPROPRIATIONS

Appropriations for the Bureau for the fiscal year aggregated $1,967,000, as follows:

Salaries, Commissioner's office	$150,400
Propagation of food fishes (including $260,000 for construction)	929,000
Maintenance of vessels	168,000
Inquiry respecting food fishes	262,000
Fishery industries	73,600
Fishery market news service	75,000
Alaska fisheries service	274,000
Enforcement of black bass law	13,500
Mississippi Wild Life and Fish Refuge	17,900
Whaling Treaty Act	3,600
	1,967,000

LIGHTHOUSE SERVICE

The special attention and study which has been given, during the last 2 or 3 years, to some of the broader aspects of personnel administration in the Service with a view to the revision of some Service policies in this regard, in order to adapt them more closely to contemporary economic and social conditions, has resulted in an important change during the year. The civil service principle has been extended to the petty officers in both the deck and engineer departments of the vessels of the Lighthouse Service. This important change was brought about by Executive Order of March 29, 1938, bringing these positions within the scope of the Civil Service Act. The signing of this order by the President represented the consummation of more than a year's study and planning by the Lighthouse Service, the Department of Commerce, and the Civil Service Commission. This measure affects upwards of 325 positions, principally those of quartermaster and oiler, and encumbents of such positions will henceforward be selected competitively in the same manner as other personnel whose positions are subject to the Civil Service Act. In addition to the petty officer positions, this measure also embraces light attendant positions, so that there is a substantial enlargement of the majority of personnel in the Lighthouse Service who are subject to the principle of the civil service. Present incumbents of these positions who acquire a civil service status incident to the promulgation of the Executive Order mentioned will become eligible for advancement in the Service according to individual merit as vacancies hereafter occur, and the measure is regarded as an important step in the further extension of the career service ideal.

Another measure arranged for and presently to become effective is that involving assembled educational examinations for keepers and vessel officers, the aim of which is to further and improve personnel administration through higher standards of original entry, consistent with increasing amount of technical skill required in view of the growing mechanization of the Service, and the desirability of keeping open avenues of advancement.

On account of the special conditions affecting the employment of lighthouse keepers, their probationary period has recently been extended from 6 months to 1 year, and all keepers hereafter appointed will have an opportunity to more thoroughly demonstrate their qualifications before their appointment is made absolute. A full appreciation of this provision adds greatly to the possibilities for better civil service personnel administration.

Two useful items of legislation to strengthen the general personnel policy of the Service were also enacted by Congress during the year, one of which provides a small sum each fiscal year for the travel of new appointees to their first post of duty at isolated stations; and

another that makes possible financial assistance in the transportation to and from school of the children of keepers at isolated stations.

A further improvement in the functioning of lighthouse tenders, and one calculated to remove some of the difficulties attending at present the continuous maintenance of an officer watch, particularly in port, involves the appointment of higher grade petty officers in both the deck and engine room departments. The present plan calls for the appointment of such petty officers on the tenders as funds become available. A license will be required of these officers and they will therefore be competent to temporarily replace those in higher grades as occasion requires.

Under the Public Works Administration Appropriation Act of 1938 there was allotted to the Lighthouse Service the sum of $2,098,750, for which a special program had previously been submitted, covering construction of undertakings in 28 States along the coasts and interior waterways of the continental United States, selected from among the more urgent needs of the Service. A total of 104 individual projects were on the list, and a wide distribution of funds will result, as many of the projects are of a diversified nature and also call for operations at two or more points. Upon the definite announcement of the allotment, steps were at once taken to get the entire program under way, in order to fully meet the intention of the act in providing immediate employment throughout the country. However, as the act became effective only 10 days before the end of the fiscal year, preliminary planning only is reported herein.

A further allotment of $1,680,000 for the construction and reconditioning of lighthouse tenders and lightships was under consideration by the Public Works Administration at the end of the year and was later definitely made.

Considerable progress has been made with the recently initiated program calling for the gradual modernization of Lighthouse Service facilities upon the Mississippi and tributary rivers. The progressive changes with respect to draft of vessels and demand for more consistent operating schedules with resultant need of large number of buoys at certain seasons has greatly altered the character of service required of lighthouse tenders. An important field for economical and efficient use of more modern lighting equipment is also provided in this area. Changes, both in equipment and administrative methods are necessary to best meet present conditions as a result of which the large and important river district will be brought more closely into line with the organization of other lighthouse districts. It seems evident that an increase in efficiency, and more prompt and effective service in emergency as well as certain economies, will result from maintaining various groups of lights and other aids from servicing bases located centrally to the considerable section they will serve. With this in view, steps have been taken to establish such bases at Pittsburgh, Pa., Point Pleasant, W. Va., and at Gasconade, Mo. The tender equipment of the Service in this area has been considerably strengthened by the commissioning of the new lighthouse tender *Goldenrod* on June 2, 1938. This small but effective and economical vessel was specially constructed for the character of work now required in the maintenance of aids to navigation on interior rivers, and will be utilized on the Missouri River to assist

in the care of aids in the 377-mile section from the mouth of Kansas City within which as many as a thousand buoys are maintained at certain seasons.

The Missouri River, under improvement for navigation purposes at an expenditure of many millions of dollars, is at present provided with navigational aids only as far as Kansas City. Above Kansas City the river is practically ready for opening to navigation as far as Rulo, Neb., and with the early availability of water from the Fort Peck Reservoir will be open, according to best information available, as far as Omaha by the time construction of additional tender equipment can be completed. Work on the remainder of the river, which it is proposed to make available as far as Sioux City, Iowa, a total distance of 790 miles, is proceeding rapidly, with expectation of completion within 3 years. With the increasing use of buoyage throughout the navigable rivers, the improvements in navigable channels in this river, in the Tennessee River, and the near completion of pooling operations in the upper Mississippi River, the supplementing of the tenders in the fifteenth lighthouse district is immediately desirable. It is accordingly proposed to construct at once two additional tenders of this special type.

The total number of aids to navigation maintained by the Lighthouse Service at the close of the fiscal year was 28,758, a net increase of 652 over the previous year. Of the additional aids established, 405 were lighted aids, 54 were sound signals, and 232 were unlighted buoys and daymarks.

New aids to navigation for three of the remotely situated United States islands in the Pacific Ocean have been provided by the Lighthouse Service in cooperation with the Department of the Interior. The new lights are located on Howland, Baker, and Jarvis Islands, situated approximately 1,650 miles south and southwest of Honolulu. Since these lights are off the usual track of vessels, they will be operated only on request.

During the fiscal year, radiobeacon equipment was installed at 11 additional light stations, this resulting in a net increase of 8 radiobeacon stations, as during the same period 2 radiobeacons were discontinued, and 1 of the new stations was not actually placed in operation until the day following the close of the fiscal year. Of the new stations, three were on the Atlantic coast, six were on the Great Lakes, and two were on the Pacific coast. The grand total of all United States radiobeacons is now 133, which is approximately 30 percent of the marine radiobeacons of the entire world.

The first low power, unattended "secondary" radio aid to navigation was established at St. Ignace, Mich., June 18, 1938. This radio aid, termed a "marker radiobeacon" operates continuously, without attendance, having automatic duplicate equipment.

Radiobeacon signals were synchronized with sound-in-air fog signals, for distance-finding purposes, at 7 additional stations during the year, there now being 91 stations having such synchronized signals.

There is indication that the present-day needs of shipping for major radio navigational facilities are now well served, particularly as respects those radiobeacons which have a purpose similar to the great landfall lights, in the recently decreased rate of expansion in

this field. Present trends are toward the provision of radiobeacon facilities for additional definite traffic routes and for the marking of the approaches to more and more harbors, the new installations being somewhat affected by the rapidity with which additional commercial vessels are equipped with the necessary receiving apparatus and the ability to operate such additional beacons within the limited band of frequencies available and without detriment to the functioning of the major system of radiobeacons.

Communication facilities have been extended to additional important isolated ships and stations by the installation of radiophones, bringing the total to 82, thus expediting tender operations, patrol, and restoration of aids.

The broadcasting of marine information by means of radiophones has been considerably extended during the year, following the experimental broadcasts made at Sault Ste. Marie, on the Great Lakes, in 1937. The initial broadcasts included urgent notices to mariners regarding navigational aids, weather forecasts, and important hydrographic information and were so favorably received by mariners that an extension of the service was immediately planned. There are now five additional radiophone broadcasting stations on the Great Lakes, and such broadcasts are also made from Key West, Fla., and New Orleans, La. In addition to matter concerning navigational aids maintained by the Service, these broadcasts include information furnished through the cooperation of the United States Weather Bureau and the Hydrographic Office of the Navy Department. A further dissemination of information has been secured through the cooperation of the United States Coast Guard, several of the stations of which rebroadcast the material prepared by the Lighthouse Service. This marine information service was intended chiefly to serve the many small marine craft not equipped with radiotelegraph apparatus or operators and vessels which depend upon radiophone rather than radiotelegraph communication, but reports from users have indicated considerable use by other vessels as well.

Comparison of the figures indicating the various types and classes of navigational aids maintained at the close of the present fiscal year with those for the past 10 years develops in a graphic manner the basic trends in the work of the Lighthouse Service. These trends are particularly significant in view of the many technological changes, both with respect to its own equipment and also that of the shipping which it is its function to serve. These various changes have affected the Service in an almost constantly accelerating pace during this period of time.

The highest percentage of increase in any of the forms of navigational aids is that of the radiobeacons, there now being 100 percent more such signals than there were in 1929. While this figure indicates the remarkable development of radio aids to navigation, it must, of course, be borne in mind that the total number of such aids is still relatively small, some 133 now established meeting fairly well the present needs of the major radiobeacon system but subject to gradual expansion. Lest the progress in the field of radio, not used for navigational purposes until as recently as 1921, seem to overshadow the other activities of the Service, it should be noted that the lighted and unlighted buoys have increased in this 10-year period by 61 percent, and as the total number of such aids is now nearly 16,000 it can

readily be seen that they serve practically every mariner, no matter how large or how small his craft. The lighted buoys, many of them fitted with fog signals as well, are justly considered as one of the most effective aids to navigation made available to shipping. These aids have increased during the past 10 years until the number is now 62 percent more than at the beginning of that period. Lighted aids to navigation, on fixed structures, have increased by 31 percent in the 10-year period under consideration; fog signals on buoys have increased by 49 percent; and unlighted beacons or day marks have increased by 48 percent. In the case of the latter the increase is due very largely to the development in the marking of the Intracoastal Waterway. Fog signals at light stations and on lightships have decreased by 3 percent, due almost entirely to the discontinuance of secondary, and often hand-operated, fog signals at stations, and their replacement by more effective fog signals on buoys placed closer to the tracks of vessels. Important changes have also taken place in the illuminants used for lighthouse purposes during the past 10 years. Electricity is now used for 43 percent of the lights on fixed structures, where formerly only 16 percent were so lighted. The great increase in this form of illuminant has accounted for the substantial reductions in almost all other forms. The percentage of acetylene lights has decreased from 45 to 21 percent; incandescent oil vapor lights have decreased from 10 to 2½ percent; and oil wick lights, in all areas except the Mississippi River system, have shown a substantial decrease. Among the lighted buoys, about the same percentage are now, as formerly, lighted by acetylene gas; other kinds of gas lights have shown a substantial decrease; and electric lights have shown a very substantial increase.

IMPROVEMENTS IN APPARATUS AND EQUIPMENT

Extension of the electrification of important light stations continues to be carried out, with increase in the candlepower and effectiveness of the lighted aids to navigation.

Additional research on fog signals was carried out at the Cape Henry Fog Signal Testing Laboratory during the year. The most significant result of this work was the discovery of the remarkable increase in loudness resulting from the simultaneous sounding of two or more electric oscillators of different frequencies. By selecting and combining signals of definite frequencies, it was found that a frequency harmonic structure was built up, which produced a blast of great loudness. These tests may point the way to means of increasing the efficiency of fog signals without an increase in power consumption above that of the present first-class signals, and at lower first costs and considerably lower maintenance costs. Plans of a new type of fog signal, based on these tests, are being prepared, and the purchase of such a composite unit for a service test will be made shortly.

Service tests of electric battery-operated fog horns have continued in six districts on the Atlantic and Pacific coasts, satisfactory results being obtained with this apparatus both at shore points and on buoys, and the unit is now considered to be a satisfactory and economical low-power signal.

Battery powered electric-solenoid-operated fog-bell strikers of the clapper type are in field service at two locations and have proved

efficient during service periods of 1 and 2 years. Power requirement is very small and varies in proportion to the number of strokes per minute. An initial order has been placed for a number of plunger type electric solenoid-operated bell-strikers suitable for use at shore points or on buoys. These will shortly be placed in service in several districts. Plans for installations have been worked out so that when the signals are connected with the shore, monitoring features will be provided to permit of remote control over telephone circuit lines for starting and stopping. This method of control, over telephone lines, is also available for other shore-connected fog signals.

Developmental service installations of apparatus for the remote control of fog signals by means of a modulated light beam, have continued to function at one Pacific coast station and at one Atlantic coast station, with satisfactory results. Equipment of this kind previously installed at Old Point Comfort Light Station, Va., has been temporarily removed, for simplification and improvement, and will later be reinstalled for further service tests. The installation of modern compressed air fog signal equipment in replacement of bell signals has continued as funds became available and is resulting in the further improvement of secondary fog signals. Public Works Administration allotments will permit of continuation of these improvements during the coming fiscal year.

The use of battery-operated electric lights with nonventilated lanterns on buoys has been extended to a number of districts, including the Alaska district, increasing the candlepower of the lights and decreasing the weight and size of the lanterns, an especially desirable feature on the larger buoys. Outages due to submergence in this type of aid have been eliminated.

The Lighthouse Service Radio Laboratory during the year completed the developmental work on a high-power radiobeacon amplifier, on ultrahigh frequency radiophone equipment, and on a calling unit to increase the efficiency and reliability of radiophone circuits. Further improvements were made in a frequency-control exciter, an intermediate-power radiobeacon transmitter, an alarm device, and a timer, and samples completed for use in procurement. Development of a sample low-power radiobeacon transmitter is under way.

Development of a buoy radiobeacon transmitter was largely completed, and preliminary field trials started.

Improvements were made in the equipment of two radio controlled major light stations and one radio controlled lightship, including the installation of alternating-current operated radio control receivers at one station.

The effective area of 10 existing radiobeacons has been increased through the improvement and modernization of the antenna systems and the radio transmitters. Of these 10 new radiobeacons, 6 are provided with vertical insulated tower antennas.

During the year, 21 radiobeacons were equipped with crystal frequency control equipment, and 20 additional installations of such equipment are in progress. These improvements are being made necessary through the extension of radiobeacon service requiring improved signal quality to further minimize interference between stations and to permit use by mariners of more selective radio direction finders.

At stations where radiobeacons and sound signals are synchronized for distance finding, further improvement of centralized timing and control equipment has been accomplished.

The required operating standards for monitoring stations were materially increased. Seventeen radiobeacon monitoring stations are now in daily operation and 62 observation stations are in intermittent use. One additional monitoring station is under construction.

Existing radiotelegraph stations on four lightships were improved. Direction-finder installations on five tenders and lightships were modernized and improved.

ADMINISTRATION

Appropriations for the maintenance of the Lighthouse Service totaled $11,376.000 for the fiscal year 1938. There were also allotted from the 1938 Department appropriations, $6,000 for contingent expenses, approximately $39,000 for printing and binding, and $85,075 for traveling expenses.

There were received and deposited in the Treasury the following: From sale of Government property, $51,065.45; rent of buildings, $1,615.52; forfeitures by contractors, $188; reimbursement for property destroyed or damaged, $10,068.12; work done for private interests, $2,987.76; commissions received on telephones, $21.17; miscellaneous, $1,763.61; total, $67,709.63.

There were allotted on June 29, 1938, by the Public Works Administration, $2,098,750, and subsequently an additional $1,680,000 for special project works.

With the increasing importance of the Calumet-Sag Canal, as a connection between Lake Michigan and the Mississippi River, and therefore a link in the important Lakes to the Gulf waterway, and the need for additional navigational aids, it became necessary to more definitely define the exact boundary on this waterway between the twelfth lighthouse district embracing Lake Michigan, and the fifteenth lighthouse district embracing the Mississippi River system. This boundary has been set at a point 13.9 miles from Lake Michigan and 15.6 miles from the junction of the Calumet-Sag Canal with the Sanitary and Ship Canal.

Among the items of special legislation affecting the Lighthouse Service passed by the Seventy-fifth Congress were several involving the transfer of land and other property (see last two paragraphs at the close of this chapter), an act regarding the marking of wrecks in navigable waters and defining the jurisdiction of the Lighthouse Service, and the acts providing for the transportation of keepers' children of school age, and the transportation of keepers to isolated stations, which are mentioned elsewhere. The act also continues in force the general procedure, with regard to the handling of mess funds of Lighthouse Service vessels and working parties, which has prevailed in the past.

New legislation clarifies the responsibilities of the owners of sunken vessels, and also the duties of the Lighthouse Service, with regard to the marking of wrecks which may obstruct navigable waters of the United States. This act also outlines improved procedure for the handling of funds paid to the Lighthouse Service by private persons for the repair or replacement of navigational aids destroyed or

damaged, which facilitates the accomplishment of such work in a way economical to the Service. Another section of this act designates the Lighthouse Service as having jurisdiction, for the purpose of establishing navigational aids, over all waters improved for navigation by the United States, thus dispensing with the need for specific legislation to confer jurisdiction over each newly improved waterway.

An act also provided for cooperation with the Sea Scout Department of the Boy Scouts of America, by authorizing the disposal, to this organization, without cost, of obsolete or condemned materials, or for the sale of materials that may be spared by the Lighthouse Service.

An act provided for the sale, to the Otto Oas Post, Veterans of Foreign Wars of the United States, of the old lighthouse keeper's residence in Manitowoc, Wis.

Several transfers of land were provided for by acts of Congress during the year, including the following: A strip of land forming part of the Mahon River Light Station, Del., was transferred to the State of Delaware for highway purposes. Seventy acres, forming a part of the Twin River Light Station, Wis., were transferred to the State of Wisconsin for park purposes. Two parcels of land in the Hawaiian Islands were exchanged with private parties for two similar pieces, to provide for the better location of the Kahului Harbor range lights. A portion of the Catano Range Rear Light Station, in Puerto Rico, was authorized to be conveyed to the Territorial Government for roadway purposes. At Guanica, P. R., an exchange of lands was authorized with the Territorial Government to obtain sites for the better location of range lights.

Other special acts of Congress authorized the Secretary of the Treasury to make certain transfers of former Lighthouse Service property, such property having been reported by the Lighthouse Service to the Director of Procurement for disposal.

PERSONNEL

During the fiscal year there was a net increase of 138 in the authorized personnel for the operation and maintenance of the Service, more than 100 of this increase having been in vessel complements, principally necessary in order to provide in a regular way for the increased leave allowances on vessels, and to provide for the observance of the regulations regarding the hours of labor. The total personnel as of June 30, 1938, was 5,189, including 1,177 light keepers and assistants; 1,895 officers and crews of lightships and tenders; 113 Bureau officers, engineers, and draftsmen, district superintendents and technical assistants; 186 clerks, messengers, janitors, and office laborers; 144 depot keepers and assistants, including laborers; 1,243 laborers, etc., mostly employed on part-time basis; and 431 field force employees engaged in construction and repair work.

During the year, in addition to their regular duties, a number of employees rendered aid to those in distress; 98 instances of the saving of life and property, or the rendering of other valuable aid were reported, many of which acts were performed at great personal risk.

Changes in the superintendents of three lighthouse districts have been made during the year. In the first district H. M. Ingalls was

appointed superintendent, on the detail to Washington of C. C. Brush to the position of Chief of the Marine Engineering and Construction Division, on September 4, 1937. In the eighth district E. C. Merrill was made superintendent on the retirement of E. S. Lanphier, on May 31, 1938. The position of superintendent of the seventeenth district, vacated by the transfer of Mr. Merrill, had not been filled at the end of the year.

LIGHTHOUSE TENDERS

At the end of the year the total number of lighthouse tenders was 62, of which 58 were in commission, 2 were laid up, 1 was being prepared for service, and 1 was out of commission and advertised for sale. Of the vessels in commission, 41 were steam-propelled, 13 had Diesel engines, and 4 had Diesel electric drive. The average age of the fleet of tenders is 19.73 years. There are eight tenders, aggregating 6,680 tons, 35 years of age and over.

Thirty-one lighthouse tenders are equipped with radiotelegraph, 35 with radio direction finder, and 18 with radiotelephone.

One new tender, the *Goldenrod*, was completed and commissioned during the year. Contracts for the construction of three additional tenders, the *Maple*, *Narcissus*, and *Zinnia*, were awarded on April 15, 1938, and the vessels are now under construction.

A stern-wheel, coal-burning towboat, the *LeClaire*, was acquired from the United States engineers, at a cost of $7,500, and an additional sum of $2,500 was expended for the repair thereof, with a view to placing it in service upon the Mississippi River. This vessel was originally built in 1915 at a cost of $44,238.

The following lighthouse tenders were extensively overhauled during the year: *Greenbrier*, *Ivy*, *Shrub*, and *Speedwell*.

It is expected that the following lighthouse tenders will be overhauled or reconditioned during the coming year: *Beech*, *Cypress*, *Hyacinth*, *Manzanita*, *Palmetto*, *Sequoia*, *Spruce*, *Tulip*, and *Wakerobin*.

LIGHTSHIPS

Lightships were maintained on 30 stations during the year, and at the close of this period the fleet consisted of 42 ships. In addition to the regular station ships, nine were held as relief ships and three were held in reserve.

Lightship *No. 69*, which was condemned during the previous fiscal year, was sold on July 15, 1937, for the sum of $3,030. Lightship *No. 72*, was condemned and sold on January 5, 1938, for the sum of $827.

A lighted whistle buoy was permanently assigned to the Heald Bank Station, Tex., on June 30, 1938.

One new lightship, *No. 118*, for the Cornfield Point Station, was under construction during the year, as described elsewhere.

During the year lightships *No. 76*, *No. 81*, *No. 85*, *No. 91*, and *No. 94* were extensively overhauled or reconditioned, and it is expected that similar reconditioning will be accomplished during the coming year on lightships *No. 79*, *No. 84*, *No. 90*, *No. 93*, *No. 100*, and *No. 107*.

PROGRESS OF VESSELS UNDER CONSTRUCTION

Lightship "No. 118."—This vessel, being constructed under contract with Rice Bros. Corporation, East Boothbay, Maine, and which was briefly described in last year's annual report, was launched on June 4, 1938, and was 91.88 percent completed at the end of the fiscal year. It is expected that the vessel will be completed, turned over to the Government, and placed on station before the end of the calendar year. The ship has been built specially to mark the Cornfield Point Lightship Station, in Long Island Sound, just to the westward of New London, Conn. Here it will replace Lightship *No. 44*, the last lightship without propelling engines to regularly occupy a station, with the exception of the radio-controlled Lake St. Clair Lightship, on the Great Lakes.

Tender "Elm."—This small tender was designed for use in the inlets and bays of the New Jersey coast, and was more completely described in last year's report. Official trials were held on November 17, 1937, the vessel was accepted, and was placed in commission on April 1, 1938.

Tender "Goldenrod."—This tender is a shallow draft, twin-screw vessel, designed primarily for buoy work on interior rivers, and was more completely described in last year's report. Official trials were held on May 28, 1938, and the vessel was placed in commission on June 2, 1938.

Tenders "Maple," "Narcissus," and "Zinnia."—These three small tenders, of the same design, have been placed under construction during the year, and when completed, will be assigned to the tenth, fourth, and seventh districts, respectively. A contract for the construction of the *Narcissus* and the *Zinnia* was awarded to the John H. Mathis Co., of Camden, N. J., on April 15, 1938, at a total cost of $440,046, the vessels to be delivered in 350 and 320 days, respectively. A contract for the construction of the *Maple* was awarded to the Marine Iron & Shipbuilding Co., of Duluth, Minn., on April 15, 1938, the cost to be $190,000, and delivery to be made in 300 calendar days. These tenders are 122 feet 3 inches in length overall, 27 feet in breadth, and will displace approximately 342 tons at a draft of 6 feet 6 inches. They will be propelled by two direct reversible Diesel engines, each connected to its propeller shaft by reduction gears. These vessels are to be of approximately 40 percent welded construction, welding being used principally on the longitudinal and transverse framing members, and on the deck and bulkhead plating. This is a departure, but a progressive one, from the all-riveted construction formerly used for Lighthouse Service vessels. Another new design feature is a tripod type of mast, eliminating the usual shrouds and backstays, and facilitating the use of the derrick with which it is fitted. A modified flat-plate keel, having a heavy flat bar welded outside the plating, is being used for the first time in this Service. This construction will result in the vessel being of less draft than if fitted with a standing bar-keel, and will eliminate objectionable docking features of the orthodox flat plate keel construction, and as applied in these tenders, will add considerably to the strength of the keel. The buoy lifting gear will have a safe working capacity of 10 tons, quite large for so small a craft.

"LeClaire."—This stern-wheel towboat was secured from the War Department on May 17, 1938. The principal dimensions of the vessel are: Overall length, 151 feet; beam, 31 feet; depth of hull, 4 feet 5 inches; draft fully loaded, 4 feet. The vessel is fitted with horizontal, tandem, compound, engines direct connected to a stern paddle wheel. It has one coal-burning, water-tube boiler. The hull is of steel construction throughout. The vessel is being given a general overhauling, and will be placed in commission sometime during the fiscal year 1939.

PROGRESS OF SPECIAL WORKS

Boston Harbor, Mass.—For the preservation of the Deer Island Light Station, the cast iron portions of which were badly cracked by ice, a steel, interlocking, sheet-pile caisson was built around the base of the cast iron pier. The caisson was filled with stone and capped with a concrete deck. Other repairs were also made to the cast iron plating and the boat hoisting gear. Total cost, $10,180.

Cape Cod Canal, Mass.—Further work on the improvement of the marking of the channels leading to the Cape Cod Canal was done during the year, six additional lights on fixed structures being erected in the Hog Island Channel approach in Buzzards Bay. One of these lights is also fitted with a fog bell. Previous work under this project was described in last year's annual report. Total cost of the project, $40,619.74.

Cleveland Ledge, Mass.—An allotment of $175,000 has been made for the erection of a new first-order light, fog signal, and radiobeacon station in Buzzards Bay in the southern approach to the Cape Cod Canal. This structure will stand in approximately 16 feet of water, on a submarine site, 2 miles from land. It will mark the channel between two dangerous ledges. A survey of the site has been made, consisting of both soundings and borings, and plans for the structure are being prepared.

Long Island, N. Y.—An allotment of $40,000 has been made for the purchase and establishment of lighted and unlighted buoys in the inlets and inland waterways along the south side of Long Island, to provide for night navigation as well as increase the safety of day navigation. The project also provides for a buoy boat for the servicing of these new aids. Total cost to June 30, $21,958.

Hudson River, N. Y.—This project provides for the improvement and extension of the system of buoyage, and for the erection of additional automatic lights in the Hudson River between Tarrytown and Kingston. Three lighted buoys are being replaced by lights on fixed structures, range lights are being established for the Tarrytown Channel and for the Silver Point Channel, and three other automatic lights are being established, two in Haverstraw Bay and one at Kingston Flats. Foundations for the new lights have been built, the skeleton towers erected, and equipment has been purchased. Of the $46,000 allotted, $16,408 had been expended by June 30.

Watervliet, N. Y.—A 6-inch concrete paved roadway was constructed, and an elevated storage space was provided for buoys and other equipment above the reach of flood waters. The sea wall was repaired, and a concrete retaining wall was constructed. Total cost, $8,687.29.

Kill van Kull, N. Y. and N. J.—Two automatic lights were established in the Kill van Kull north channel, both being 18-foot skeleton steel towers on concrete bases protected by riprap. The work was completed, the total cost being $9,321.67.

Roosevelt Inlet, Del.—Four automatic acetylene lights, on skeleton steel towers, two forming a range, and two marking the ends of the north and south jetties, were established at Roosevelt Inlet. This inlet, which has been deepened and improved, gives access to Rehoboth Bay from Delaware Bay, via the old Lewes and Rehoboth Canal. Cost $4,754.94.

Chesapeake and Delaware Canal, Del. and Md.—This project for the establishment of approximately 9 sets of range lights, 29 minor lights, 17 lighted buoys, 14 unlighted buoys, and 3 fog signals was necessitated by the War Department project for deepening and widening the canal proper. At the end of the fiscal year practically all the work had been completed except the erection of five sets of range lights and the placing of the unlighted buoys. The work of constructing the foundations for four sets of range lights on submarine foundations, and the establishment of a servicing base at Chesapeake City is underway. It is estimated that the project is 75 percent complete. Cost of the project to June 30, $99,075.

Pocomoke River, Md. and Va.—The dredging and improvement of the channel in this river, which is not yet completed, is to be followed by the establishment of new aids to navigation. All material has been purchased and is on hand.

Beaufort, N. C.—A general arrangement and improvement of aids in Beaufort Harbor was made, including the establishment of eight additional lighted buoys and four additional unlighted buoys. Total cost, $19,740.

Charleston, S. C.—The Charleston Light Station on Morris Island is being converted from an attended to a fully automatic station, and the foundation of the tower, threatened by the continued encroachment of the sea, is being protected by the construction of an interlocking steel sheet piling cylinder surrounding the base. The former first-order electric light has been replaced by an automatic acetylene light of the mantle type, showing the same characteristic as formerly. This work has been completed. The placing of the sheet piling protection wall is being performed by contract, from an allotment of $17,500, and $4,010 had been expended to June 30.

Intracoastal Waterway, S. C., Ga., and Fla.—Further progress in the marking of the sections of this waterway lying in the above States was made during the year, this being a continuation of the work reported last year. There were newly installed, 155 electric lights on standard 3-pile dolphins, 159 daymarks on single-pile dolphins, and 28 special third-class buoys. In addition, 60 lights were fitted with larger lanterns and equipped with electric lamp

changers. Reflectors were also installed on 630 unlighted aids. To facilitate the work in the Intracoastal Waterway, the channel leading to the recently established Fort Pierce buoy depot was dredged to a depth of 6 feet, and the storage space was improved by the erection of a substantial enclosing fence. Cost to June 30, $70,968.86.

Port Everglades, Fla.—Improvement of the navigational aids marking the harbor of Port Everglades is being made, consisting of the erection of four three-pile iron light structures, two single-pile iron light structures, and the moving of two range lights to new sites. A contract for the fabrication of four of the iron structures has been let, and other equipment is being assembled. Cost to June 30, $11,641,13.

Florida Reefs, Fla.—The replacement of temporary beacons on the Florida Reefs with permanent structures, the initiation of which has been provided for by an allotment of $40,000, is progressing. A contract for the construction of five wrought iron structures, to be erected at Elbow Reef, Dixie Shoal, Coffin Patches, Big Pine Shoal, and Pelican Shoal was let before the end of the year. Cost to June 30, $26,033.

Intracoastal Waterway, Ala., Miss., and La.—See annual report, 1937, page 116. Aids to navigation have been established in Dog River, Cat Island West End Channel, Bayou Perot, Bayou St. Denis, Bayou Petit Anse, Lake Arthur, and Bayou Villers. Five lights yet remain to be erected in Mud Lake. Field work on the project is 80 percent completed, and practically all expenditures have been made. Cost to June 30, $9,866.55.

Sabine-Neches Waterway, Tex.—See annual report, 1937, page 117. An additional light and lighted buoy were established in the Neches River south of Beaumont. Additional materials and equipment have been purchased for lights on the Sabine-Neches Canal, Sabine Pass, and Port Arthur sections of this waterway. Project 48 percent completed. Cost to June 30, $28,759.87.

Mona Island, P. R.—Progress has been made with the electrification of this station, the improvement of the illuminating apparatus, and the installation of a radiobeacon. During the year engine generators have been installed and placed in operation for lighting purposes, much of the radiobeacon equipment has been set up, and installation of the wind-electric plant will begin shortly. It is anticipated that the amount of wind normally experienced at this station will be adequate to generate a very large percentage of the required electric current. The sum of $9,904 has been expended or obligated to date.

Presque Isle Harbor (Marquette), Mich.—This project covers the establishment of an unattended light to mark the end of the breakwater extension, the erection of a keeper's dwelling, and construction of a boathouse at Marquette. At the end of the year the work of the War Department had not as yet reached a point where the erection of a light tower could be commenced. The erection of the keeper's dwelling is progressing, under contract, and the construction of the boathouse is also under way. The project, as a whole, is 10 percent completed.

Whitefish Point Light Station, Mich.—The construction of five wooden pile groins to check shore erosion and prevent further damage to station property begun in the previous fiscal year, has been completed, by contract, the cost being $15,190.

Portage Lake Ship Canals, Mich.—The complete rebuilding of the Portage Lake Ship Canal Light Station, made necessary by extensive channel improvements undertaken by the War Department, and which was underway during the previous fiscal year, has progressed satisfactorily. The steel work and 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 is completed. Rear light and fog signal are now on a temporary structure. The service building and the three-family dwelling for the keepers have been completed. Cost to June 30, $78,609.67.

Calumet Harbor, Ill.—See annual report, 1937, page 117. The construction of the light and fog signal station on the south end of the new breakwater has been completed. A tower was moved from Holland, Mich., reconditioned, and prepared for the reception of the new apparatus. All signals at the new light station are remotely controlled, through submarine cable connections, from the previously existing Calumet Harbor Breakwater Light Station. Electricity for the operation of the light, obtained from commercial power lines, is conveyed to the new station through a submarine cable, and electric storage batteries, of suitable capacity, are provided as a stand-by. The fog signal is an air-operated diaphragm horn, the air normally being supplied from an electric motor-oper-

ated compressor, a gasoline engine-operated compressor also being available as a stand-by. Total cost, $24,932.66.

Illinois River, Ill.—The project for the improvement of aids to navigation in this waterway was intended principally to provide for the purchase and establishment of a number of third-class special buoys, and the establishment of pile clusters in Peoria Lake in order to mark the channel for night navigation. Cost to June 30, $9,779.39.

Point Pleasant, W. Va.—A portion of the property formerly used as lock 11 on the Kanawha River, located near Point Pleasant, W. Va., was obtained for use as a servicing base for navigational aids in the general vicinity. This property, in addition to adequate water frontage, includes a storehouse, a workshop, and four dwellings. Improvements being made include modernization of two of the dwellings and the provision of storage tanks for gasoline. A Diesel powered motorboat, a truck, and a speedboat are also being procured for use in servicing the aids in this area. Cost to June 30, $23,560.88.

Tennessee River.—This project covers the marking of the navigable channel of the Tennessee River from Pickwick Dam to Guntersville Dam, a section of the river lying almost wholly within the State of Alabama. Lights and buoys were installed to mark the channel through the Wheeler pool. In the Pickwick pool the buoys were moved to suit the new channel conditions, older light structures were moved, and a number of new light structures were erected. All materials are on hand and the installation of the lighting equipment is in progress. Cost to June 30, $12,019.19.

Mississippi River.—Improvement in the marking of the upper reaches consisted of the establishment of 95 automatic flashing lights, and 32 of the third-class special buoys, between St. Louis, Mo., and St. Paul, Minn. An additional quantity of lighting equipment and buoys is on hand, and the work of installation will soon be taken in hand. Cost to June 30, $18,329.01.

Missouri River.—That portion of the river between its mouth and Kansas City is to be better marked by the installation of improved lighting equipment, including 100 oil lanterns and 150 automatic flashing lights. New equipment has been purchased and installation is to begin within a short time. Cost to June 30, $21,784.05.

New Dungeness, Wash.—This project is a continuation of a previous one to provide shore protection, and to reconstruct the wharf and tramway at the New Dungeness Light Station. Because of progressively building up of the sand spit, as the result of work done under a previous project, additional work was postponed until further observations could be made. At the close of the year bids had been received for the placing of additional riprap and for the reconstruction of the wharf. Cost to June 30, $455.63.

Columbia River, Oreg. and Wash.—This project provided for the establishment of aids to navigation on the Columbia River between Bonneville and The Dalles, Oreg., and from Celilo, Oreg., to Walulu, Wash. The aids will include the necessary lights, buoys, and beacons to mark the ship channel from the Bonneville Dam to The Dalles, and necessary lights to provide for night navigation between Celilo and Umatilla. A channel has not yet been provided above Umatilla. At the close of the year the project was practically completed, 46 semiautomatic electric lights, 5 electric lighted buoys, and 3 day beacons having been established. Cost to June 30, $22,746.88.

Los Angeles, Calif.—A gasoline-engine powered launch is being provided for the servicing of aids in Los Angeles Harbor, and a boat hoist and boathouse will be erected for its protection at the Los Angeles Harbor Lighthouse Depot. The launch has been received from the Mare Island Navy Yard where it was built; hoisting apparatus, also secured from the Navy Yard, has been reconditioned; and bids for the construction of the boathouse have been invited. Cost to June 30, $5,714.

Radiobeacons, general.—A special project covering the extension and improvement of the radiobeacon and communication system, which was under way in the previous fiscal year, has been continued in the present year. Ten new radiobeacons were placed in commission during the year, as follows: Nobska Point, Mass., St. Paul Island, Alaska, Green Bay Harbor, Wis., Manana Island, Maine, St. Ignace, Mich., Bonita Point, Calif., South Buffalo South Side, N. Y., Superior Entry, Wis., Old Mackinac Point, Mich., and Georgetown, S. C.

A radiobeacon was also installed at Portage Lake Ship Canals, Mich., being placed in operation after the close of the fiscal year.

Interlocked operation of radiobeacon and sound signals for distance finding purposes was completed at 7 additional stations, making a total of 91 such aids. One additional radiobeacon monitoring station is under construction, and communication facilities have been extended to 16 additional important isolated ships and stations, by the installation of radiotelephones, bringing the total to 82, and expediting tender operations, patrol work, and the restoration of aids.

Fog signals, general.—See annual report, 1937, page 118. This project, a general service item, providing for the improvement and extension of fog signal facilities, is about 90 percent completed. Cost to June 30, $40,497.78. Under this project, fog signals were improved at the following stations: Two Bush Island, Maine, Beavertail, R. I., New London Ledge, Conn., Penfield Reef, Conn., Christiana Jetty, Del., Sharps Island, Md., Hooper Island, Md., Love Point, Md., Smith Point, Va., Wolf Trap, Va., Lightship *No. 94*.

IMPORTANT WORKS COMPLETED

Kewaunee Shoal and Green Bay Angle Lights, Wis.—See annual report, 1937, page 117. Structures for unattended lights on submarine sites were built from the same plans at both the above sites. The structural work consists of an outer casing of interlocking steel piling, 30 feet in diameter and filled with small stone. Piling 50 feet long was used which provided for a penetration of approximately 12 feet, a depth of water of 20 feet, and a deck height above water of 18 feet. The foundation material at Kewaunee Shoal was hard gravel and at Green Bay Angle stiff clay.

The main deck consists of a reinforced concrete slab over the entire area. A 30 foot structural steel tower and tank house formed the superstructure, surmounted by a 375 millimeter acetylene light.

The foundation cylinder was reinforced by riprap stone to a point 7 feet below the water line. The cost of Kewaunee Shoal Light was $27,594.71 and of Green Bay Angle Light $25,069.73.

Mary Island, Alaska.—A new, reinforced concrete, light, fog signal, and radiobeacon building has been completed. This new structure replaces an old frame building originally built in 1903. The new building consists of one story and a basement, above which rises the tower for the light. The first floor houses the power plant, consisting of engines, air compressors for the fog signal, and electric generators for the radiobeacon and for lighting purposes. On the same floor are the radiobeacon transmitters and the control equipment for the light and fog signal, including the timing devices for sending synchronized signals for distance-finding purposes. Provision has been made in the basement for the heating plant, fuel storage, and other station supplies. The structure is of modern design, the tower being square in plan and relieved only by such decorative treatment as is readily applicable to concrete construction. Total cost, $54,792.

COAST AND GEODETIC SURVEY

REVIEW OF THE YEAR

The work of the United States Coast and Geodetic Survey for the year past carries many accomplishments of interest and importance. The Bureau has progressively improved methods and appliances, without reducing its high standard of precision but with an appreciable reduction in operating costs. Among other things, its records cover nautical and aeronautical charts, compass variations, tide and current predictions, control surveys, which include the exact geographical locations and elevations of thousands of points throughout the United States, earthquake data, and related subjects, such as gravity, variation in sea levels, current diagrams, information on ocean depths, the size and shape of the earth, manuals on its various kinds of surveying, and many other matters. These records also include basic data of great educational value, reaching from ready commercial use to vital contributions to the ultimate solutions of fundamental scientific problems.

The Bureau has responded to the rapidly rising demand for its products and it is appropriate to cite that the many collateral uses to which these data are put increase their value. For example, each year more and more gaps are filled in the basic geodetic control survey of the country, furnishing accurately determined latitudes, longitudes, distances, and true bearings, and these data are not only used to insure the accuracy of positions on charts, but the taxpayer is learning they are available as a money saver in engineering and industrial operations, such as hydroelectric power development, drainage and irrigation projects, flood control, highway location, boundary lines, etc.

Operations on land, sea, and in the air and the compilation and issuance of the finished products by the Washington office must be a continuing process with such increases from year to year as are necessary to anticipate the most urgent needs of the public. A stoppage of any of the projects, many requiring more than one season for accomplishment, is expensive.

Because of the many changes which occur and the need for publicizing new conditions, the Bureau's work for the area covered is not finished with the issuance of a chart. Ever keeping in stride with the greater requirements of the users of nautical and aeronautical charts, those of today show a wealth of detail which in other days were as impracticable as they were unnecessary.

There was an increase in orders this fiscal year over last of 7 percent for aeronautical charts and 5 percent for nautical charts, while for all navigational publications the increase was approximately 6.5 percent, and 141 percent as compared with the number issued a

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decade ago. These increases are the more remarkable when it is realized that 1937 was in itself a record year in each of the instances mentioned. Over 351,000 nautical charts were issued, exceeding that for 1937 and for all previous years in the history of the Bureau.

Bureau work continues to be augmented by the increased activities of other agencies. This should be met by a small increment in appropriation to permit the proper publication of the changes in existing conditions. Construction of new and better navigation aids by the Lighthouse Service, the dredging and other improvement of waterways by the United States Engineers, and the marking of new air routes by the Bureau of Air Commerce, are improvements which, while beneficial to the marine and aviation industries, add materially to the work of revising charts and necessitate the issuance of frequent new editions.

The unprecedented use of the Bureau's products and the work accomplished by other Bureaus which must be shown on its charts are creating a situation with which it is increasingly difficult to cope with the present available appropriations and personnel.

Some relief came toward the end of the year in the form of an allotment of $2,051,000, under the terms of the Public Works Administration Act of 1938: covering $490,000 for geodetic surveys in 34 States; $136,000 for replacement of fathometer equipment on 5 survey ships, repairs to observatory buildings and equipment for 44 tide stations; and $1,425,000 for the construction of 2 vessels. One of the latter will be a survey ship of about 1,500-ton displacement, for offshore surveys in the Aleutian Islands, with an 8,000-mile cruising radius and a complement of 90 officers and men, and the other, an 88-foot tender to replace the *Helianthus*. The regular appropriation of $2,665,500 for the fiscal year 1939 will be materially aided by the Public Works Administration Act allotment, particularly with respect to the geodetic work.

DEVELOPMENT OF METHODS AND INSTRUMENTS

The Dorsey Fathometer No. 3, a precision echo-sounding instrument, has been developed for use both in shoal and deep water. Placed on one of the Alaska ships, the *Westdahl*, it has already measured depths from 5 to 450 fathoms. It is expected that this type will come into general use on Survey ships, because of its increased precision and adaptability.

The regular use of automatic buoys, known as sono-radio buoys, in lieu of the small survey vessels formerly used as station ships in radio acoustic position finding, has accomplished a considerable reduction in operating cost and relieved station ships for regular survey duties.

A delicate apparatus built in the Bureau's shops has eliminated practically all traces of magnetic material in the construction of instruments for measuring and recording the earth's magnetic properties.

A new sea water sampler has been designed which makes use of pneumatic pressure set up within the instrument itself as it is lowered into the sea, to trap a true sample of the surrounding water at any desired depth.

Experiments conducted over a period of several months have provided a method whereby two or more gradient tints on aeronautical charts can be printed from one color plate. It is estimated that former nine press-runs can now be made with four press-runs. This method is also contemplated for use on the shoal-water tint of nautical charts.

A master plate or disk engraved in the office and fitted to the sounding machine permits the cutting of certain lettering on the nautical charts in the same manner that soundings are now cut.

A thermostatic device for maintaining a uniform temperature of the Brown gravity apparatus permits the use of the more stable bronze instead of invar pendulums, and eliminates magnetic effects.

Other improvements include easier identification markings for level rods; stronger and more lasting rod cases; rapid introduction of positive-type planetable sheet clamps; better methods of holding theodolites and collimators in their cases to prevent jarring out of adjustment; and an improved magazine roll element for the standard tide gage.

COOPERATIVE ACTIVITIES

The following projects were accomplished on a cooperative basis with the organizations named:

Special map work: Cooperation with various bureaus of the Federal Government in many minor tasks which in the aggregate required much time. An example is the enlargement, preparation, and printing of a special map of North America for the United States Weather Bureau. This will be used in the main office of that Bureau as a master map for the preparation of many others showing different data and information for the public.

United States Maritime Commission: Cadet officers of the Commission are being given instruction, in the Washington office and aboard survey vessels, to learn the many activities of the Bureau benefiting the merchant-marine officer. Six cadet officers were recently assigned for a period of training for 6 months on the survey vessel *Oceanographer*.

Soil Conservation Service: Continuation of the extension of first- and second-order triangulation over certain areas in Colorado, Utah, and Wyoming, totaling 40,000 square miles, for use in controlling mosaics from air photographs made in connection with the mapping of those areas.

The Comision Mixta of Guatemala and El Salvador: Establishment of an astronomical station near the Pacific end of the common boundary. Additional cooperation was extended the two countries by furnishing each with two astronomical stations to be used in coordinating proposed nets of triangulation in preparation for air photographic mapping. Cooperation of this nature has now been extended three countries of Central America, namely, Honduras, Guatemala, and El Salvador, and the results of the work have been of such usefulness that other countries may ask similar cooperation.

Corps of Engineers, United States Army: Extension of first-order leveling from Biloxi, Miss., through New Orleans, La., to the Head of Passes, and from New Orleans to Baton Rouge, La.

Committee in Seismology, Carnegie Institution of Washington: Extension of 200 miles of triangulation and traverse across eight zones along the San Andreas and three other faults in California, for studying earth movements.

Ardmore, Pa.: Detail of an officer to assist in obtaining geographic positions in lower Merion Township as a basis for local surveys and to provide a connection with the Pennsylvania State coordinate system.

Baltimore County, Md.: Detail of an officer to extend a system of triangulation over the metropolitan area, to provide a basis for the reference of property boundary lines, and for the preparation of tax-assessment maps. Forty-six triangulation stations were established and adjusted to the national control survey net.

California Works Progress Administration: Continuation of the releveling of level lines in the vicinity of San Jose, Calif., for the study of earth settlement.

Works Progress Administration project of King County, Wash.: Continued detail of an officer as technical adviser to parties extending necessary triangulation for control surveys for mapping the county and to an office force reducing the records.

Florida mapping project, Works Progress Administration: Completion of arcs of first- and second-order triangulation totaling 432 miles in length and covering more than 4,000 square miles, under the technical direction of one of the Bureau officers, and the technical supervision by another officer of the computing office.

Technical advice to other States: For limited periods during the year, officers have acted as technical advisers to the Engineering Department of Minneapolis, Minn., and to the Cleveland, Ohio, Regional Geodetic and Topographic Survey, in the extension, through Works Progress Administration projects, of triangulation, traverse, and leveling over their areas and to provide proper connections with the national control surveys. An officer was assigned 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 15 States in carrying on horizontal and vertical control surveys as part of the Works Progress Administration program initiated by the Bureau in November 1933 under the Civil Works Administration.

Seismological observatories: Operated on a cooperative basis with the institutions named, at Columbia, S. C., University of South Carolina; Chicago, Ill., University of Chicago and United States Weather Bureau; Butte, Mont., Montana School of Mines; Bozeman, Mont., Montana State College; Honolulu, Territory of Hawaii, College of Hawaii; and College, Alaska, near Fairbanks, University of Alaska.

Science Service, a Washington institution for the popularization of science, financed the transmission of earthquake code messages for the purpose of having Survey seismologists locate earthquakes within a day or so of their occurrence.

The Massachusetts Institute of Technology cooperated in studying methods of analyzing seismographic records with special analyzing

machines available only at that institution. Methods of improving the operation of seismological instruments have been studied and specifications to accomplish this have been prepared in the Bureau.

The University of California cooperated in maintenance of tilt meters in connection with the Bureau's seismological program.

The United States Weather Bureau, a number of universities interested in seismological research, and a large number of commercial agencies and individuals, cooperate actively in collecting earthquake information.

The cooperation of the Department of Terrestrial Magnetism, Carnegie Institution of Washington included: Better determination and maintenance of national and international magnetic standards as a result of joint observational programs at the Cheltenham Magnetic Observatory; operation of a cosmic ray meter at Cheltenham Magnetic Observatory; 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 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.

This Bureau continued cooperation with foreign governments in the maintenance of international magnetic standards.

CHART PRODUCTION

Good progress was made during the year with the issue of 123 revised editions of existing nautical charts. To meet further the requirements of marine commerce in those places where detailed surveys had recently been made, the 15 charts listed below were compiled and issued, making a total of 792 nautical charts of United States waters now available. These include the completion of the Intracoastal Waterway series from Norfolk to Miami.

MARYLAND-DELAWARE: Chesapeake and Delaware Canal.
VIRGINIA-NORTH CAROLINA (Intracoastal Waterway):
  Dismal Swamp Canal.
  Norfolk to North River.
NORTH CAROLINA (Intracoastal Waterway):
  North River to Alligator River—Pungo River Canal.
  Alligator River—Pungo River Canal to Neuse River.
  Neuse River to New River Inlet.
SOUTH CAROLINA:
  Stone and North Edisto Rivers.
  St. Helena Sound.
FLORIDA:
  Fort Pierce Harbor.
  Intracoastal Waterway—Cape Florida to Blackwater Sound.
LOUISIANA: Isles Dernieres to Point au Fer.
CALIFORNIA:
  Pyramid Cove and Approaches.
  Estero Bay.
ALASKA:
  Portland Inlet to Nakat Bay.
  Kodiak Island.

Orders for aeronautical charts to meet the needs of civil and military aviation have continued to increase parallel 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 48 revised editions of 45 individual charts.

At the close of the year there were available the entire series of 87 sectional aeronautical charts covering the entire United States, 4 of the regional series, and 2 of the direction finding series. This latter series was first issued this year to provide charts for air navigation by radio control.

The demands on the Division of Charts can be best illustrated by the fact that the number of press impressions during the fiscal year was more than 7,000,000. This is in comparison with only slightly more than 5,000,000 in the preceding year and approximately 2,000,000 4 years ago. The steady and substantial growth in the need for nautical and aeronautical charts and related publications is shown by the following tabulation of these publications for the past 4 years:

Item	1938	1937	1936	1935
Nautical charts [1]	351,150	333,366	275,800	309,765
Aeronautical charts [1]	299,094	277,878	178,973	61,268
Strip maps			12,186	9,210
Air planimetric maps	6,705	4,544	4,236	2,907
Miscellaneous	3,241	3,166	2,857	2,192
United States coast pilots	10,812	8,062	6,167	6,077
Intracoastal Waterway pilots	1,008	1,463	1,022	943
Distances between United States ports	529	559	429	588
Tide tables	24,299	24,567	24,184	21,984
Current tables	9,769	9,114	9,002	7,588
Tidal current charts	1,631	1,628	1,607	1,705
Practical air navigation	3,798	1,837	5,167	
Total	712,066	666,184	521,630	424,227

[1] Annual reports prior to 1936 did not include charts withdrawn because of the issue of revised editions.

A second and revised edition of the manual "Practical Air Navigation" was issued toward the close of the fiscal year. First published in 1936, this book was entirely rewritten and enlarged to include much new material of benefit to the aviation industry. It has already received many favorable comments from officers of commercial air lines and the military air forces.

HYDROGRAPHIC AND TOPOGRAPHIC WORK

During the year topographic and hydrographic surveys, including the necessary control triangulation, were made on the Atlantic, Gulf, and Pacific coasts of the United States, in Alaska, Hawaii, and the Philippines. The field stations of the Bureau in the United States, Honolulu, and Manila, continued invaluable service in supplying data for the correction of charts in their vicinities, and in disseminating information of the Bureau's activities.

A brief outline of and statistics for the various projects follows:

Hydrography, topography, and coastal triangulation

Locality	Hydrography			Topography		Coastal triangulation		
	Sounding lines	Area	Soundings	Shoreline	Area	Length of scheme	Area	Geographic positions
	Miles	*Square miles*	*Number*	*Miles*	*Square miles*	*Miles*	*Square miles*	*Number*
Nantucket Sound	46	2	2,419	16.0	4.0	5	6	9
Atlantic coast of Long Island	2,865	1,184	29,594					
New Jersey coast	12,304	6,660	124,749					
New Jersey Inland Waterway	1,628	56	58,648					
Chesapeake Bay	516	24	22,290	367.0	140.0	30	76	46
Inland Waters, Va., and N. C	295	24	13,745	142.0	390.0	29	92	53
St. Johns River, Fla	797	28	38,823	387.0	257.0			
Florida Keys	2,091	173	71,540	900.5	123.7	8	13	2
Texas coast	15,829	11,683	145,536	86.0	48.0			
Vicinity of Santa Barbara Islands, Calif	4,618	3,642	22,972					
Coast of Northern California and Oregon	3,214	[1] 2,732	29,538	102.4	4.0	8	14	16
Columbia River, Oreg., and Wash	1,231	43	47,010	189.0	10.0	50	49	221
Southeastern Alaska	2,028	[2] 174	45,494	184.7	399.7	60	173	144
Goodnews Bay, Alaska	16	1	432			2	2	13
Gulf of Alaska	4,983		5,417					
Alaskan Peninsula	6,701	5,460	84,876	92.7	184.5	22	63	15
Aleutian Islands, Alaska	4,031	1,919	58,000	138.0	305.0	98	905	68
Philippine Islands	3,995	618	61,117	7.5	22.0	83	521	49
Total	67,188	34,423	862,200	2,612.8	1,887.9	395	1,914	636

[1] Includes 153 square miles of wire drag.
[2] Includes 18 square miles of wire drag.

On the Atlantic coast the survey vessels *Oceanographer* and *Lydonia* continued hydrographic surveys off New Jersey and Long Island. The successful functioning of the new sono-radio buoys, described in previous reports, made it possible to relieve the *Gilbert* from station-ship duty with these vessels and to assign her to surveys on the south coast of Cape Cod. A special wire-drag survey of reported shoal areas and wrecks along the Atlantic coast, from Cape Henry to Sandy Hook, has been under way since May. The launches *Marindin* and *Rodgers* are being used on the project, under the supervision of the commanding officer of the ship *Oceanographer*.

The *Mikawe* in the summer of 1937 completed the survey of the New Jersey Intracoastal Waterway and during the winter continued surveys of the St. Johns River above Lake George, Fla. The vessel is now engaged on hydrographic surveys in upper Chesapeake Bay.

Small air photographic compilation units continued at Baltimore, Md., Palatka, Fla., and at Norfolk, Va., during the winter months, when personnel were available from ships in port for the annual repair period. Air photographic surveys were made with the Bureau's newly developed nine-lens camera in upper Chesapeake Bay, and in cooperation with the Army, for the Soil Conservation Service, in the High Rock Reservoir area in North Carolina. Use of this nine-lens camera makes possible an increase in efficiency of about 20 percent over former methods in areas of flat terrain. In areas of considerable relief, a specially constructed rectifying camera and a contour plotting machine are used.

Basic surveys were continued by the shore party operating in the vicinity of Key West, Fla.

In the Gulf of Mexico the vessel *Hydrographer*, with the tender *Faris* operating as a subparty, continued hydrographic surveys along the Texas coast.

On the Pacific coast the *Guide* was engaged on inshore and offshore hydrography in the vicinity of Cape Mendocino and wire-drag surveys off Cape Mendocino, Cape Blanco, Point Reyes, and Del Mar. A shore party continued combined operations along the Columbia River. The *Pioneer* completed her assignment on offshore surveys in the vicinity of Santa Barbara Islands in the fall of 1937, and in 1938 transferred to southwestern Alaskan waters for control and other surveys westward from Umnak Island. The *Surveyor*, with the tender *Wildcat*, continued combined operations in the vicinity of Umnak Pass, Alaska, while the *Discoverer*, with the tender *Helianthus*, extended combined operations eastward from Unimak Pass. To and from the working grounds the vessels operating in southwestern Alaska ran sounding lines across the Gulf of Alaska.

A resurvey of part of the approaches to Goodnews Bay was made in cooperation with the Alaska Steamship Co.

In southeastern Alaska the *Explorer*, in 1937, engaged on new surveys in Sumner Strait and tributary arms and revision surveys in Wrangell Harbor, in 1938 taking up combined operations and wire-drag surveys in Sitka Harbor and approaches. In 1937 the *Westdahl*, made new surveys in Stephens Passage and Taku Inlet and in 1938 engaged on surveys in Elfin Cove and Glacier Bay.

The 13 United States Coast Pilot volumes showing the results of field inspections made by this Bureau contain a wide variety of important information supplemental to that shown on the chart, such as a detailed description of the coast and information concerning waterways, as well as maritime data for all the ports of the United States and possessions. These volumes are kept up-to-date by annual supplements and revisions based on supplemental field examinations and new surveys. Ten supplements were published, one new edition was issued, and three volumes were in process of revision during the year. Two field examinations were made in the Intracoastal Waterway, and others were in progress in the Philippine Islands, the Virgin Islands, and Puerto Rico, on which to base other supplements and new editions. The publication Distances Between United States Ports was also completely revised and a number of new tables added.

In the Philippine Islands the *Fathomer* engaged on surveys on the northern coasts of Luzon and the west coast of Palawan. In cooperation with the survey ship *Herald* of the British Navy, a triangulation connection was made between the Sibutu Islands and Borneo. In the spring the *Fathomer* was decommissioned and the *Pathfinder* recommissioned and assigned to work on the southeast coast of Luzon.

GEODETIC WORK

One gravity party was in the field the entire year, except for two short intervals required for standardizing apparatus at the Washington base station. A total of 148 new stations located in 13 States, in places best suited for geodetic purposes and geological studies, was determined and 7 old stations reoccupied.

The two observatories for the determination of variation of latitude, at Ukiah, Calif., and Gaithersburg, Md., have been kept in continuous operation under a cooperative international agreement. The records were sent to the central office of the International Latitude Service, now located in Italy, that the results may be computed with relation to those obtained at other international stations. The following table gives a brief statistical summary of geodetic work accomplished:

Geodetic triangulation, base lines, reconnaissance, and leveling, and astronomical and gravity observations

Locality	Length of scheme	Area
TRIANGULATION, FIRST ORDER	*Miles*	*Square miles*
Amsterdam Avenue base net, New York	4	2
Vicinity of New York, N. Y.	10	2
Soil-conservation area, Utah, Colorado, and Wyoming	495	12,180
Connecticut-Rhode Island boundary, Connecticut and Rhode Island	45	360
Reed base net, Nevada	12	60
Colquitt, Ga., to Laurel Hill, Fla.	145	1,450
Hudson River, N. Y., to Hudson, N. Y.	150	1,550
Baltimore County, Md.	22	180
Earthquake investigation:		
Maricopa, Calif.	16	80
Palmdale, Calif.	15	75
Gorman, Calif.	24	120
Hartford to Torrington, Conn.	24	200
Virgin River area, Utah and Arizona	180	6,000
Total	1,142	22,259
TRIANGULATION, SECOND ORDER		
Arcadia to Fort Ogden, Fla.	17	170
Lake Okeechobee to Fort Myers, Fla.	70	490
Lower Merion Township, Pa.	10	50
Highland to Francis, Fla.	60	600
Soil-conservation area, Utah, Colorado, and Wyoming	950	22,550
Carrabelle, Fla., to Colquitt, Ga.	80	720
Early to Campbellton, Fla.	60	600
Total	1,247	25,180
BASE LINES, FIRST ORDER		
Amsterdam Avenue, New York	4.0	----
Lonoke, Ark. (remeasurement)	9.3	----
Total	13.3	----

Locality	Length of scheme	Area
TRAVERSE, FIRST ORDER	*Miles*	*Square miles*
Earthquake investigation, Maricopa, Calif.	14.4	----
RECONNAISSANCE, FIRST ORDER TRIANGULATION		
Amsterdam Avenue base net, New York	4	2
Vicinity of New York, N. Y.	10	2
Colquitt, Ga., to Mobile, Ala.	260	2,695
Baltimore County, Md.	22	180
Soil-conservation area, Utah, Colorado, and Wyoming	495	12,180
Earthquake investigation:		
Cajon Pass, Calif.	9	12
Whitewater, Calif.	7	10
Moreno, Calif.	11	44
Whittier, Calif.	9	36
Inglewood, Calif.	10	50
Palmdale, Calif.	15	75
Gorman, Calif.	24	120
Maricopa, Calif.	16	80
Greenville, Ala., to Cuthbert, Ga.	95	950
Rockford to Roanoke, Ala.	55	550
Fredericktown to Success, Mo.	95	950
Virgin River area, Utah and Arizona	180	6,000
Total	1,317	23,936
RECONNAISSANCE, SECOND ORDER TRIANGULATION		
Kingman, Kans., to Ninaview, Colo.	290	2,900
Highland to Francis, Fla.	60	600
Arcadia to Fort Ogden, Fla.	17	170
Lower Merion Township, Pa.	10	50
Soil-conservation area, Utah, Colorado, and Wyoming	950	22,550
Grantsville-Tooele area, Utah	45	900
Weber River area, Utah	115	2,925
Total	1,487	30,095

State	First order	Second order
LEVELING	*Miles*	*Miles*
California	325	----
Colorado	100	287
Idaho	75	101
Louisiana	261	----
Maryland	53	7
Mississippi	50	----
Montana	----	404

State	First order	Second order
LEVELING—continued	*Miles*	*Miles*
Nevada	4	39
New Mexico	7	11
Virginia	----	215
Utah	44	209
Wyoming	----	115
Total	919	1,388

Geodetic triangulation, base lines, reconnaissance, and leveling, and astronomical and gravity observations—Continued

State	Determinations		State	Determinations	
	New	Repeat		New	Repeat
GRAVITY			GRAVITY—continued		
Alabama	15		North Carolina	23	1
Connecticut	3		Pennsylvania	27	1
Florida	18	2	Rhode Island	4	
Georgia	17		South Carolina	1	
Massachusetts	12	1	Virginia	12	1
New Hampshire	1		Total	148	7
New Jersey	6				
New York	9	1			

The office computation and adjustment of 41 arcs of first-order and 52 arcs of second-order triangulation were completed, and progress made on the computation of an additional 15 arcs of first-order and 19 arcs of second-order triangulation. Office computation was also made of the first-order base along Amsterdam Avenue, in New York City.

The adjustment of the triangulation of the United States on the 1927 North American datum continued rapidly, so that the geographic positions of approximately 60,000 stations have now been computed on that datum. Plane coordinates of approximately 24,000 stations have also been computed.

Personnel detailed to the Washington office by the Chief of Engineers, United States Army, continued on the adjustment of the Mississippi River triangulation from Vicksburg, Miss., to New Orleans, La. By the close of the year adjustments were completed and the preparation of the manuscript was in progress.

The computation of the elevations of bench marks based on the 1929 adjustment of the first-order level net continued. Adjustments were made of numerous small sections in Arkansas, Connecticut, Georgia, Idaho, Oklahoma, Oregon, and Texas. An intensive treatment of the subordinate leveling in Georgia was completed and the descriptions and adjusted elevations of bench marks issued in lithographed form.

Office computations were made of 153 new gravity stations and 8 reoccupied stations. The isostatic reductions were completed for 153 gravity stations determined by this Bureau; 83 stations determined by the Gulf Research & Development Co., data for which were furnished by that organization to this Bureau; and 5 gravity-at-sea stations of the 1936–37 expedition of the United States Navy and the American Geophysical Union. In addition, the isostatic reductions were revised for 214 gravity stations in the United States, because of an improved reduction method giving somewhat better accuracy and because of the availability of better maps.

Three geodetic publications were printed during the year, two giving results of triangulation in Utah and Wyoming and the other containing leveling data for North Carolina.

TIDE AND CURRENT WORK

Tide and current data are required not only for use in this Bureau's surveying and charting activities but for varied navigation and engineering purposes. The tide is the vertical rise and fall of the water. The current is the horizontal movement or flow of the water which accompanies the tide. Each of these movements is of direct practical importance in the divers commercial activities of our waterways.

Automatic tide gages were in operation at 40 primary and 27 secondary stations—35 on the Atlantic coast, 5 on the Gulf coast, 22 on the Pacific coast, 4 in Alaska, and 1 in the Hawaiian Islands. Thirty-one of these were maintained in cooperation with other agencies, including the United States Engineers, the Navy Department, the States of Texas and Delaware, the cities of Santa Monica and Los Angeles, town of Stratford, port of Willapa Harbor, Woods Hole Oceanographic Institution, Chesapeake Biological Laboratory, and University of Washington. Supplementary data for shorter periods were obtained at 115 other stations in connection with hydrographic surveys and other activities.

The tide survey of San Francisco Bay, begun last year, for the precise determination of tidal datum planes and possible changes in the tidal regime in consequence of hydrographic changes, was completed and the survey extended to the Sacramento-San Joaquin delta. Two other tide surveys were carried on in cooperation with the United States Engineers, one of Galveston Bay to furnish data for model studies of channel improvements, and the other of the Connecticut River, for information in connection with studies of flood control.

The ebb and flow of the current must be taken into consideration in problems of harbor improvements, sewage disposal, and navigation. Data for use in the solution of such problems are derived from current observations. During the past year, practically all of the current observations obtained were in connection with hydrographic surveys, data being obtained for only 37 stations, covering a total period of but 148 days. As the current varies from place to place to a much greater extent than the tide, a measurement at one place supplies information for that place only.

Forecasts of the rise and fall of the tide appear in annual tide tables. Tide Tables, Atlantic Ocean, 1939, prepared during the year, gives daily predictions for 55 reference stations including the 6 new stations: Tampa Bay, Fla.; Surinam River Entrance, Surinam; Pernambuco, Brazil; Takoradi, Gold Coast; and Flushing and Hook of Holland, Netherlands. A table of differences is available for obtaining predictions for about 2,400 other places. Tide Tables, Pacific Ocean and Indian Ocean, 1939, contains daily predictions for some 1,800 other places. Predictions for Port Phillip, Australia, were substituted for those for Melbourne and exchanges of tide predictions were continued with England, Germany, France, Canada, India, and the Netherlands.

Advance information regarding the velocity and direction of the current is made available in two annuals: Current Tables, Atlantic Coast, 1939, and Current Tables, Pacific Coast, 1939, both prepared this year. The tables of daily predictions for these publications were typed in the Bureau on a special machine for photographic reproduction, at a saving in printing costs of over $1,500. The logical program to reproduce all of the material in the tide and current tables by the photo offset process is being accomplished as rapidly as available personnel permits.

A special publication on currents was issued, giving detailed results of current surveys in St. Johns River, Savannah River, and Intervening Waterways.

A Manual of Current Observations, prepared for Bureau work, is also of value to engineers engaged on problems involving measurements and analyses of tidal currents.

Compilations of tidal bench marks for Florida and New Jersey, and information concerning those connected during the recent tide and current survey in Los Angeles and Long Beach Harbors, were published. Considerable progress was also made on a revised edition of Tidal Bench Marks, State of Washington, omitting the Columbia River area in Oregon and Washington, to be covered by a separate publication.

Tide notes were prepared and verified for 208 charts and descriptions and elevations of 967 bench marks were furnished for use in hydrographic, geodetic, and other engineering work.

MAGNETIC WORK

With the increasing use of the airplane as a means of transportation over land and sea, magnetic data assume new importance, since the magnetic compass is the controlling directional guide in all aircraft. Each airport should have a magnetic station with necessary auxiliaries for testing the airplane's compass. At present the Bureau has made observations at only five or six airports. There are many large areas in mountainous regions where the declination has not been observed, where pilots have reported areas of local attraction, which should be investigated by making additional magnetic observations.

The needs at sea continue equally important. Owing to the lack of proper equipment, such as nonmagnetic ships, this Bureau is now without sufficient data to give reliable magnetic information for some of the charts. In fact, there have been no observations along our coast lines in this country and Alaska since 1928.

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. During the year, the following publications have been issued: Uses of Magnetic Stations, Magnetic Declination in Arkansas in 1935, and United States Magnetic Tables and Magnetic Charts for 1935. The facilities of the computing office in New York City, employing Works Progress Administration personnel, supervised by regular Bureau personnel from the

Washington office, have made it possible to make some headway with the preparation of observatory results for publication.

The distribution of magnetic observations during the year is shown by the following table:

Place	Stations				
	Repeat			Other declination stations	Total
	Old	New	Declination only		
Alaska				37	37
Arkansas			1		1
California				7	7
Connecticut				1	1
Florida				42	42
Kentucky			1		1
Massachusetts				1	1
Michigan	1		2		3
Missouri	1	1	1		3
Montana				2	2
New York				10	10
North Carolina		1			1
Ohio	1				1
Oregon				4	4
Tennessee	1				1
Texas				17	17
Vermont				7	7
Washington				6	6
Total	4	2	5	134	145

SEISMOLOGIC WORK

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 received from many sources. Instruments are maintained in readiness to obtain records of destructive earthquake motions so essential 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 4 directly: San Juan, P. R.; Tucson, Ariz.; Sitka, Alaska; and Ukiah, Calif. (at the International Latitude Station). Six other observatories are operated on a cooperative basis and a number of independent stations make their records available. Many of these records are furnished 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, in cooperation with the Jesuit Seismological Association and Science Service. This preliminary information is of interest to the public and useful to individual stations.

Information regarding earthquakes and related matters appears in form of bulletins and in the annual series of publications entitled "United States Earthquakes." Intensive questionnaire coverage was obtained in the case of 27 earthquakes. More than 2,200 noninstrumental reports on earthquakes were received, covering approximately 450 earthquakes.

Recording of strong motions continued in California, Nevada, Montana, and Panama, and new stations were established at Boulder Dam. Fifty-one instruments were operated in California, 4 in Nevada, 4 in Montana, 1 in Panama, and 3 at Boulder Dam, and 2 instruments were held in reserve at Washington, D. C., and 1 at Chicago.

Tests of accelerographs on a shaking platform at the Massachusetts Institute of Technology, to appraise instrumental performance and methods of analysis, are still under way. Important conclusions have already been reached.

Twenty-one vibration tests were made in 3 buildings, and 61 ground tests at 51 locations. Shaking table tests were made on 12 instruments, supplying 730 test records. At the close of the year plans were under way to make ground vibration observations for the Navy in the San Francisco Bay area.

Three tilt meters were kept in operation with the cooperation of the University of California, and 1 used for experimental work.

PERSONNEL AND FINANCES

With a personnel of 1,135 on June 30, 1938, 345 were on duty in the Washington office (18 commissioned and 327 civilian), and 790 in the field service (158 commissioned and 632 civilian). The civilian employees in the field included 435 seamen and 127 hands, of which number 51 civilians on duty at the Manila office and 50 members of the crew of the ship *Fathomer* are paid by the Philippine insular government but under the jurisdiction of this Bureau.

The library and archives acquired during the year 114 hydrographic and 102 topographic sheets, representing new Bureau surveys. Other additions were 1,089 blueprints (mostly surveys by Army Engineers); 2,719 maps; 1,345 charts; 7,096 field, office, and observatory records; 250 negatives; 609 prints; 251 lantern slides; 898 books; and 3,819 periodicals.

Collections on account of the sale of nautical charts and other publications, deposited in the Treasury Department to the account of miscellaneous receipts, totaled $109,871.32, as compared with $109,659.29 during the preceding year.

The regular appropriations for the year totaled $2,649,400. These were supplemented by the following additional appropriations: Transfer from Salaries and Expenses, Soil Conservation Service (transfer to Commerce), 1938, $74,450; Working Fund (War, Flood, Mississippi River and Tributaries), $8,500; Working Fund (Navy, Maintenance, Yards and Docks), 1938, $1,2000; and an allotment from the Department of Commerce for travel of $22,830.

Disbursements during the year ended June 30, 1938, totaled $2,677,085.83, distributed among the various appropriations as follows:

Party expenses, 1936	$180.20
Repairs of vessels, 1936	90.00
Pay, etc., officers and men, vessels, 1936	158.92
Pay and allowances, commissioned officers, 1936	403.23
Party expenses, 1937	86,193.20
Repairs of vessels, 1937	12,982.77
Pay, etc., officers and men, vessels, 1937	102,950.02
Pay and allowances, commissioned officers, 1937	74,171.11
General expenses, 1937	27,904.42
Maintenance of air navigation facilities, 1937	6,412.32
Salaries, 1938	566,447.06
Field expenses, 1938	372,582.49
Repairs of vessels, 1938	55,483.24
Pay, etc., officers and men, vessels, 1938	453,792.73
Pay and allowances, commissioned officers, 1938	708,544.14
General expenses, 1938	48,464.27
Aeronautical charts, 1938	97,474.55
National Industrial Recovery, 1933–39	3,579.19
Working Fund, Commerce, C. and G. Survey (Hospital and Domiciliary Facilities and Services, V. A.)	516.77
Salaries and Expenses, Soil Conservation Service (transfer to Commerce, C. and G. Survey, Act of Apr. 27, 1935), 1937	1,005.37
Salaries and Expenses, Soil Conservation Service (transfer to Commerce, C. and G. Survey, Act of Apr. 27, 1935), 1938	43,943.72
Traveling expenses, Department of Commerce, 1938	11,031.33
Working Fund, Commerce, C. and G. Survey (War, Flood Control, Mississippi River and Tributaries)	2,774.78
Total	2,677,085.83

BUREAU OF MARINE INSPECTION AND NAVIGATION

INSPECTION DIVISION

It is the responsibility of this Division to administer the inspection laws and to pass on the safety and seaworthiness of all vessels subject to inspection. It is comprised of an administrative staff in Washington headed by an Assistant Director, and 48 boards of local inspectors located in the continental United States and the Territories of Puerto Rico, Hawaii, and Alaska. Under the inspection laws, the United States is geographically divided into 7 supervising inspection districts, each presided over by a supervising inspector. These supervising inspectors are authorized by statute to meet as a board once a year and with the approval of the Secretary of Commerce to promulgate necessary regulations governing the construction, equipment, operation, and manning of vessels subject to inspection. The rules and regulations thus promulgated are administered and enforced by this Division.

During the fiscal year ended June 30, 1938, the field inspection force consisted of 94 local inspectors and 301 assistant inspectors. The Washington staff consisted of 10 principal traveling inspectors, 1 traveling inspector, 2 nautical experts, and a varying number of clerks. The personnel of the Division, both at Washington and in the field, is still insufficient to enable it properly to carry out its varied and complex responsibilities. Additional inspectors are needed, together with administrative and clerical assistants, in order that proper attention can be given to the multitudinous details which arise in connection with the inspection activities and to meet the demands of the industry for certificated ship personnel.

During this fiscal year the Civil Service Commission in conjunction with the Bureau, conducted a study of the duties and responsibilities performed by local and assistant inspectors. The reports submitted as a result of this personnel survey, recommended a classification of the offices of local inspectors based on the volume and complexities of the duties performed in the respective ports and a reallocation of all positions to higher classification grades. Additional funds were appropriated by Congress for the fiscal year 1939 with which to put the reclassification scheme into effect as of July 1, 1938. Congress, by this action, has made it possible to raise the standards of pay throughout this service to a level where they will be comparable with those received by employees in other branches of the Government engaged upon work of a similar nature. It is believed that the effectiveness of this raise in grade and pay will stimulate the morale of a very efficient corps of inspectors and will make the service more attractive to highly qualified men who are desirous of entering the Government service.

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During the fiscal year 1938, the problems of the Inspection Division have been primarily those dealing with the enforcement of regulations promulgated during the past 2 years which became effective during that time. During the fall of 1937, it became necessary to take drastic action to enforce compliance with the provisions of the regulations requiring automatic sprinkler systems and other additional fire-protection equipment aboard passenger vessels. This regulation issued under the provisions of Public 712, enacted by the Seventy-fifth Congress, restricted the sailing of those vessels which had not complied by October 1, 1937. To this end it was found necessary to revoke the certificates of several large passenger vessels in order to prevent them from operating as passenger vessels. The Division was also actively engaged in checking the compliance of all American passenger vessels affected by certain provisions of the International Convention for Safety of Life at Sea which provisions had been included in the General Rules and Regulations of the Board of Supervising Inspectors and approved by the Department.

The checking of vessels for compliance with subdivision and stability requirements, particularly vessels navigating lakes, bays, and sounds, and the Great Lakes has progressed satisfactorily. These new safety requirements were promulgated as regulations by the Board of Supervising Inspectors at their January meeting.

Inspection of tank vessels under the new rules promulgated November 10, 1936, was actively continued and it was found necessary to amend these rules in the light of a year's experience. These amendments were promulgated and appeared in the form of Supplement I of the Rules for Tank Vessels under date of November 18, 1937.

The Division has, during the year, laid great stress on more intensive drilling and instruction of the crews of passenger and excursion vessels. This intensive drilling by local and assistant inspectors at regular inspections and reinspections of passenger vessels together with the frequent detailed drills and inspections conducted by the traveling inspectors has resulted in a more efficient working organization of the masters, officers, and crews. The Division has endeavored also to coordinate the activities of the personnel aboard inspected vessels with the whole program of maritime safety by thoroughly training the officers and crews in the handling of all types of equipment. This training has raised the morale of all ships' personnel and has resulted in the crews becoming "safety conscious." The safety record which has been maintained throughout the past 3 years is due largely to the fact that masters, officers, and crews of American vessels have learned that eternal vigilance on their part is the price of safety. One example of this was brought out when the excursion boat *Mandalay* collided with the passenger steamer *Acadia* in lower New York Harbor, under conditions having all the potentialities of a major disaster. The seamanship and judgment displayed by the officers and crews of these two vessels was such as to meet with Nation-wide acclaim.

The Division has continued its work on revision of the ocean and coastwise regulations. This work has been delayed owing to the necessity of carefully examining Senate Report No. 184, and considering the regulations prepared by the Senate Technical Committee

for Safety at Sea. At the close of the year these regulations were in fairly smooth form but were being reviewed by officers of the Bureau to determine policy in regard to their application to existing vessels.

Losses experienced by maritime nations throughout the world indicate that fires in cargo predominate. The increasing diversity of cargoes and the shipment of thousands of types of packaged chemicals, plastics, complicated mechanisms of various types which contain dangerous elements or properties, make the problem of reasonable and suitable regulations exceedingly difficult. Notwithstanding the difficulties of the problem, the need for concise regulations has become increasingly evident to all maritime nations of the world, and thus the Division has continued its work in the preparation of rules and regulations in the elimination of the hazards caused by the carriage of so-called dangerous cargoes.

These regulations are now receiving the scrutiny and criticism of other Government agencies, including the Interstate Commerce Commission. The Bureau of Explosives also has the subject under consideration. The National Bureau of Standards, as the official testing laboratory of the Bureau of Marine Inspection and Navigation, has been called upon to conduct a large number of investigations and tests to clarify questionable rulings and furnish a sound basis of fact. In drafting these regulations the Division has endeavored to provide clear, simple, and adequate rules properly coordinated with existing rules of other regulatory agencies ashore. Placed in the hands of stevedores, masters, and mates, these regulations will provide a ready means for determining the proper stowage and handling of such cargo.

In order to assure a more thorough training of the officers and crews in the use of various types of respiratory apparatus, such as oxygen breathing apparatus, gas masks, and the accessory safety lamp, a principal traveling inspector was sent to the Pittsburgh School of Mines to pursue the thorough course of instruction provided there. Upon completion of this course, the inspector made a tour of the field inspection offices, instructing local and assistant inspectors, officers, and crews of vessels, and other interested persons, in the use of this most important equipment.

At the close of the year nearly all inspection personnel have received this instruction, and are now better prepared to drill crews in the use of the breathing apparatus. It has been found that in order to secure the efficient use of respiratory apparatus of this character, a full knowledge of its functions and operations is necessary to give the wearer the proper confidence and the consequent ability to take prompt action in time of emergency.

In the case of all regulations, it is rapidly becoming the policy of the Division to advise the industry in advance of the proposed regulations and if necessary invite them to participate in a preliminary conference. This procedure has been followed several times during the year in matters concerning large groups of vessel operators and it has been found to work well as it aids in clarifying misunderstandings and speeds enforcement.

During the year the Division worked on a compilation of all rules and regulations contained in supplements, circular letters, and Bureau bulletins published since March 1931. It was published under date

of May 28, 1938, as supplement I to 1931 edition of the General Rules and Regulations, including rules I and II as appearing in the Fifty-first supplement. Supplement I is a compilation of material contained in monthly bulletins, circular letters, and the material contained in five different supplements issued since 1931. The availability in one volume of all amendments to the rules and regulations has materially aided the inspectors in the administration and enforcement of the regulations and has assisted the industry to determine just what is required according to law.

The Board of Supervising Inspectors at its annual meeting in January 1938 passed regulations amending the boiler rules in regard to grades of steel for various marine uses. The most important and far-reaching regulation promulgated was in regard to the subdivision and stability of new and existing passenger vessels navigating the Great Lakes and lakes, bays, and sounds. This regulation will place passenger vessels on such waters on a par with those navigating ocean and coastwise waters in the matters of watertight subdivision and minimum stability.

During the year there were three executive committee meetings of the Board of Supervising Inspectors. The first held on October 11, 12, and 13, 1937, was called for the purpose of promulgating supplement I to the Rules For Tank Vessels. This meeting was preceded by a public hearing to which all interested tank vessel operators were invited. The second executive committee meeting was held on March 15, 1938, primarily for the purpose of approving various life-saving and fire-fighting equipments. The third executive committee meeting was held on May 24, 1938. At this meeting many regulations were passed which had been prepared and recommended by the Department working in conjunction with the Bureau in the recodification of laws and regulations.

PRINCIPAL TRAVELING INSPECTORS

During the fiscal year, the principal traveling inspectors of the Bureau traveled a total of 162,896 miles of which 14,848 were at sea. They inspected, during this period, 514 passenger vessels of 1,974,950 gross tons; 35 of these vessels with a gross tonnage of 152,650 were inspected at sea. They also inspected 93 tank ships of 151,556 gross tons; 185 tank barges of 67,683 gross tons; 9 freight ships carrying oil as part cargo with a gross tonnage of 42,329; 24 freight vessels with a total of 117,441 gross tons; and 183 special and miscellaneous inspections aggregating 1,385,065 gross tons.

LOCAL INSPECTORS

The Bureau's staff of inspectors examined 1,267 cargo vessels which desired to carry persons in addition to the crew; and reinspections were made numbering 2,962. For other Government services, they inspected 180 vessels and 1,958 stationary boilers. They also made special examinations on 14,677 vessels and 3,185 dry docks. It was found necessary to withdraw or refuse certificates of inspection in 186 cases.

Marine boilers in the number of 9,491 were inspected, of which 34 were condemned for further use. They tested 3,291 boiler plates and found it necessary to reject 105 of these.

In accordance with the practice of testing certain equipment at the factories, the Bureau's staff inspected 16,467 life preservers, rejecting 356; 482 life boats; 14 life rafts; 172 sets of boat davits; 11,605 ring buoys, rejecting 51; 111 wood floats; and 26,209 flare signal cartridges.

LAW ENFORCEMENT AND REVIEW DIVISION

During the year this Division has considered applications and petitions for relief from statutory penalties incurred by owners, operators, masters of vessels, and other persons for violations of the navigation and inspection laws. It has also continued its usual task of interpreting these laws, drafting new legislation, and reporting on bills introduced in Congress which relate to or affect navigation problems; has issued instructions to collectors and other officers of customs charged with enforcement of law and performance of duties under the supervision of this Bureau; and generally instructed the field service in connection with their duties. Also has prepared various regulations for the enforcement of navigation laws, as authorized by statute.

All regulations issued prior to June 30, 1938, were codified for publication in the Federal Register, as was required by statute and Executive order. No other regulations promulgated prior to that date will hereafter have any force or effect.

The review of all investigations of marine casualties and accidents, as well as cases of alleged negligence, incompetence, and misconduct on the part of officers and seamen was accomplished in this Division.

The patrol fleet has been engaged in enforcement of navigation and inspection laws, and in the patrolling of marine regattas.

MARINE INVESTIGATION BOARDS

As was reported in the annual report for the fiscal year 1937, the Seventy-fourth Congress established a new procedure for the investigation of all marine casualties and accidents or any violation of any provisions of Title LII or any rules promulgated thereunder, and provided for the subsequent trial of all licensed and certificated personnel, if there is sufficient evidence of misconduct, inefficiency, or negligence. This legislation also provided for the establishment of three classes of boards whose duty it is to take jurisdiction of and investigate all marine casualties depending upon the gravity of each case. These boards have functioned since August 27, 1936.

From June 30, 1937, to June 30, 1938, 2,794 marine casualties, cases of negligence and incompetence, and misconduct on the part of licensed and unlicensed personnel on vessels of the United States were investigated.

Casualties involving loss of life are investigated by a board consisting of a member of the Department of Justice, learned in maritime law, a member of the United States Coast Guard, usually of the rank of captain or commander, and a United States supervising inspector of the Bureau of Marine Inspection and Navigation. During the fiscal year 1938, there was but one passenger life lost due to casualty on inspected vessels of the United States merchant marine. This occurred on July 29, 1937, when the S. S. *City of Baltimore* was burned just east of Seven Foot Knoll below Baltimore in Chesa-

peake Bay. This vessel was a bay steamer which made voyages from Baltimore, Md., to Norfolk, Va. There were 140 other investigations involving loss of life, which disclosed that there were 74 natural deaths, passengers and crew; 58 accidental drownings not involving culpable negligence on the part of the ship or personnel; and 44 disappearances, the surrounding circumstances of which indicated that the parties had committed suicide.

During the year there were 209 marine casualties of a serious nature investigated by the "B" Marine Investigation Boards. These boards consist of a supervising inspector of this Bureau, who acts as chairman, and two principal traveling inspectors attached to the field service of the Bureau of Marine Inspection and Navigation. The greatest loss sustained by the United States merchant marine, and which was investigated by one of these boards, was the loss of the S. S. *President Hoover* off the Island of Hoisho To on the night of December 10, 1937. The S. S. *President Hoover* was proceeding down the east coast of the Island of Formosa when she stranded. The cause of her loss, as ascertained by investigation, was primarily the navigation of the vessel at virtually full speed in circumstances where the visibility was low and the position of the ship uncertain.

The major portion of marine casualties and accidents investigated are of a minor nature, and these are investigated by personnel attached to the field service of the Bureau of Marine Inspection and Navigation. The boards which investigate these casualties and accidents are known as "C" Marine Investigation Boards. There were also 2,440 minor marine casualties, acts of negligence, incompetence, and misconduct investigated during the year.

Among cases investigated by "C" boards were many involving disputes arising between masters and personnel of ships, and alleged violation of law on their part. A number of officers and seamen had licenses and certificates of service suspended or revoked as a result of these investigations. Shipowners, masters, and vessel personnel have learned that the Bureau will at all times expect and require observance of the laws applicable to the subject of the dispute. It is believed that this procedure has done much toward securing efficiency in the manning and operation of our merchant marine. This attitude of the Bureau has apparently tended to reduce greatly the number of disputes heretofore occurring between operators and owners and the crews of American vessels. Throughout the year great interest has been shown in the functioning of the "C" boards in investigation of alleged misconduct on the part of the ships' personnel in staging "sit-down" strikes.

In the last year 100 certificates were suspended and 6 revoked. In this same period 144 licenses of officers were suspended and 6 revoked.

FINES, PENALTIES, AND FORFEITURES

The Law Enforcement and Review Division reviews and considers reports and petitions for relief submitted to the Secretary of Commerce in all cases of violations of navigation laws occurring on the navigable waters of the United States or within admiralty or maritime jurisdiction of this country. The activities of the Bureau's patrol fleet and other agencies result in the report to this Division of

a large number of violations, necessitating consideration of petitions filed for mitigation and remission. While the fines reported run into large figures, the attitude of the Department has been directed to a continuing and progressive education of the operators to equip and operate their boats with due regard to safety, and in considering mitigation and remission of penalties, a liberal attitude in this respect has been taken.

The historic policy of Congress has always protected our domestic shipping from inroads of foreign competition. In the enforcement of laws relating to coastwise transportation of cargo and passengers, the Bureau has been exacting in seeing that these statutes are enforced.

By reason of the comparatively recent enactments relating to the manning and inspection of vessels, an increasing number of violations are being reported. Of necessity, the Division has felt the impact of this increase. The aggregate of all violations reported during the year numbered 16,719.

COLLECTION OF FEES AND DUTIES

During the year the Law Enforcement and Review Division has supervised the collection, through collectors of customs, of $1,799,360.20 in tonnage duties imposed upon vessels entering ports of the United States from foreign countries; also $186,318.48 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.

PATROL FLEET

The patrol fleet maintained by the Bureau consists of three vessels: the *Siwash*, *Navigation*, and *Tyrer*, and two 18-foot launches. The three patrol vessels are operated continuously throughout the year on the Atlantic and Gulf coasts. One of the two launches is assigned the district comprising the entire Mississippi River basin. The other is working in Pacific coast ports. The personnel of the vessels is engaged in the enforcement of the navigation laws; particularly, the Motorboat Act, the Numbering Act, and the Tanker Act. These boats have been of material assistance to the local inspectors in enabling them and their assistants to reach larger numbers of vessels under their jurisdiction. Examination of tank vessels having on board inflammable or combustible liquids in bulk has occupied much of the time of the fleet.

Out of a total of 9,629 inspections made by the patrol fleet, 6,021 violations were reported, and in addition, other enforcement officers reported 10,698 violations.

SHIP MORTGAGE ACT

The Bureau is 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. It is necessary that the owner of every vessel prior to its documentation under the laws of the

United States, and upon every change in ownership or change in home port, designate a home port for the 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; permanent documents are issued from that port; bills of sale, mortgages, and all other documents affecting the title of the vessel are recorded in the office of the collector of customs at that port. During the fiscal year 1938, there were approved 7,956 such home port designations as compared with 7,156 approvals during the preceding year.

PASSENGER ACT

The Law Enforcement and Review 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 1938, there were 794 voyages made involving 154,787 steerage passengers. Although the number of voyages on which steerage passengers were carried diminished somewhat this year over last, nevertheless the number of passengers so carried increased more than 14 percent.

PREVENTION OF OVERCROWDING

Under the provisions of Revised Statutes 4464, the local inspectors shall state in every certificate of inspection granted to vessels carrying passengers, other than ferryboats, the number of such passengers which may be carried with safety. To prevent these vessels taking on passengers in excess of the number so fixed this Bureau employs temporary navigation inspectors and designates certain other employees to count the passengers so carried. During the year these inspectors made counts of passengers embarking on such vessels and in a number of instances prevented additional persons from boarding the vessels, the limit of safety having been reached.

NUMBERING OF MOTORBOATS

On June 30, 1938, there were numbered 221,546 motorboats. This is an increase of 38,920 during the year. It must be borne in mind, however, that this increase does not represent in its entirety new building, for the reason that for the past 2 years the motorboats of the United States were being renumbered, and in many outlying districts the renumbering process proceeds very slowly.

MOTORBOAT ACT

It has been the opinion of the Bureau for some time that the present Motorboat Act, which was approved June 9, 1910, and which has not since been amended, is in many respects 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 made a very comprehensive study which resulted in the preparation of new legislation repealing the old act. Before submitting the bill, the Bureau obtained the views of representatives of motorboat organizations, boat and engine manufacturers, owners and operators of commercial craft, and others concerned, and it is believed that the bill fairly expresses the consensus of opinion as to necessary legislation. The proposed bill submitted by the Bureau was transmitted to Congress on December 18, 1937, and was thereafter introduced in both Houses. This bill, with minor amendments, was passed by the Senate, and was the subject of hearings before the House Committee on Merchant Marine and Fisheries, which were not completed prior to adjournment of Congress.

TECHNICAL DIVISION

The organization of this Division was authorized by the act approved May 27, 1936, and has been functioning a little more than 2 years. The Director of the Bureau is required to approve all plans and specifications for the construction of new or major alterations to existing passenger vessels of the United States of 100 gross tons and over propelled by machinery. No such vessel may have a certificate of inspection issued to it by a board of local inspectors until the plans have been submitted and approved by the Director before construction or alteration is commenced. The Division is comprised of the naval architecture subdivision, load line, hull, and admeasurement section; the marine engineering subdivision; and the electrical engineering subdivision. Each subdivision is in charge of and functions under the supervision of a naval architect, a marine and an electrical engineer, respectively.

NAVAL ARCHITECTURE SUBDIVISION

Hull section.—It is the function of this section to examine plans and specifications for the building or alterations of all types of vessels subject to inspection by the Bureau, their life-saving equipment and appliances, fire-detecting and extinguishing equipment, and other equipment and appliances for ships. The work also includes stability tests, investigations into floodability and stability, answering questions submitted of a technical nature, and preparing all correspondence relative to the foregoing.

During the fiscal year ended June 30, 1938, plans and specifications for 114 new designs, representing 136 new vessels, were examined. In each instance plans for the arrangement of the passenger and crew accommodations, the adequacy of means of escape, the number, size, and type of lifeboats and other life-saving equipment, and arrangement of means for launching them, the strength of structural members, the extent of fireproofing, the type and size of fire-detecting and extinguishing apparatus, the watertight integrity of the vessel, and stability characteristics were checked to determine compliance with existing laws and regulations.

In addition to the new designs enumerated above, plans for 136 distinct types of vessels, covering approximately 230 barges, were

examined to determine their strength and compliance with the Bureau's rules.

Plans for conversion or alteration of 270 existing vessels were submitted and appropriate action taken and investigations of subdivision and damaged stability of existing passenger vessels were continued. Subdivision load lines were assigned to 103 vessels.

All mechanically propelled ferry vessels on the Great Lakes, bays, sounds, and lakes other than the Great Lakes, and on the rivers will be required to meet a one-compartment standard of subdivision by January 1, 1939. Preliminary investigations dealing with the subdivision and stability of the numerous vessels of this class have been made pursuant to the placing of this additional requirement into effect. The large number of vessels subjected to compliance with this regulation, together with the increased work incident to the approval of plans and specifications submitted for the construction of new vessels, has increased the work of this section to such an extent that the present personnel is inadequate to keep it current. Funds for the appointment of additional naval architects should be provided to facilitate this work.

Inclining tests were conducted on 95 vessels and calculations made to determine the stability available. Where plans were not available, the vessels were measured while in drydock and plans were drawn from which the calculations could be made. Whenever stability was found to be inadequate, ballast was ordered installed, or other steps taken, to insure satisfactory operating conditions. In a number of cases calculations were made to determine the effect of alterations on the stability of existing vessels, and appropriate action was taken to see that the proper margin of safety was present.

This section also cooperated with the Inspection Division by assigning representatives to work with principal traveling inspectors in the collection of actual data from 23 representative passenger vessels for use in drafting new regulations regarding sanitary conditions, ventilation, light, heat, arrangement, etc., of crews' quarters. In addition, its personnel assisted the National Bureau of Standards conduct standard laboratory tests of various fire-resisting materials proposed for use in vessel construction. These tests are being conducted in accordance with proposed regulations as drafted by the Senate Technical Committee for Safety of Life at Sea in Senate Report 184.

Approximately 300 pieces of equipment such as life preservers, buoyant apparatus, fire extinguishers, etc., were tested by, or under the supervision of, this section to insure compliance with Bureau regulations. Plans covering the arrangement of mechanical means for lowering lifeboats, on practically all passenger boats required to be so fitted, have been examined. In connection with this work, detailed plans covering the construction of a number of boat winches have been examined and 21 types approved for installation as complying with Bureau requirements.

Work has been completed on fire-detecting and extinguishing systems on all existing vessels. Those not having the necessary equipment on board have been taken out of service altogether or placed in restricted service.

Admeasurement section.—The tonnage of a vessel is shown on her document. On the basis of her computed tonnage, canal tolls, wharf-

age, dockage, pilotage, tonnage taxes, and other navigation fees are fixed.

During the fiscal year, 1,883 vessels, aggregating 463,064 gross tons, were admeasured for documentation. Applications for 452 readmeasurements, totaling 525,665 gross tons, were reviewed and approved if found correct; otherwise corrections were made and appropriate instructions issued.

In determining the tonnage of a vessel it is necessary to examine and check the blueprints and admeasurement figures submitted for each admeasured vessel and to make such calculations and adjustments of these figures as may be necessary to determine allowable space. In the case of new construction the complete plans of a vessel are required to be checked, whereas in the case of structural alterations and rearrangements of space in existing vessels only those plans affected by the change are checked.

Special appendix to Certificates of Registry, showing the tonnage of spaces exempt under our laws, but not so treated in foreign countries, were issued to 19 vessels. This procedure is followed in cases where domestic ships are engaged in foreign trade. Under the admeasurement laws certain spaces are excluded from tonnage, whereas under foreign admeasurement laws these spaces are not so excluded; and therefore, to place vessels of American registry on a par with foreign vessels, for tonnage tax purposes, adjustments in registered tonnage, both gross and net, are made.

Panama Canal Tonnage Certificates were issued to 95 vessels having an aggregate of 760,134 gross tons and Suez Canal Special Tonnage Certificates were furnished 21 vessels, the total of which amounted to 171,723 gross tons.

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 some 120 employees of the Treasury Department.

Load line section.—Amendments to the Foreign Trade and the Great Lakes Load Line Regulations and established Special Service regulations for determining the position of load lines on steam colliers, tugs, barges, and self-propelled barges when engaged on limited coastwise voyages were approved by the Department under date of September 28, 1937. Regulations determining the position of subdivision load lines applicable to passenger vessels, required by the International Convention for Safety of Life at Sea and by the Coastwise Load Line Act, 1935, were also approved during this fiscal year. These regulations affect all vessels of 150 gross tons and over engaged in coastwise voyages by sea and on the Great Lakes. These regulations and those formerly in effect have been combined and reprinted in a single volume for ready reference.

Canadian regulations for Great Lakes vessels were determined to be equally as effective as the United States Great Lakes regulations, with the exception of the omission from the Canadian regulations of subdivision load lines for passenger vessels.

All the load line regulations, as revised, were prepared for inclusion in the Code, according to the rules outlined by the Codification Board.

Suggested amendments for bringing the Load Line Act of March 2, 1929, into conformance with the International Convention and the Coastwise Act, 1935, were approved by the Department and presented for congressional action.

The waters of Apalachee Bay, Fla., lying north of a line drawn 58° true from Lighthouse Point on St. James Island to Gamble Point on the east side of the entrance to the Aucilla River, were designated as inland waters and publication thereof was included in the Federal Register of June 23, 1938.

A survey has been made of the Great Lakes, Eastern, and Gulf Coast ports for the purpose of ascertaining the necessary steps that should be taken to improve the enforcement of the various load line acts. During this survey, oral advice as to load line enforcement was presented to the Customs and Coast Guard officials and also to the local inspectors of the Bureau.

The Board of Trade, London, requested the Department's interpretation of Rule LXV of the International Load Line Convention of 1929. A meeting of the surviving available members of that convention was held to determine, if possible, the intention of the convention. As a result, the opinions of the meeting were presented to the Department and, after approval, incorporated in a reply to the Board of Trade and later promulgated in Bureau Circular Letter No. 210.

During the fiscal year 587 vessels were marked and certificated with load lines authorized by the various load line acts, 159 violations of the load line acts were handled, 17,259 reports of sailings of vessels were received, and 1,771 annual load line inspections were accomplished.

MARINE ENGINEERING SUBDIVISION

As mentioned in last year's report, the Bureau has in course of preparation, a code covering the welding of high pressure piping. With the cooperation of the Navy Department and the American Welding Society, this work has continued and the code is now ready for promulgation. In the meantime, special permits have been granted for the use of this form of welding on six new vessels, all of which are now in service.

Other work in connection with welding has included the development of new methods of repairing fire-tube boilers and repairing deteriorated furnaces.

Resolutions were passed by an executive committee of the Board of Supervising Inspectors approving the welding of sea chests and seal and tack welding.

The regular work of approving welding rods and electrodes and the examination and qualification of welding operators has continued to expand and demands a steadily increasing proportion of the time and attention of the marine engineering subdivision. With the expansion of shipbuilding now in progress the present staff will soon become quite inadequate to handle the enormous amount of detail work involved.

In cooperation with the Navy Department, a new procedure has been developed for the qualification of welding operators for both plate and pipe work.

In the last annual report mention was made of several failures of boiler plate submitted for approval. In certain instances plate has proved defective in a completed new boiler. This very serious situation has been the subject of an extended and far-reaching investigation by the Marine engineering subdivision with the cooperation of boiler manufacturers and steel companies, with the result that new specifications governing the manufacture and testing of boiler steel have been developed and will shortly be put into effect. The importance of preventing the manufacture of defective boiler steel, however slight the defects may be, cannot be overestimated.

This subdivision has investigated steam pipe failures on the *Brazos* and *Caloria* and issued instructions to inspectors relative to piping installations which should prevent a repetition of such accidents.

An investigation of the boiler explosion on the tug *Invincible* produced added testimony as to the necessity for more stringent requirements for boiler steel, as before-mentioned, and also for an effort to educate operating engineers relative to the hazards of dirty boilers.

Other important work includes the development of an adjusted service pressure table governing pressure and temperature ratings for valves and fittings; tentative rules for rating and testing the capacity of safety valves and the passing of a resolution by the Board of Supervising Inspectors relative to the inspection of steam vessels subject to the motorboat act.

The Boiler Code adopted by this Bureau has now been in operation for 3 years, and it is gratifying to know that in addition to the universal approval of the industry in this country it has been highly commended by certain eminent foreign engineers.

ELECTRICAL ENGINEERING SUBDIVISION

The duties of this subdivision include the examination of plans and specifications for the electrical installation on all new passenger, cargo, tank, towing, and miscellaneous vessels, as well as plans and specifications for the major alterations to the electrical installations on existing vessels. These plans include lighting and power distribution circuits, emergency lighting and power distribution circuits, interior communication circuits, and apparatus. Plans showing the type and construction of generators and motors, control equipment for generators and motors, switchboards and distribution panels, circuit protective devices, communication apparatus and types and capacities of electric cable are also included. The testing and approval of electrical equipment, such as fire detecting and alarm systems, emergency loudspeakers systems, lighting fixtures, and wiring appliances, etc., are additional types of equipment this subdivision is required to approve before it can be installed for use on board vessels.

The most important single project completed during the year, was the inspection and test of emergency loudspeaker systems on 103 passenger vessels, the test including sound level determination at each speaker, power consumption, operation under short-circuit conditions and electrical ground conditions, and operation of emergency power supply. Plans for each vessel showing the location of loudspeakers were first approved and then plans for each vessel showing the elec-

trical wiring circuit for the particular installation, together with the location of amplifiers, control equipment, and power supply equipment, were approved.

The electrical plans covering the construction of the following new vessels have been checked and approved by this subdivision: 5 passenger vessels, 3 cargo vessels, 35 tank ships and barges, and 18 miscellaneous tugboats and cargo vessels. Electrical plans of major alterations to 15 vessels have also been checked and approved.

During the year the Bureau has examined and approved samples representing a great variety of electrical equipment suitable for marine use. This equipment includes watertight and vapor-proof lighting fixtures, connection boxes and wiring appliances, berth lights, bells and other signaling devices, switches and control units, as well as explosion-proof electrical equipment suitable for use in hazardous locations.

In addition to the above duties, the electrical engineering subdivision has been engaged in the preparation of specifications and minimum standards for many items of marine electrical equipment. This work is being done in cooperation with the National Bureau of Standards, the American Institute of Electrical Engineers, and manufacturers of such equipment.

A continual effort is being made by this subdivision, in cooperation with the boards of local inspectors and the Federal Communications Commission, to increase the safety of life at sea, by eliminating all fire hazards in connection with electrical equipment aboard ship.

SHIP PERSONNEL DIVISION

Administration of the Seamen's Act as amended by recent acts of Congress has been somewhat difficult due to the lack of sufficient personnel. However, it is expected that some relief will be afforded during the coming fiscal year when funds become available for the appointment of a number of additional clerks for this work. The records show that under the provisions of the above act, the following have been issued to merchant seamen during the year: 36,070 continuous discharge books; 100,861 certificates of identification; 9,842 able seamen's certificates; 12,668 lifeboat certificates; 11,310 qualified member of the engine department certificates; 63,376 certificates of service; 1,110 tankerman certificates, making a total issue of 235,227 certificates of all classes, including continuous discharge books. There were 9,011 duplicate discharge books and certificates of various kind prepared by this Division for issuance to seamen who lost their original papers. Under the law, the cost of furnishing duplicate records is borne by the seamen requesting same.

The rules and regulations originally prepared for the issuance of seamen's certificates and other papers were revised as of May 5, 1938, to meet the requirements of new legislation.

Under the supervision of this Division it is the duty of the United States shipping commissioners located at the various ports throughout the United States to witness the shipment and discharge of crews on shipping articles of agreement for all vessels in the foreign and intercoastal trade. He acts as arbitrator for the master and seamen it settling disputes as to wages, working conditions, overtime, etc. Factional disputes among seamen continue to cause confusion in the

offices of shipping commissioners and increases greatly the number of questions they are called upon to decide. There has been a material increase in the number of services rendered ships' officers, owners, and agents with particular respect to the maintenance of registers for the convenience of, and assistance to, seamen who may be seeking employment on ships of American registry.

During the fiscal year much progress has been made with respect to the establishment and formulation of a procedure which has for its purpose the standardization and centralization of the Bureau's method of conducting examinations for licensed officers. The appointment of a qualified engineer examiner is absolutely essential to the early completion of the preliminary work incident to this change in procedure as well as in the rating of the papers after the system is established. However, much progress has been made during the year.

A complete revision of the rules and regulations relating to the licensing of officers has been completed wherein many important and far-reaching changes have been recommended and specimen examinations prepared. Specimen examinations for unlicensed personnel have also been prepared.

A system of sea observations was inaugurated and 75 ship masters are now official observers, sending in regularly their celestial observations in accordance with instructions recently issued by the Bureau. This instruction booklet, "See Observations," is also serving to introduce the general use of the line of position and of the various modern methods of navigation throughout the merchant marine.

The collaboration of the United States Weather Bureau has been obtained in regard to the securing of meteorological observations and data from vessels at sea in the path of storms, for use in the preparation of problems and weather charts.

A reference library of 200 books has been assembled. Specifications have been drawn up for modern and efficient equipment for the field examination centers to be established.

The revision and standardization of the physical requirements for licensed officers and certificated men was successfully accomplished in collaboration with the Public Health Service.

During the fiscal year there were 7,316 deck officers' licenses, including pilots, 8,933 engineer officers' licenses, and 12,230 licenses to motorboat operators issued.

AMERICAN SHIPPING ON JUNE 30, 1938

On June 30, 1938, the merchant marine of the United States, including all kinds of documented craft, comprised 27,309 vessels of 14,676,382 gross tons, as compared with 26,588 vessels of 14,676,128 gross tons on June 30, 1937. There were of this total 1,825 vessels of 3,591,521 gross tons engaged in the foreign trade, as compared with 1,884 vessels of 3,853,487 gross tons on June 30, 1937, while 25,484 vessels of 11,084,861 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, 5,249 of 11,320,493 gross tons; wooden vessels, 21,922 of 2,508,843 gross tons; Maritime Commission, steel vessels, 134 of 846,666 gross tons; wooden vessels, 4 of 380 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, 1938, when it amounted to only 3,591,521 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 4,971,865 gross tons.

On July 1, 1938, there were building or under contract to build in American shipyards for private shipowners, 157 vessels of 462,308 gross tons. The corresponding figures for 1937 were 302 vessels of 365,862 gross tons.

LAID-UP VESSELS

On June 30, 1938, the laid-up tonnage of the United States aggregated 1,890 vessels of 2,967,672 gross tons, as against 1,612 vessels of 1,308,679 gross tons on June 30, 1937.

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, 1938."

APPROPRIATIONS

The following appropriations were made available to this Bureau for the fiscal year 1938:

Departmental salaries	$297,540
Salaries and general expenses	2,114,460
Total	2,412,000

However, the amount appropriated for the Bureau's activities is largely offset by the fees, fines, and penalties collected during the same period. These amounted to $2,066,122.30.

PATENT OFFICE

In the course of the last 12 months the American patent system has been the subject of more widespread interest and inquiry than it has evoked in two generations. The President, in his message to Congress on January 3, 1938, made reference to it and recommended congressional action with respect to certain weaknesses and abuses charged to it.

A score of bills contemplating various vital changes in the statutes affecting patents were before the Seventy-fifth Congress. Notable among these legislative proposals were a bill (H. R. 9259) for the compulsory licensing of patents; a measure (H. R. 8508) prohibiting the patenting of "labor-saving" machines, and another (S. 475) looking to the establishment of a single court of appeals of national jurisdiction and final authority in the determination of questions arising out of patent grants. After conducting a series of hearings on the bill (S. 475) contemplating the creation of such a court the Patents Committee of the Senate unanimously recommended its enactment. An objection to its consideration by the Senate prevented further action by the Seventy-fifth Congress. In the latter days of its third session that Congress constituted a Temporary National Economic Committee empowered and directed to investigate, among other matters, "the effect of existing * * * patent and other Government policies upon competition, price levels, unemployment, profits, and consumption."

At this writing the Committee is prosecuting its inquiry into the relation of patents to the economic problems it was authorized to study.

The Commissioner of Patents and his associates have put themselves at the disposal of the Committee and are prepared to furnish facts and recommendations with regard to improvements in the present statutes. The special Patent Office Advisory Committee, appointed by the Secretary of Commerce in July 1933, in collaboration with the Commissioner and his associates, is continuing its studies of some of the problems with which the Economic Committee is concerned, and at the same time is pursuing its work for the betterment of the system as a whole, including the intramural procedure governing the prosecution and issue of applications. A further reference to the Advisory Committee's work will be found later in this report.

The number of applications for patents (including designs) and for the registration of trade-marks, prints, and labels filed in the fiscal year was 92,018, exceeding by 2,038 the total received in 1937.

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Applications for patents other than those covering designs were 66,050, an excess of 2,278 over the aggregate for 1937 and the largest total since 1932. A large increase was recorded also in the number of applications for design patents. These were 8,014, or 1,397 more than in 1937, and the greatest annual aggregate in the history of the Office. As was noted in a previous annual report, manufacturers and merchandisers are making increasingly larger use of design patents for the protection and exploitation of the ornamental features of their goods.

Receipts for the 12 months ended June 30 were $4,551,298.87, an excess of $74,385.62 over expenditures. For the last 5 years the annual surpluses have averaged $122,566.

CONDITION OF THE WORK

Notwithstanding a large increase in the number of new applications, and without an enlargement of the technical personnel, the total of cases disposed of in 1938 was 60,168, against 58,091 in 1937. At the same time, however, the cases awaiting action by examiners were 45,723, compared with 38,121 at the end of the preceding year. The total of applications pending on June 30, 1937, was 109,735, and on June 30, 1938, there were 116,041. At the close of the year covered by this report the work of 11 examining divisions of the Office was within 90 days of current. Of the remaining 54 divisions 27 were not more than 4 months in arrears, and 17 were less than 5 months behind. Four divisions were within 8 months of current. The Design Division was keeping pace with incoming business. The work of the clerical divisions was current.

CLASSIFICATION OF PATENTS

Classification of patents has progressed as satisfactorily as the funds and personnel available for the task would permit. Difficulties were occasioned by the retirement and death of examiners having experience and skill. In the interval since the last previous report 4 new classes (8, 68, 124, and 260) comprising 35,806 original patents and 15,011 cross references have been revised. In addition, 26 subclasses of class 152 were abolished and 251 new subclasses were established. The subclasses discontinued involved resilient tires and wheels. The new subclasses in class 152 embrace 11,182 original patents and 9,666 cross references. There were established 282 subclasses in existing classes. These new subclasses contain 12,263 patents and 6,168 cross references. Forty-four subclasses were abolished and the patents embraced in them, numbering 2,549 originals and 649 cross references, were transferred to existing or new classes. Miscellaneous patents to the number of 1,690 were transferred from different classes and 2,668 cross references were made to facilitate searching in existing classes. In all, 37,400 cross references were made in connection with the weekly issue of patents. The Division was proceeding with the revision or rerevision of many other classes. For lack of sufficient personnel it was necessary to defer the formation of certain new classes.

PATENT OFFICE ADVISORY COMMITTEE

With the cooperation of the Commissioner and other officials, the Patent Office Advisory Committee, of which mention has been made in one of the foregoing paragraphs of this report, has closely investigated the alleged evils and weaknesses of the patent system and canvassed the various correctives suggested. Among the many subjects to which the Committee has given attention are so-called suppression and pooling of patents and one of the cures advocated for the abuses imputed to these practices—compulsory licensing. It is expected that the Committee's information and viewpoints will be welcomed by the Temporary National Economic Committee.

The Advisory Committee's present members, all of whom serve without compensation and bear the expenses incident to their attendance at frequent meetings in Washington, are: George Ramsey, of New York, N. Y., chairman; John J. Darby, Washington, D. C.; John A. Dienner, Chicago, Ill.; Thomas Griswold, Jr., Midland, Mich.; Franklin D. 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.; Milton Tibbetts, Detroit, Mich.; and Charles E. Townsend, San Francisco, Calif.

RECENT LEGISLATION

At the last session of Congress several statutes directly concerning the work of this Office were enacted.

Public Act No. 498 (75th Cong., 3d sess.), approved May 9, 1938, makes it unlawful for any person, not duly recognized to practice before the Patent Office in accordance with the statutes and the rules of the Patent Office, to hold himself out or permit himself to be held out as a patent solicitor, patent agent, or patent attorney, or as authorized to represent applicants for patents before the Patent Office. It also prohibits any person disbarred from practice before the Patent Office and not subsequently reinstated from holding himself out as entitled to represent or assist persons in business before the Patent Office. The act makes a violation thereof a misdemeanor punishable by a fine of from $50 to $500.

The purpose of the act is to prevent unauthorized practice before the Patent Office, and to control the fraud and deception by persons who have either been disbarred from practicing before the Patent Office or who have never been enrolled to practice, and advertise themselves as patent agents, or attorneys, solicit business, and otherwise engage in unauthorized practice before the Patent Office. The act is considered of great importance and will be of material benefit to the Patent Office and the patent system.

Public Act No. 586 (75th Cong., 3d sess.), approved June 10, 1938, authorizes the Patent Office to register certain collective trade-marks. The Trade-Mark Act of February 20, 1905, is amended by this act to permit any natural or juristic person, including nations, States, municipalities, and the like, which exercise legitimate control over the use of a collective mark, to apply for and obtain registration of

such mark, by procedure similar to that for the registration of other trade-marks. Prior to this act organizations which controlled the use of a trade-mark by a number of manufacturers or dealers could not in general have a trade-mark registration. In 1936 the Trade-Mark Act was amended to permit the registration of collective marks by an association located in a foreign country, in order to comply with our treaty obligations. The present act removes the injustice of a discrimination against our own citizens and gives to domestic users of collective marks the same protection that we give to foreigners.

Public Resolution No. 100 was also passed by the same Congress. This act protects the copyrights and patents of foreign exhibitors at the Pacific Mercado International Exposition to be held at Los Angeles, Calif., in 1940. In a preceding session of Congress two bills were passed (Pub. Res. 35, May 28, 1937, and Pub. Res. 41, June 11, 1937), to protect the copyrights and patents of foreign exhibitors at the Golden Gate International Exposition to be held at San Francisco, Calif., in 1939, and at the New York World's Fair, also to be held in 1939.

SPECIAL CASES

A total of 226 petitions to give pending applications special status in order to expedite their prosecution and issuance and thus hasten the manufacture and use of the particular inventions sought to be patented was filed in the year ended June 30. This compared with 336 in the 12 months from June 30, 1936, to July 1, 1937.

The number of such "petitions to make special" granted was 104. Of these, in turn, 69 were granted in the interest of prospective manufacture necessitating the investment of capital and the employment of 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, 1938[1]

With fees:		
Applications for patents for inventions	66,050	
Applications for patents for designs	8,014	
Applications for reissue of patents	421	
		74,485
Applications for registration of trade-marks	[2] 14,601	
Applications for registration of labels and prints	2,932	
		17,533
Total, with fees		92,018
Without fees:		
Applications for inventions (act Mar. 3, 1883)	486	
Applications for reissue (act Mar. 3, 1883)	2	
Total, without fees		488
Grand total		92,506

[1] Including applications in which fees were refunded and transferred.
[2] Includes 1,229 applications for renewal of trade-mark registrations.

Applications for patents for inventions with fees

Year ended June 30—		Year ended June 30—	
1929	87,039	1934	56,095
1930	91,430	1935	56,832
1931	84,097	1936	59,809
1932	73,465	1937	63,772
1933	59,408	1938	66,050

Applications for patents, including reissues, designs, trade-marks, labels, and prints, with fees

Year ended June 30—		Year ended June 30—	
1929	114,496	1934	79,367
1930	117,569	1935	81,000
1931	106,717	1936	85,102
1932	93,859	1937	89,980
1933	79,469	1938	92,018

Patent applications awaiting action

June 30—		June 30—	
1929	103,236	1934	39,226
1930	119,597	1935	31,920
1931	92,203	1936	33,540
1932	76,723	1937	38,121
1933	49,050	1938	45,723

Patents withheld and patents expired

	1937	1938
Letters patent withheld for nonpayment of final fees	4,773	4,846
Applications allowed awaiting payment of final fees	15,113	15,949
Patents expired	37,937	38,082
Applications in which issue of patent has been deferred under sec. 4885 R. S	446	490
Applications in process of issue	2,701	2,865

Patents granted and trade-marks, labels, and prints registered

	1934	1935	1936	1937	1938
Letters patent	48,523	41,621	39,978	39,412	36,672
Plant patents	30	28	61	65	28
Design patents	2,419	3,437	4,174	4,939	5,142
Reissue patents	343	400	400	405	343
Trade-marks	10,139	11,109	10,777	11,329	10,529
Labels	1,635	1,908	1,787	1,955	1,806
Prints	535	500	519	551	609
Total	63,624	59,003	57,696	58,656	55,129

Statement of receipts and earnings for the fiscal year ended June 30, 1938

Unearned balance at close of business June 30, 1937	$209,170.50	
Collections during fiscal year ended June 30, 1938	4,364,322.97	
Total	4,573,493.47	
Refundments	22,194.60	
Net collections		$4,551,298.87

EARNINGS

Inventions, first fees	$1,978,020.00		
Extra claims	34,029.00		
Reissues	12,600.00		
Designs	83,305.00		
Design extensions	29,225.00		
Trade-marks	219,875.00		
Labels and prints	14,448.00		
Total		$2,371,502.00	
Final fees	$1,097,659.00		
Extra claims	18,063.00		
Total		1,115,722.00	
Appeals	$60,225.00		
Oppositions	10,130.00		
Disclaimers	1,860.00		
Revivals	3,520.00		
Total		75,735.00	
Printed copies, etc	$403,502.60		
Photoprints	11,208.49		
Photostats	66,133.50		
Manuscript	122,600.95		
Certified printed copies, etc	8,997.33		
Recording articles of incorporation	1,020.00		
Recording international trade-marks	40.00		
Registration of attorneys	640.00		
Total		614,142.87	
Drawings		19,862.46	
Assignments		149,895.41	
Total earnings			$4,346,859.74
Unearned balance June 30			204,439.13
Net receipts			4,551,298.87

Expenditures, fiscal year ended June 30, 1938

Salaries			$3,377,620.08
Photolithographing:			
Current issue, black and white		$35,953.92	
Current issue, color		5,935.50	
Reproduction, black and white		68,463.81	
Reproduction, color		535.00	
Photographic printing		15,073.14	
Photostat supplies		44,267.68	
Total			170,229.05
Miscellaneous expenses			46,403.86
Printing and binding:			
Specifications		$703,954.56	
Official Gazette		95,155.08	
Indexes		10,687.14	
Total			809,796.78
Miscellaneous			72,863.48
Total			4,476,913.25

Receipts and expenditures

Receipts from all sources	$4,551,298.87
Expenditures	4,476,913.25
Surplus	74,385.62
Receipts from sale of Official Gazette and other publications (Superintendent of Documents)	73,734.42

Comparative statement

June 30—	Receipts	Expenditures	Deficit	Surplus
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	[1] 4,487,508.78	5,314,851.59	827,342.81	
1933	[1] 4,423,563.18	4,588,585.02	165,021.84	
1934	[1] 4,383,468.11	3,876,785.01		$506,683.10
1935	[1] 4,264,874.67	4,153,591.21		111,283.46
1936	[1] 4,368,099.17	4,446,463.69	78,364.52	
1937	[1] 4,565,501.69	4,492,273.47		73,228.22
1938	[1] 4,551,298.87	4,476,913.25		74,385.62

[1] This does not include the amount received by the Superintendents of Documents for the Official Gazette and other publications.

Comparative statement of expenditures under separate appropriations

Appropriation	1937	1938
Salaries	$3,377,554.85	$3,377,620.08
Photolithographing	165,345.41	170,229.05
Printing and binding	850,844.58	809,796.78
Miscellaneous printing and binding	54,325.76	72,863.48
Miscellaneous expenses	44,202.87	46,403.86
Total	4,492,273.47	4,476,913.25

Litigated cases

Patent:		
Interferences declared		1,494
Interferences disposed of before final hearing		1,464
Interferences disposed of after final hearing		280
Interferences heard		281
Interferences awaiting decision		30
Trade-mark:		
Interferences declared		118
Oppositions instituted		1,008
Cancellations instituted		178
Interferences disposed of before final hearing		990
Interferences disposed of after final hearing		358
Interferences heard		360
Interferences awaiting decision		16
Before the Board of Appeals:		
Appeals in ex parte cases	3,237	
Appeals in interference cases:		
Priorities	207	
Motions	205	
	412	
		3,649
Ex parte appeals decided	3,230	

Before the Board of Appeals—Continued			
Appeals in interference cases decided:			
Priorities	259		
Motions	230		
		489	
			3,719
Ex parte cases awaiting action		1,947	
Interference cases awaiting action:			
Priorities	139		
Motions	142		
		281	
			2,228
Oldest ex parte case awaiting action			May 25, 1938
Oldest interference case awaiting action			May 20, 1938
To the Commissioner:			
Appeals in trade-mark interferences	7		
Appeals in trade-mark oppositions	95		
Appeals in trade-mark cancellations	21		
Appeals in ex-parte trade-mark cases	31		
Interlocutory appeals	22		
		176	
Petitions to Commissioner:			
Ex parte[1]	6,703		
Inter partes	189		
To make special	266		
		7,158	
			7,334
Cases disposed of by Commissioner:			
Appeals in trade-mark interferences	5		
Appeals in trade-mark oppositions	65		
Appeals in trade-mark cancellations	15		
Appeals in ex parte trade-marks	25		
Interlocutory appeals	22		
		132	
Petitions disposed of:			
Ex parte[1]	6,599		
Inter partes	181		
To make special	266		
		7,046	
			7,178
Notice of appeals to United States Court of Customs and Patent Appeals:			
In ex parte cases (including 4 trade-marks)		105	
In inter partes cases (patents)		83	
In design applications		1	
In trade-mark interferences		1	
In trade-mark oppositions		20	
In trade-mark cancellations		8	
			218
To the District Court of the United States for the District of Columbia (suits)			126

[1] Includes revivals and amendments under Rule 78.

OTHER DETAILS OF BUSINESS FOR THE FISCAL YEAR

As to the volume of business, the Office received during the year 74,485 applications for patents, reissues, and designs; 13,372 trade-mark applications and 1,229 applications for renewal of trade-mark registrations; 2,932 label and print applications; 177,238 amendments to patent applications; 11,246 amendments to design applications, and 17,814 amendments to trade-mark, label, and print applications.

The number of letters constituting the miscellaneous correspondence received and indexed was 466,786. In addition, 44,871 letters were returned with information.

The number of printed copies of patents sold was 3,966,147; 1,078,539 copies of patents were shipped to foreign governments; and 772,204 copies furnished public libraries. The total number of copies of patents furnished was 6,419,578, including those for Office use and other Departments.

The Office received for record 44,495 deeds of assignment.

The Drafting Division made 805 drawings for inventors, and corrected 11,749 drawings on request of inventors; in addition, 7,500 drawings were corrected for which no charge was made; 131,578 sheets of drawings were inspected, and 14,999 letters answered.

Typewritten copies of 3,508,400 words were furnished at 10 cents per hundred words. The Office certified to 16,864 manuscript copies, and furnished 7,255 miscellaneous certified copies. The Office also furnished 531,346 photostat copies of manuscript pages, 40,110 photographic copies, and 332,954 photostat copies of publications and foreign patents, for sale; 14,753 photostat-manuscript pages, 254 certified manuscript copies, and 11,346 photostat copies for Government departments, without charge; 34,600 photostat and 19,279 photographic copies for use of the Patent Office; 14,871 photostat copies for sale through photo-print section, and 191 photostats for Office use; also 78,965 photostats for assignments, grants, and disclaimers for official use; in all, 1,019,026 photostat and 59,389 photographic copies.

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