Thirteenth Annual Report of the Secretary of Commerce 1942

Thirtieth Annual Report

of the

Secretary of Commerce

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CONTENTS

Report of the Secretary

	Page
Economic review of the year	V
War expenditures	V
The process of economic mobilization	VI
Gross national output at record high	VI
Government portion increased sharply	VII
Consumer expenditures and retail sales	VII
The national income is a net measure of the national output	VIII
Corporate earnings showed a downtrend	IX
Physical volume of output	X
Industry mobilized without general slump	X
Industrial conversion and arms manufacture	XI
Construction activity at peak levels	XII
Total transportation volume at record high level	XII
Power and gas output also in peak volume	XIII
Manpower utilization	XIV
Highlights of the year	XV
Business Advisory Council	XV
Bureau of the Census	XVI
Civil Aeronautics Administration	XVII
Coast and Geodetic Survey	XVIII
Bureau of Foreign and Domestic Commerce	XIX
Foreign-Trade Zones Board	XX
Inland Waterways Corporation	XX
Bureau of Marine Inspection and Navigation	XXI
National Inventors Council	XXII
Patent Office	XXII
St. Lawrence Survey	XXIII
National Bureau of Standards	XXIII
Weather Bureau	XXIV

Report by Bureaus

Chief Clerk and Superintendent	3
Department Library	3
Division of Purchases and Sales	3
Division of Accounts	4
Division of Publications	9
Division of Personnel Supervision and Management	10
Division of Administrative Management	12
Conferences and Expositions	13
Office of the Solicitor	14
Bureau of the Census	15
Civil Aeronautics Administration	41
Coast and Geodetic Survey	65
Bureau of Foreign and Domestic Commerce	83
Patent Office	93
National Bureau of Standards	103
Weather Bureau	129

30*th* Annual Report
of the
Secretary of Commerce

DEPARTMENT OF COMMERCE,
OFFICE OF THE SECRETARY,
Washington, December 1, 1942.

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

Submitted herewith is the Annual Report of the Department of Commerce for the fiscal year ended June 30, 1942.

ECONOMIC REVIEW OF THE YEAR

Rearmament under the national defense program provided the chief stimulus to rising economic activity during the first 5 months of the fiscal year 1942. The attack on Pearl Harbor converted the defense program almost overnight into a drive for total war mobilization. Hence the economic developments of the year reflected the acceleration of industrial output and the mobilization of human and economic resources necessary to the raising, training, and equipping of a vast Army and the launching of a mighty fleet. Under this stimulus the Nation's economic achievements shattered all previous records.

WAR EXPENDITURES

The Government's expenditures for war goods and services indicate the rate and extent to which the national economy was converted from peacetime to wartime needs. At the close of the fiscal year 1941 total expenditures for war activities were running at about $830,000,000 a month. Spectacular increases throughout the period in disbursements for the Army, Navy, Lend-Lease Administration, and other war agencies brought total monthly war expenditures up to about $3,830,000,000 by June 1942. The total for the 1942 fiscal period was $26,000,000,000.

As these outlays, initially for defense but subsequently for war, rose month after month, the goods and services they purchased rose in corresponding volume. While the needs of the armed forces and

of our allies were thus in effect preempting an increasingly major portion of the national output, the latter was not, of course, static but was rising rapidly in response to the dynamics of the situation.

The Process of Economic Mobilization

Several broad developments were notable as economic mobilization continued apace during the year. The clue to the entire process was the rise in the gross national product that was achieved by bringing to bear increasing quantities of manpower and capital equipment upon a growing volume of raw materials—all despite the continued drain of eligible men into the armed forces. During the 12 months under review, 3,100,000 more men and women enrolled in the Nation's labor forces. This increased employment, together with rising wage rates, resulted in such a flood of consumer purchasing power that in the early part of the fiscal year a record-breaking volume of civilian-goods output was superimposed upon the rising war-goods production. Hence it became necessary to apply Government controls of a progressively sweeping nature to assure to the arms industries a flow of materials, labor, and industrial facilities adequate to their needs.

The War Production Board's limitation orders curtailed or forbade the production of certain goods for civilian uses. Materials orders curtailed or prohibited the use of certain scarce materials for civilian purposes. Priorities and allocations of scarce materials were employed to give war uses preference over civilian uses.

Another development during the year was the battle against inflation. All the elements existed for an explosive inflation—consumer purchasing power was being poured out in a volume never before attained, just when the quantity of goods available for civilian consumers was commencing to shrink. The price level was naturally forced up by these circumstances. During the year the cost of living rose 11 percent. That the rise was not greater was due to various measures effected by the Government, culminating finally in the widespread freezing of prices by the General Maximum Price Regulation in April.

The governmental organization for managing the war economy continued to evolve during this period. Of the 45 emergency war agencies that had been set up by July 1, 1942, including joint boards and committees formed with various allied nations, 29 were newly established or substantially reorganized during the year. While some of these were established primarily to deal with military problems, such as the Pacific War Council and the Munitions Assignments Board—with the United States and Great Britain as the two members—others were essential to the functioning of the war economy, such as the War Production Board, War Manpower Commission, Board of Economic Warfare, Lend-Lease Administration, War Shipping Administration and others.

Gross National Output at Record High

The aggregate of all goods and services produced, valued at final market prices to users, constitutes the gross national product or the gross national expenditure. It is the most inclusive measure of the Nation's output. This aggregate, as may be seen in table 1, reached the record high level of $134,000,000,000 in the fiscal year 1942.

TABLE 1.—*Gross national product by use*

[Billions of dollars]

	Fiscal year ended June 30—			1941		1942	
	1940	1941	1942	July–Sept.	Oct.–Dec.	Jan.–Mar.	Apr.–June
Gross national product or expenditure	92.8	105.9	133.8	31.1	33.1	32.9	36.7
Government expenditures for goods and services	15.5	19.0	38.0	6.4	7.7	10.2	13.7
Federal Government	7.2	10.8	29.7	4.3	5.6	8.1	11.7
War	1.7	5.8	24.8	3.0	4.3	7.0	10.5
Other Federal Government	5.5	5.0	4.9	1.3	1.3	1.1	1.2
State and local government	8.3	8.2	8.3	2.1	2.1	2.1	2.0
Output available for private use	77.3	86.9	95.8	24.7	25.4	22.7	23.0
Private gross capital formation	13.2	16.5	17.1	5.6	4.8	3.7	3.0
Consumers' goods and services	64.1	70.4	78.7	19.1	20.6	19.0	20.0
Durable goods	7.7	9.7	8.2	2.6	2.3	1.6	1.7
Nondurable goods and services	56.4	60.7	70.5	16.5	18.3	17.4	18.3

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

Government portion increased sharply

The most significant fact is the increasing proportion of the total output purchased by the Federal Government, especially that part going into war uses. Equally important was the continuing increase in private capital formation, especially the portion going into private construction and durable productive equipment. Because of the increases in these two groups, the portion of goods and services available for consumers shrank in relative magnitude, dropping from 69 percent of the total in the fiscal year 1940 to 59 percent in 1942. The larger share taken by the Government reflected, of course, the growing consumption by and equipment of the armed forces as well as considerable military construction and industrial facilities purchased by the Government for armament production. When to this last-mentioned type of expenditure is added the peak total of private expenditure for construction and capital equipment, there is no doubt that this period saw the largest addition ever made to the Nation's stock of productive facilities.

Consumer expenditures and retail sales

Consumer expenditures during the fiscal year 1942 were at a record level for both goods and services. High incomes engendered by war expenditures resulted in rising demand for consumer goods. Except for a few products—notably automobiles, tires, and sugar—supplies to meet this increased demand were forthcoming although only at higher prices in most cases. After allowing for price increases and isolated shortages, however, the amount of goods which American consumers were able to purchase was the highest in history.

Sales of retail stores, which in the fiscal year 1941 were already slightly above the previous peak reached in 1929, moved sharply upward in the fiscal year 1942. Limitations on instalment sales in September and the cutting off of passenger car and truck sales in January brought about a substantial decline in the sales of stores handling principally durable goods. All major groups of nondurable-goods stores, however, recorded sharp sales increases. In the case of food stores, the rise was largely in prices, and physical volume

increased only about 5 percent. On the other hand, apparel and drug stores, as well as eating and drinking places, showed increases of about 10 percent even after adjusting to eliminate price changes.

TABLE 2.—*Sales of retail stores and consumer expenditures for goods and services, 1939–42*

[Millions of dollars]

	Fiscal years ending June 30—			
	1939	1940	1941	1942
Sales of all retail stores	40,285	43,887	49,587	55,013
Durable-goods stores	9,576	11,225	14,097	11,983
Nondurable-goods stores	30,709	32,662	35,490	43,030
Consumer expenditures	59,279	62,887	68,464	77,288
Goods	37,200	39,898	44,223	50,944
Services	22,079	22,989	24,241	26,344

The national income is a net measure of the national output

National income is less than the gross national product by the amount of depreciation and maintenance, direct business taxes, and other deductions representing costs and adjustments. Because it is measured *after* business taxes, depreciation, and other reserves have been deducted, it registered a smaller percentage gain during the year than the gross product. The striking feature of the income originating in the several industrial divisions of the economy (see table 3) is the continued increase in the contributions of manufacturing and government. Income originating in the trade, services, and finance industries also rose, though less substantially. In view of the drive for war production and the fact that few armaments flow through distributive channels, these trends were to be expected.

TABLE 3.—*National income by industrial divisions*

[Millions of dollars]

Industrial division [1]	Calendar year 1929	Fiscal year ended June 30—				
		1933	1939	1940	1941	1942
Total	83,283	38,675	67,007	73,884	84,161	104,248
Manufacturing	20,915	6,252	14,531	18,435	23,403	30,923
Trade	11,878	4,962	9,108	11,218	12,247	13,755
Government	6,346	6,477	10,132	9,980	10,897	13,468
Agriculture	6,772	2,584	5,800	6,107	6,623	10,228
Service	8,315	5,233	8,328	7,213	7,579	8,679
Transportation	6,982	3,534	4,610	5,214	5,851	7,235
Finance	10,136	4,517	5,908	6,052	6,221	6,434
Contract construction	3,547	656	1,923	2,257	3,173	4,099
Mining	1,919	521	1,170	1,580	1,821	2,350
Power and gas	1,427	1,043	1,386	1,514	1,553	1,534
Communications	1,046	668	878	956	1,000	1,104
Miscellaneous	4,000	2,228	3,233	3,358	3,793	4,439

[1] Industrial divisions, except Miscellaneous, are arranged in decreasing order of magnitude according to 1942 data.

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

All types of income shared in the gains of the year (see table 4). The largest gain, however, was made in farm entrepreneurial income,

due chiefly to the swift rise in farm prices. The next largest gain was in wages and salaries, due to the substantial increase in employment and the upward trend of wage rates. Income of stock and bond holders gained the least. Over the last 3 years, compensation of employees has become a slightly larger fraction of the national income.

TABLE 4.—*National income by distributive shares, without adjustment for seasonal variations*

[Millions of dollars]

Fiscal year ended June 30—	National income, total	Compensation of employees			Entrepreneurial income and net rents and royalties	Interest and dividends	Corporation savings
		Total	Salaries and wages	Other labor income			
1929 [1]	83, 283	53, 023	52, 496	527	17, 199	11, 811	1, 250
1933	38, 675	29, 033	28, 074	959	6, 307	7, 555	−4, 220
1937	69, 271	46, 080	43, 010	3, 070	13, 993	10, 065	−867
1938	67, 604	46, 204	42, 607	3, 597	13, 310	9, 272	−1, 182
1939	67, 007	46, 472	42, 346	4, 126	12, 650	8, 401	−516
1940	73, 884	50. 107	46, 451	3, 656	13, 652	9, 131	994
1941	84, 161	57, 829	54, 117	3. 712	14, 724	9, 659	1, 949
1942	104. 248	72, 235	68, 771	3, 464	19, 699	9, 841	2, 473

[1] Calendar year.

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

Corporate earnings showed a downtrend

For the year as a whole (see table 5) corporate earnings registered a total unequaled since 1929 and a peak for recent years. But during the second half of the fiscal year, owing to higher taxes, corporate earnings dropped slightly below the same period of the fiscal year 1941. The fortunes of economic mobilization necessarily produced a wide diversity of profit trends among the several industries. While manufacturing earnings were sharply down in April, May, and June, 1942, compared with 1941, transportation profits were even more strikingly higher. Indeed, of all the large industries, transportation made the best showing. The reason was the tremendous increase in traffic with a much less than proportionate increase in labor and other costs.

TABLE 5.—*Estimated corporate profits after taxes by major industrial divisions*

[Millions of dollars]

Industrial division	Fiscal year ended June 30—				1941		1942	
	1939	1940	1941	1942	July–Sept.	Oct.–Dec.	Jan.–Mar.	Apr.–June
Total	2, 783	5, 018	6, 400	7, 151	1, 928	2, 056	1, 523	1, 644
Agriculture	13	18	20	30	7	9	7	7
Mining	−15	105	183	219	60	56	50	53
Manufacturing	1, 635	3, 115	3, 834	4, 038	1, 114	1, 197	840	887
Trade	418	569	706	827	220	287	179	141
Contract construction	11	25	60	85	22	21	18	24
Transportation	202	460	729	1, 044	302	229	194	319
Power and gas	370	445	428	329	65	106	90	68
Communications	162	207	211	217	50	57	55	55
Finance	244	298	394	468	122	119	115	112
Service	34	62	66	89	18	25	23	23
Miscellaneous [1]	−291	−286	−231	−195	−52	−50	−48	−45

[1] This item is consistently negative because investment trusts, which form a major component of this division, receive a large part of their income as dividends, which when deducted from net income leaves a negative item; and the international flow of dividends, also included in this division, is generally negative on balances, representing a net outflow of dividend payments.

Physical Volume of Output

Notwithstanding that in June 1942 industrial production, as measured by the Federal Reserve index, was at a level virtually half again as high as at the peak of the 1937 boom, our industries were not, in general, operating at their maximum capacity. This generation has never before been called upon to utilize every item of its present plants and equipment as near to 168 hours a week as possible in a supreme effort to produce the very utmost of goods and services. The pressure of total war during the period since December 1941 has forced our economy closer to its unknown maximum, but the monthly rate of gain was, in June 1942, continuing virtually unchecked at the same rate as that of the last 2 years during which the defense program has been under way.

Table 6.—*Industrial production*

[Index, 1935–39=100]

Industry group and industry	Fiscal year ended June 30—			
	1939	1940	1941	1942
Industrial production	97	116	139	168
Manufactures	97	117	142	175
Durable	91	123	166	218
Nondurable	102	111	123	139
Minerals	100	115	118	130
Selected industries:				
Durable manufactures:				
Steel	(1)	(1)	181	209
Open hearth and Bessemer	88	130	167	178
Electric	(1)	(1)	282	434
Machinery	88	119	168	249
Automobile bodies, parts, and assembly	84	105	133	121
Cement	107	117	137	165
Lumber	99	110	123	130
Nondurable manufactures:				
Cotton consumption	102	116	141	166
Rayon deliveries	116	138	151	173
Apparel-wool consumption	98	101	157	197
Woolen and worsted cloth	99	103	139	172
Shoes, leather	103	102	112	124
Meat packing	106	120	126	139
Manufactured dairy products	107	110	122	141
Other manufactured foods [2]	104	111	117	137
Printing and publishing	100	112	114	123
Chemicals	99	110	124	156
Minerals:				
Bituminous coal	90	114	118	143
Anthracite	95	98	103	115
Crude petroleum	105	114	114	121
Metals	93	125	144	151

[1] Comparable data are not available.
[2] Other than wheat flour, cane-sugar meltings, manufactured dairy products, and meat packing; includes baking, canning, and preserving, confectionery, beet sugar, and miscellaneous food products.

Source: Board of Governors of the Federal Reserve System.

Industry mobilized without general slump

Since the year began in peace and ended in war, there were naturally very diverse cross-currents in industry. The expectation had been widely held that when major industries curtailed or ceased operations during the process of converting from peace to war goods manufacture, there would ensue a general although temporary slump before armament production could get well under way. Conversion did indeed cause slumps in final-assembly industries, such as the auto-

mobile industry, as they tooled up for the production of various kinds of war goods. Industries dependent on the automobile and other final-assembly industries, such as those making tires and plate glass, also slumped. Moreover, civilian industries whose materials were cut off or diverted to war uses curtailed operations in varying degrees. Still others slowed down because of transportation and other curbs.

Petroleum production and refining declined because of lack of means of moving gasoline to certain regions on the Atlantic and Pacific coasts after tankers had been withdrawn from the petroleum trade and placed at the disposal of the armed forces. In the case of most civilian industries, except those primarily using metals, conversion or curtailment led to a gradual tapering off rather than abrupt slumps. This was true of leather and shoes, wool textiles, pulp, paper and paper products, printing and publishing, furniture, and others.

The sharp expansion of the war industries and of those furnishing them supplies far more than offset declines such as the foregoing, Although less numerous than those curtailing operations, armament and allied industries made such steady and tremendous gains that they swept aggregate industrial production to new highs. Expansions in aircraft and shipbuilding were such notable landmarks in the annals of industry as to require no elaboration here.

Industries providing materials and equipment for those making armaments also scored important gains—the machinery industry is a notable illustration. But the increased output of iron and steel, nonferrous-metal smelters, coal and coke, cement, chemicals, and other products were also basic to the outpouring of the finished armaments. Moreover, industries midway in the industrial process quickly converted to war work with little or no curtailment. Thus, makers of auto parts and accessories switched quickly to the making of parts and accessories for aircraft, tanks, and other war products. Finally the manufactured foods and tobacco industries produced more for both civilians and the armed forces.

Industrial conversion and arms manufacture

It is notable that those industries which slowed down after the outbreak of war were for the most part makers of nondurable goods and that nondurable goods output as measured by the Federal Reserve adjusted index declined steadily from the peak attained in the last pre-war month. The durable-goods industries, in marked contrast, continued their steep rise, as reflected in the Federal Reserve adjusted index of durable manufactures, with never a pause. This index reflects virtually all durable-armaments output. It would never have been possible for these industries to convert from peace- to war-products manufacture without a change-over slump had it not been for the many preparatory measures previously taken under the defense program between the summer of 1940 and December 7, 1941—i.e., the placing of armament orders, the building and tooling of new plants, the making of pilot models, the setting up of production lines for mass production of arms, and other necessary preliminaries. The tangible amount of this preparation is indicated by the fact that durable-goods output in November 1941, the month before the United States entered the war, was 75 percent higher—largely due to rising

output of defense items—than when the British Army escaped from Dunkerque in May 1940.

TABLE 7.—*New construction activity by function and ownership*

[Millions of dollars]

	Fiscal year ended June 30—				Fiscal year ended June 30—		
	1940	1941	1942		1940	1941	1942
New construction, total [1]	6,099	8,896	12,288	New construction—Continued.			
Private, total	3,800	4,738	4,630	Public—Continued.			
Residential building (nonfarm) [2]	2,107	2,591	2,574	Military and naval	177	1,309	2,929
Nonresidential building	840	1,222	972	Nonresidential building	447	941	2,646
Industrial	302	603	492	Industrial	27	625	2,406
All other	538	619	480	Other	420	316	240
Farm construction	234	267	288	Highway	887	992	925
Dwelling	137	158	165	Sewage disposal and water supply	206	121	114
Service	97	109	123	All other Federal	344	373	420
Public utility	619	658	796	Miscellaneous public service enterprises	96	108	103
Public, total	2,299	4,158	7,658				
Residential	142	314	521				

[1] Does not include data for work-relief construction.
[2] Bureau of Labor Statistics, Department of Labor.

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

Construction activity at peak levels

Construction activity attained a volume of $12,500,000,000 in the year ending June 1942, surpassing the 1929 calendar year total by nearly 20 percent.

Private construction, despite priorities and restrictions, remained virtually at the same level as in the previous period. Because of severe restrictions on the use of steel, lumber, asphalt, and other materials, substitutes became the order of the day. Building designs and specifications were changed to conform to available materials. In the course of the year, nonessential construction was restricted and the criterion as to what was essential became increasingly strict.

In the field of public construction, highway, sewage disposal, water supply, public buildings, public works, and other usual types declined, while direct and indirect defense and war projects boomed. Military and naval construction alone, aggregating nearly $3,000,000,000, was almost equal to the total of all construction in the calendar year 1934 ($3,044,000,000). Public residential construction amounted to one-fifth of private residential building for the year. Finally, public industrial construction, representing largely the Nation's new armament plants, totaled $2,400,000,000 and was roughly treble the volume of private industrial construction in the prosperous year 1929. Indeed, total private industrial construction for all of 1929 was almost exactly equaled by public industrial construction in April, May, and June, 1942.

Total transportation volume at record high level

The unprecedented levels of production and distribution occasioned by the defense and war efforts naturally involved a correspondingly large volume of passenger and commodity traffic. The tonnage of

commodities, including mail and express, transported by all types of carriers, combined with longer hauls in miles to make the largest ton-mile total in the annals of American transportation. Likewise, business and pleasure travel and troop movements combined to yield the largest passenger-mile aggregate on record.

TABLE 8.—*Volume of transportation* [1]

[Index: 1935-39=100]

Fiscal year ended June 30—	Total commodity and passenger	Total commodity	Total passenger	Fiscal year ended June 30—	Total commodity and passenger	Total commodity	Total passenger
1940	112	114	104	1942—Continued.			
1941	126	129	115	November	146	150	134
1942	158	162	145	December	149	153	137
1941:				January	154	156	146
June	145	152	124	February	158	161	149
1942:				March	164	167	154
July	147	153	127	April	172	175	162
August	148	155	128	May	178	180	171
September	145	150	128	June	180	180	180
October	147	152	131				

[1] Indexes for commodity and passenger transportation (except local transit) are based upon ton-miles and passenger-miles, respectively; index for local transit is based upon number of passengers. The monthly indexes are adjusted for seasonal variations.

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

The railroads, intercity motor lines, and air lines all set new high records for the volume of both commodity and passenger traffic. Pipe lines carried more oil and gas than ever before. Passengers carried by local transit lines were up from the previous year but not to the record 1929 level. Intercity motor-freight traffic for the 12 months ending June 1942 exceeded the previous period and was larger than ever before but was on the downgrade after January chiefly because of speed restrictions and of difficulties in obtaining spare parts. Air passenger traffic, also higher than in the previous period, slumped after April when the Army took over part of the air lines' equipment. Carriers engaged in coastwise and intercoastal domestic trade suffered an actual slump. Their traffic volume for the actual period fell one-seventh because many of their ships were put into the service of the Army and Navy.

Tonnage handled by the Inland Waterways Corporation, operating the Federal Barge Lines, is off 12 percent for the 1942 period. The direction of traffic movement has become more unbalanced than in the past; 71 percent of the 1942 traffic has been north-bound and 29 percent south-bound.

The largest rate of gain in transportation over the preceding year was scored by the railroads whose traffic volume rose 34 percent. The air lines might perhaps have exceeded that had not part of their facilities been commandeered by the armed forces. Even under these circumstances, air traffic rose 31 percent above the year ended June 1941.

Power and gas output also in peak volume

The unprecedented economic activity and consumer purchasing power of the year under review, made it inevitable that there would be

unusually heavy demands for heat, light, and power. Hence, output of manufactured gas rose 9 percent, natural gas 10 percent, and electric power 13 percent, compared with 1941. Much larger increases, of course, were experienced near large establishments of the armed forces or near industrial cities, especially those where heavy industry is concentrated. In some of the these areas, rising demands placed heavy strains on existing gas and electric-power facilities.

Manpower Utilization

Total civilian employment continued to increase throughout the past year although with some hesitation in the middle of the period due to curtailment and conversion in certain industries. Heavy withdrawals by the armed services were more than offset by a substantial reduction in the volume of unemployment and an increase in the employment of women.

Table 9.—*Estimated civilian labor force*

[Millions of persons]

	June 1940	June 1941	June 1942
Total civilian labor force	56.2	56.2	56.1
Employment	47.6	50.2	53.3
Nonagricultural	36.6	39.3	41.8
Employees in nonagricultural establishments	30.6	34.5	36.7
Manufacturing	10.4	12.8	14.3
Mining	0.9	0.9	0.9
Construction	1.6	2.0	2.0
Transportation and public utilities	3.0	3.3	3.5
Trade	6.6	6.9	6.6
Finance, service, and miscellaneous	4.1	4.3	4.3
Government	4.0	4.3	5.0
Self-employed, proprietors, domestic, etc	6.0	4.8	5.1
Agricultural	11.0	10.9	11.5
Unemployment	8.6	6.0	2.8

Sources: Bureau of the Census, Department of Commerce, except employees in nonagricultural establishments which are from the Department of Labor.

Although a summary analysis of the Nation's labor force and reserves suggests that there was no Nation-wide shortage of workers, manpower shortages developed or continued on a regional and an occupational basis. By the end of June 1942 a number of serious male labor shortages existed both in certain skills and in particular local areas where war production has been concentrated. Shortages in some skills were alleviated not only by training before and after placement and by the upgrading of workers as they gain experience, but also by job break-downs diluting skill requirements. Shortages in local areas developed not particularly because of a dearth of migrant labor but because housing conditions or wage differentials are often such that the migrant labor supply cannot be stabilized sufficiently for training and assimilation into the work forces.

The United States Employment Service under the authority of the War Manpower Commission has facilitated the transfer of labor between industries and areas. As a local organization it reaches into every community and has aided in recruiting women workers and in meeting changes in employer requirements.

HIGHLIGHTS OF THE YEAR

Business Advisory Council

With the Nation plunged in war on December 7, 1941, those members of the Business Advisory Council who had been engaged in defense activities immediately assumed important responsibilities in the war agencies. D. M. Nelson became Chairman of the War Production Board. W. L. Batt, at first Director of the Production Division of the Office of Production Management, was subsequently made Vice Chairman of the War Production Board. W. A. Harriman has served as the President's representative on lend-lease in England and also headed a mission to Russia in which Mr. Batt participated. W. L. Clayton has been successively Deputy Federal Loan Administrator, special assistant to the Secretary of Commerce, and Assistant Secretary of Commerce.

On December 11, 1941, the President convened a national conference between management and labor at which the management representatives were selected by the Chairman of the Council, W. L. Batt. This conference resulted in the creation of the National War Labor Board on which the following Council members have served: R. D. Lapham, Walter C. Teagle, George H. Mead, R. R. Deupree, and C. S. Ching.

A considerable number of other Council members, both past and present, are currently serving as civilian executives in war agencies and also in the armed services.

During the past year a Council committee has been active in helping the Department initiate and organize a post-war planning program to coordinate the contribution which business can make to a high level of employment and productivity when hostilities are over. Another committee has devoted itself to a study of the problems which small business enterprises face due to the hardships created by the "all-out" war effort.

In January 1942, R. R. Deupree succeeded W. L. Batt as Chairman of the Council and a number of changes were made in the membership. The Council was composed of the following men on June 30, 1942:

*R. R. Deupree, Cincinnati, Ohio, Chairman.
*Ralph E. Flanders, Springfield, Vt., Vice Chairman.
*Paul G. Hoffman, South Bend, Ind., Vice Chairman.
*Arthur Kudner, New York, N. Y., Vice Chairman.
*Walter C. Teagle, New York, N. Y., Vice Chairman.
*W. L. Batt, Philadelphia, Pa.
John D. Biggers, Toledo, Ohio.
Mason Britton, New York, N. Y.
W. Gibson Carey, Jr., New York, N. Y.
C. S. Ching, New York, N. Y.
*W. L. Clayton, Washington, D. C.
John L. Collyer, Akron, Ohio.
*Carle C. Conway, New York, N. Y.
Edward B. Cosgrove, Le Sueur, Minn.
W. Y. Elliott, Cambridge, Mass.
Charles T. Fisher, Jr., Washington, D. C.
Robert V. Fleming, Washington, D. C.
*M. B. Folsom, Rochester, N. Y.
*Clarence Francis, New York, N. Y.
John H. Goss, Waterbury, Conn.
W. A. Harriman, New York, N. Y.
George A. Hill, Jr., Houston, Tex.
Thomas S. Holden, New York, N. Y.
Charles R. Hook, Middletown, Ohio.
*James W. Hook, New Haven, Conn.
Jay C. Hormel, Austin, Minn.
G. M. Humphrey, Cleveland, Ohio.
Harrison Jones, Atlanta, Ga.
Louis E. Kirstein, Boston, Mass.
William S. Knudsen, Washington, D. C.
E. H. Lane, Altavista, Va.
*Roger D. Lapham, San Francisco, Calif.

*Member of the executive committee.

THOMAS B. MCCABE, Chester, Pa.
CHARLES P. MCCORMICK, Baltimore, Md.
PAUL B. MCKEE, Portland, Oreg.
GEORGE H. MEAD, Dayton, Ohio.
ROBERT L. MEHORNAY, Kansas City, Mo.
D. HAYES MURPHY, Hartford, Conn.
D. M. NELSON, Washington, D. C.
NICHOLAS H. NOYES, Indianapolis, Ind.
C. R. PALMER, New York, N. Y.
ROBERT H. PATCHIN, New York, N. Y.
RICHARD C. PATTERSON, JR., New York, N. Y.
FRANK C. RAND, St. Louis, Mo.
*PHILIP D. REED, New York, N. Y.
REUBEN B. ROBERTSON, Canton N. C.
*GEORGE A. SLOAN, New York, N. Y.
EMIL SCHRAM, New York, N. Y.
ROBERT T. STEVENS, Washington, D. C.
R. DOUGLAS STUART, Chicago, Ill.
REESE H. TAYLOR, Los Angeles, Calif.
J. T. TRIPPE, New York, N. Y.
J. W. WATZEK, JR., Chicago, Ill.
SIDNEY J. WEINBERG, New York, N. Y.
*W. H. WHEELER, JR., Stamford, Conn.
S. CLAY WILLIAMS, Winston-Salem, N. C.
D. ROBERT YARNALL, Philadelphia, Pa.
JAMES W. YOUNG, Pena Blanca, N. Mex.
HARRY W. ZINSMASTER, Minneapolis, Minn.

*Member of the executive committee.

BUREAU OF THE CENSUS

Census data have had an increased importance in this past year during which the human and material resources of the Nation have been mobilized for war. The participation of the Bureau in the war effort, while paralleling that of World War I, has been much greater than it was then. Although most of the regular reports of the Bureau of the Census have been found to be directly related to the war, it has been necessary to obtain more detailed information or to provide special compilations of data to serve the needs of war agencies. In consequence, a number of surveys have been instituted; and monthly, quarterly, or annual canvasses, already a part of the Bureau operations, have been expanded to meet demands for current statistics. The conversion of the Bureau to a war-program basis has been facilitated greatly by the provisions of the Second War Powers Act of 1942, and by the presence in the Bureau of trained professional and supervisory decennial census personnel and decennial census equipment, which have been diverted to the preparation of statistics required for the war.

The extent of Census operations during the past year can be gauged from the volume of tabulation work and the personnel involved. Using averages based upon a 44-hour week, every minute of the past working year saw over 400 tabulating cards punched, over 20,500 cards passed through sorting machines, and over 5,400 cards tabulated. At the end of the year there were 5,931 employees in the Washington office, of whom 724 were on the permanent staff, and 1,005 employees working in the field. Of the total number in the Washington office, 449 were on military leave.

In addition to its regular reports which are used extensively in the preparation of war plans, the Bureau of the Census renders three general types of services to war agencies: (1) The preparation of special tabulations and reports from data already on hand in the Bureau; (2) the conduct of surveys made as needed to supplement regular census information; and (3) the editing, coding, tabulating, and other processing of data collected by war agencies. The work done for other governmental agencies on a reimbursable basis during the past year amounted to $984,349, exclusive of sums spent from working funds of $1,059,510. Practically all of this work was done

for war agencies, the major statistical jobs having been performed for the War Production Board and the Selective Service System.

Work on the Sixteenth Decennial Census has been evaluated in the light of war needs. Since basic data depicting the social and economic structure of the Nation is needed for war planning, only slight modification in the original plans for tabulation and presentation was necessary. Information has been and is made available in advanced multilithed reports as soon as possible, and separate bulletins either for a single State or a single subject are issued before being combined into the final volumes. The major portion of the reports of the Sixteenth Decennial Census has been released or is now in the hands of the printer. Publication of certain analytical studies and of such general volumes as a statistical atlas has been placed in abeyance indefinitely.

The past year has witnessed the integration into the Bureau of a new field of basic statistics—that of foreign trade. The transfer of this work to the Bureau of the Census from the Bureau of Foreign and Domestic Commerce was completed in 1941. Statistics in this field have been expanded considerably because of their importance from the standpoint of economic warfare. For the same reason both the publication of these reports and the release of information to the general public were suspended for the duration of the war, effective with the reports for October 1941.

In the field of current manufactures reports, the regular monthly surveys have been continued, usually on an expanded basis to meet war needs. Thirty special surveys of segments of the economy have been made during the past year in response to requests from war agencies. Among the new surveys were a quarterly report by manufacturers of their metal requirements and a monthly plant report of operations. Reports were received from nearly all of these and by the end of June tabulations covering firms that use significant amounts of metals had been forwarded to the War Production Board. Preliminary tabulations were in the hands of that agency in less than 1 week after the actual closing date of the survey.

During the past year activities in the vital-statistics field included the development and improvements of national statistics on mortality, natality, marriage, divorce, mental institutions, prisoners, criminal courts, and hospitals. Plans were made for sampling current mortality data so that an index of mortality by regions and causes could be released at an early date, which would help delimit problem areas in maintaining war production at a high level from a health standpoint.

The past year witnessed a remarkable increase in the demand by the public for transcripts of data from Census records to help prove age and citizenship. Applications numbering 737,132 were received—more than double the number received in the previous fiscal year. The total number received for the entire year 1933 was 13,226.

Civil Aeronautics Administration

Prompt adaptation to war needs highlighted Civil Aeronautics Administration activities during the year. Of the Nation's roster of pilots and students—over 218,000 in all—approximately 120,000 were

recertificated for loyalty; 20,000 ground instructors, mechanics, and other airmen were investigated; and a system of controls established for all civilian flights. To be approved as landing areas, airports were required to provide guards, registrar and clearance officers, and otherwise conform to war regulations formulated by the Civil Aeronautics Administration.

The CAA pilot-training service handled a series of requests from the armed forces for training of instructors, ferry pilots, and other flight specialists, while arrangements were concluded to use its network of 600 centers for initial flight training of 20,000 reservists for the Navy and 13,350 for the Army. A program for training some 500 Latin Americans as pilots, mechanics, and engineers got under way at CAA schools.

In cooperation with the U. S. Office of Education, a program of preflight aeronautics in high schools was initiated, with the immediate objective of accelerating the production of trained airmen; a long-range program of introducing aviation material in grade-school subjects was also begun, aimed at "air-conditioning" the entire young generation.

The Federal Airways system provided the routes for greatly increased military traffic in continental United States, Alaska, and Hawaii, and a means for control of all airplane movements. Construction and improvement of airports, for use primarily by the Army and Navy, but also of value to civil aviation, continued on a larger scale.

Coast and Geodetic Survey

The growing needs of the armed forces for nautical and aeronautical charts and other products of the Coast and Geodetic Survey made it necessary, during the past year, to place the operations of this Bureau entirely on a war footing. Although all activities which do not contribute to the prosecution of the war were discontinued, considerable expansion of the Bureau's facilities was required to enable it to meet war needs. This expansion was financed in part by funds provided by the War and Navy Departments and other agencies engaged in war operations.

The issue of over 4,000,000 nautical and aeronautical charts during the year exceeded the number distributed during the preceding year by some 2,500,000 copies and was over five times the maximum issue in any year prior to the inauguration of the defense program. Approximately 85 percent of these charts was furnished to the Army and Navy.

For purposes of national security, the distribution of all aeronautical charts, coastal topographic maps, and nautical charts of certain areas was placed on a restricted basis. A large quantity of data resulting from the activities of the Bureau was furnished for specific application in various military operations and war construction projects.

In the field, all activities were devoted to the charting and mapping of strategic areas and to the accomplishment of a large number of special projects required for war purposes. In connection with an extensive war-mapping program in the eastern States, this Bureau was assigned the work of providing the basic control surveys required and of executing a part of the topographic mapping.

Fifty-six commissioned officers were transferred by Executive Order to the War and Navy Departments and 32 civilian members of the Bureau were furloughed to serve under reserve commissions in the armed forces. Five survey ships were transferred to the Navy Department for patrol and other special duty and three ships received from the Navy Department, in exchange for survey ships transferred early in the year, were returned to that department.

Participation was continued in the program of the Department of State for cooperation with the American Republics. Comprehensive magnetic surveys, carried on in Central and South America and the West Indies, provided data of immediate value for aeronautical chart construction and other war projects. Gravity observations were made at a number of stations in Colombia. Six tide stations were installed in Mexican and South American ports in addition to the eight stations previously established. Data from these stations are already being utilized for the prediction of tides at a number of ports. Cordial relations were continued with the officials of the various countries with whom the engineers of the Coast and Geodetic Survey were associated in this work.

Bureau of Foreign and Domestic Commerce

The year witnessed the emergency conversion of the Bureau from being largely a direct aid to business to being preponderantly a supplier of essential data to other Government agencies.

A major part of the Bureau's work has been for the Board of Economic Warfare under an agreement whereby the Bureau promised to devote approximately 40 percent of its resources to research work for the Board. Actually, more than 70 percent, measured in funds expended, has been allocated to this indispensable job.

In addition, special studies, regular reports, and the use of the Bureau's files and of the Department's field force, have been made available to regular and war emergency agencies. Practically all of this work has been of a confidential nature. Use of the Bureau's resources in this manner has obviated the necessity of creating new organizations and of assembling new files of information in Government with their attendant extra costs.

Adjustment to war economy

Activities in behalf of business have been aimed at aiding it to adjust itself to the war economy. Major attention has been given to: (1) Removal of trade barriers blocking war production and civilian supply; (2) encouraging businessmen and the smaller communities by promoting "Wartime Business Clinics" and distributing the "Small Town Manual for Community Action" and aiding communities to use it properly.

The publication program, even of paid publications, was drastically reduced and adapted to the war program. Information for general business use was concentrated in the three Bureau periodicals (Survey of Current Business, Domestic Commerce, and Foreign Commerce Weekly) and in special publications of immediate practical use in the war program.

The contraction of publications for civilian use has been balanced by a decided expansion in the production of confidential reports and

bulletins. Many of these are vehicles for the continuing transmission of pertinent information to a considerable number of other Government agencies whose activities require a basis of commercial facts.

Foreign-Trade Zones Board

A foreign-trade zone is an area within a port, separated by a barrier from the port itself, where foreign cargoes may be landed without payment of duty pending reshipment abroad or entry into the United States. As of June 30, 1942, only the New York Foreign-Trade Zone was in operation.

During the first half of the fiscal year, shipments to the zone from South America and other areas, excluding Axis dominated countries, increased substantially. Important manipulations carried on in the zone included curing and repacking Brazil nuts; relabeling and repacking South American canned meats; sorting and reconsignment of Brazilian and Peruvian cotton; examination and sale of East Indian tobaccos and the refining of Chinese and Bolivian tungsten ore. A tungsten ore refining plant, established at the zone, operated on a 24-hour basis during the entire year.

Early in 1942, the Army acquired a substantial part of the Staten Island Zone for military purposes. Responding to representations of the State Department on behalf of several Latin American governments, and the many urgent requests from commercial interests, the Foreign-Trade Zones Board directed that zone activities be removed to sites on North River, Manhattan, where limited operations will be carried on temporarily. The success of the New York Foreign-Trade Zone in handling foreign merchandise, especially the products of Latin America, has prompted other ports to consider the possibility of establishing similar facilities. Houston, Tex., and New Orleans, La., have applied for permission to establish foreign-trade zones in their respective harbors. Officials of several other ports both on the Atlantic and Pacific are now giving serious consideration and study to the establishment of foreign-trade zones to meet postwar conditions.

Inland Waterways Corporation

The Inland Waterways Corporation was created for the purpose of carrying on the operations of the Government-owned inland waterways system until such time as the system can be transferred to private operation to the best advantage of the Government.

The Corporation operates as a common carrier in the same manner and to the same extent as if its facilities were privately owned and operated. Its fiscal year, under regulations of the Interstate Commerce Commission, is the calendar year, and its detailed annual reports are prepared on that basis.[1]

The Corporation closed the year in a sound financial condition. It has no bonded debt or other obligations except of a current nature. A substantial part of its investment in Treasury Bonds accumulated from its operation is held in reserve for the replacement of facilities or purchase of new equipment. All expenses are paid from revenues.

[1] Copies may be obtained from Inland Waterways Corporation, Boatmen's Bank Building, St. Louis, Mo.

Consolidated balance sheet, June 30, 1942 [1]

ASSETS

Current assets:			
Cash		$771, 166. 74	
Temporary cash investments (Treasury Bonds)		2, 934, 119. 53	
Accounts receivable		489, 158. 60	
Materials and supplies		280, 135. 51	
			$4, 474, 580. 38
Investment securities and advances:			
Long-term loans receivable			398, 183. 71
Property and equipment:			
Transportation property and equipment	$27, 309, 226. 34		
Noncarrier property	109, 637. 92		
		27, 418, 864. 26	
Depreciation and amortization reserves-credit		8, 165, 440. 95	
			19, 253, 423. 31
Deferred debits and prepaid expenses			386, 119. 44
Total assets			24, 512, 306. 84

LIABILITIES

Current liabilities:			
Accounts payable			$756, 074. 45
Reserves:			
Insurance reserve		$113, 732. 42	
Other reserves		137, 892. 87	
			251, 625. 29
Deferred credits:			
Other deferred credits			15, 604. 27
Capital stock and surplus:			
Capital stock		$12, 000, 000. 00	
Premiums and assessments on capital stock		10, 362, 843. 12	
Surplus—			
Invested in property	$453, 100. 67		
Unappropriated	673, 059. 04		
		1, 126, 159. 71	
			23, 489, 002. 83
Total liabilities			24, 512, 306. 84

[1] Includes accounts of Inland Waterways Corporation and its wholly owned subsidiary, the Warrior River Terminal Co.

Bureau of Marine Inspection and Navigation

By virtue of the authority embodied in the First War Powers Act, 1941, and in order to expedite the prosecution of the war, the President, by Executive Order which became effective March 1, 1942, transferred the functions of the Bureau of Marine Inspection and Navigation from the Department of Commerce.

Those functions pertaining to registry, enrollment, and licensing of vessels and related duties; measurement of vessels; entry and clearance of vessels; protection of steerage passengers; and the power to remit and mitigate fines, penalties, and forfeitures incurred under the laws governing these functions were transferred to the Commissioner of Customs, to be exercised by him under the direction and supervision of the Secretary of the Treasury.

Those functions pertaining to approval of plans for construction, repairs, etc., of vessels; approval of materials, equipment, and appli-

ances; classification of vessels; inspection of vessels; load-line requirements; licensing of officers, pilots, and seamen; investigation of marine casualties; shipment, discharge, protection, and welfare of seamen; numbering of undocumented vessels, etc.; and the remission and mitigation of fines, penalties, and forfeitures incurred under the laws governing these functions, were transferred to the Commandant of the United States Coast Guard, to be exercised by him under the direction and supervision of the Secretary of the Navy.

These transfers of functions remain in force until the termination of Title I of the First War Powers Act, 1941.

National Inventors Council

The Council's primary function is the evaluation of all inventions and suggestions submitted by the public. Each contribution must be carefully scrutinized to determine whether it contains any information of value to the armed services. This requires the closest cooperation with the branches of the Army and Navy. The Secretary of War and the Secretary of the Navy have appointed liaison officers for the individual branches, and to them meritorious proposals are referred.

In addition to those ideas communicated to the Army and the Navy, other proposals are submitted to the Office of Scientific Research and Development and other Federal agencies directly concerned with the war effort.

Since July 1940 (when the Council was created by the Secretary of Commerce with the concurrence of the President), approximately 90,000 suggestions have been examined and evaluated. In addition, more than 10,000 inventors have called at this office to discuss their conceptions before submission.

For reasons of military secrecy, the Council does not receive from the Army or the Navy comprehensive data, and, therefore, any statistics must be incomplete. It may be said, however, that the operations of the Council are proving eminently successful.

Patent Office

Net receipts of the Patent Office were $3,917,833.69, or $471,113.90 less than in the preceding fiscal year, while expenditures totaled $4,726,304.28, an increase of $808,470.59. The decline in earnings was caused largely by a progressive decrease in the number of applications for patents and registration of trade-marks.

Applications for patents, including those covering designs, were 53,551 in 1942, as against 65,356 in 1941. In the latest fiscal period applications for the registration of trade-marks were 12,103, compared with 14,302 in the previous 12 months. Applications for design patents were 5,568 in 1942, a drop of 2,894. Patents granted in 1942, including those for designs, plants, and reissues, numbered 45,926. This was 2,523 fewer than in 1941.

On June 30, 1942, applications pending numbered 95,265, or 9,692 fewer than on the corresponding date in 1941. The total of cases disposed of in the latest fiscal period was 59,763, compared with 62,281 in 1940–41. Cases awaiting action were 46,240. On June 30, 1941, the number of such cases was 42,106.

As an exigency of the war most of the personnel and activities of the

Office were transferred to Richmond, Va., in February 1942. All of the examining divisions except that concerned with trade-marks are now in that city. This was the first time since its establishment in Washington in 1800 that the Office had been removed from the National Capital.

The Patent Office War Division, created by the merger of the Patent Office War Committee and the Patent Office Licensing Division to safeguard from disclosure inventions of value in the war, continued its activities, including collaboration with the Army and the Navy. In the period from September 24, 1941, the date on which the Licensing Division was established to effectuate Public, No. 239, amending Public, No. 700 (July 1, 1940), to June 30, 1942, some 50,000 petitions for license were filed with the Patent Office License Committee and the Patent Office War Division.

St. Lawrence Survey

The impact of war on the United States has necessitated reexamination of the relationship of the St. Lawrence Seaway and Power Project to the war production program. Studies have been continued on the effect of the project on the material and manpower requirements of the war. In this work the Survey has cooperated with many agencies of the Government and has supplied information to war agencies for their proper evaluation of the project. As the only Federal office solely interested in the St. Lawrence Project, the Survey is the focal point of contact and exchange of information among various agencies interested in carrying out the President's program of developing this great natural resource.

Since the publication of seven volumes of reports in the course of 1941, the staff of the Survey has been reduced to a skeleton service organization.

National Bureau of Standards

The year has witnessed a steady shift of personnel and laboratory equipment from peacetime to war activities. Problems of unbelievable variety, requiring the special facilities of almost every section of the Bureau, from atomic physics to textiles, have been submitted by the War and Navy Departments, the National Advisory Committee for Aeronautics, Office of Scientific Research and Development, the War Production Board, the Office of Civilian Defense, and many other agencies. The Navy Department awarded to the Bureau its highly prized "E" pennant for excellence in production.

The great increase in the volume of work has necessitated the employment of many more physicists, chemists, engineers, and laboratory assistants, and the erection of new buildings. The staff now numbers 1,709, the highest on record, and progress is being made on one major and several minor buildings. The new materials-testing laboratory will probably be completed early in 1943. Some delays have occurred in the erection of the new radio transmitting station at Beltsville, but this has not been allowed to interfere with the standard frequency service, which, although the apparatus is housed in makeshift quarters, has been greatly improved.

The necessity of finding substitutes for critical materials illustrates in a striking manner the value of research work carried on at the Bureau of Standards. Measurements made over a period of years on the constants and properties of rubber and rubberlike materials provide a source of information which is now in urgent demand; precise measurements made on isoprene when it was a laboratory curiosity are now being put to practical use in making synthetic rubber.

Along with this unprecedented volume of investigational work growing out of the complexities of modern mechanized warfare has come a great increase in the volume of tests covering purchases of supplies by the Government and the calibration of instruments needed by plants engaged in the manufacture of munitions. The fee value of this work shows a 32-percent increase over the preceding year.

The Bureau's commercial standardization group has cooperated with the War Production Board in the elimination of unnecessary variety in types and sizes of articles offered for sale, in the establishment of commercial standards of quality, and in the drafting of emergency alternate specifications covering substitutes for strategic materials. Manufacturers have been kept informed of changes affecting their products.

Weather Bureau

Although the public received less weather information than usual during the last year, the Weather Bureau's over-all services were enlarged for war purposes. Because weather reports are of value to the enemy, dissemination is limited and only the military forces and other vitally interested war agencies receive general meteorological information. The several special services to aeronautics, agriculture, and other activities have provided advisory warnings of storms, cold waves, and other conditions when necessary. Surveys show that these weather advices have added to the efficiency of many war industries and have made it possible to take precautionary measures, greatly reducing property damage.

The results of special projects under the Weather Bureau since the war started will not be available for publication until current restrictions have been lifted. The necessities of war have led to important progress in some phases of meteorological service.

Large numbers of young men are receiving professional training in meteorology. Graduates from courses in this field last year exceeded the total trained in meteorology in this country during the preceding 10 years. The training program to provide meteorologists for war assignments promises additional benefits in the post-war period. The great increase in scientific workers in this field may be expected to be the foundation on which new and valuable developments in applied meteorology will arise. Many should find gainful occupations in private practice as consultant meteorologists.

Appropriations and emergency funds

The report of the Chief Clerk and Superintendent contains full information covering direct and transferred appropriations, as well as emergency funds available to the Department during the year. Miscellaneous receipts amounting to $5,550,959.18 were turned into the Treasury of the United States.

The reports of the several branches of the Department are attached.

Very sincerely.

JESSE H. JONES,
Secretary of Commerce.

Report by Bureaus

Chief Clerk and Superintendent

There was no abatement of the activities of the Office of the Secretary, but through the cooperation of the personnel, and the performance of 1,071 days of overtime, the demands were met and work was kept fairly current.

DEPARTMENT LIBRARY

The fiscal year ending June 30, 1942, has been an unusual one for the Library. Since December 1941 it has been called upon to give unlimited service to the new agencies organized as a result of the war, while its staff has not been increased from its peacetime status. The agencies housed in the Commerce Building enjoy the benefits and facilities of a well-organized library with the saving to them of a considerable outlay of money for books and periodicals. During the present year the circulation figures have shown a marked increase each month over those of the preceding month. It has meant that many more books and periodicals were handled—taken from and returned to the shelves after use.

Statistical summary of routine work of the Library for the year ended June 30, 1942:

Library staff	14
Number of books and pamphlets in library	221, 004
Number of periodicals and newspapers currently received	1, 833
Number of books cataloged	6, 179
Cards filed in catalog	16, 357
Books prepared for shelf	8, 474
Number of books circulated	45, 380
Books bound	903
Books borrowed from Library of Congress and other libraries	1, 107
Books loaned to other libraries	1, 196
Telephone requests requiring research	8, 551

DIVISION OF PURCHASES AND SALES

During the fiscal year 1942 there were placed 9,616 purchase orders, which, including freight, rent, and miscellaneous accounts, involved the expenditure of $1,403,405.78. These amounts show an increase in orders of 1,109 over the fiscal year 1941 and an increase in expenditure of $563,417.08.

There were 77 contracts approximating $1,672,073.85 submitted to this office for examination by the various offices of the Department. In addition, there were 5 formal contracts amounting to $103,771 prepared by this Division, making a total of 82 contracts examined and prepared, and involving a total expenditure approximating $1,775,844.85.

This Division also examined, before issuance, 33 proposed specifications and proposals prepared by the Weather Bureau. There were 223 leases submitted by the several Bureaus of the Department for examination, and 5 bid bonds were examined and filed.

The typewriter repair shop repaired 1,494, cleaned 249, and overhauled 169 typewriters.

Approximately 117 circulars, embodying some 5,875 reports of surplus, forfeited, and abandoned property, were received from the Procurement Division and appropriately handled. Approximately 361 surveys of surplus property were received from the various Bureaus and offices of the Department and approved. Of these surveys, 111 required action by the Board of Survey.

Through the cooperation of the Procurement Division of the Treasury Department, there has been obtained by transfer, without the exchange of funds, surplus and forfeited property valued at approximately $68,667. This office also reports to the Procurement Division all surplus property which has a sale value. In connection with these reports, surplus material valued at approximately $188,207 was transferred, without the exchange of funds, from this Department to other branches of the Government service, or disposed of as directed by the Procurement Division.

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, 1942, 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, and transfers made pursuant to the provisions of section 601 of the Economy Act of 1932:

Bureau or office	Annual appropriation act	Deficiency and supplemental appropriations	Transfers from other departments	Transfers to other departments	Prior year appropriations available for 1942	1942 funds available for 1943	Net available for 1942
Office of the Secretary	$1,424,000	$905	$900	$2,670			$1,423,135
Bureau of the Census	7,305,000	893,995			$2,939,341	$2,254,725	8,883,611
Civil Aeronautics Administration	145,367,750	82,334,657	15,000	135,540,354	40,068,234	38,179,611	94,065,676
Civil Aeronautics Board	1,179,000		10,000			9,472	1,179,528
Coast and Geodetic Survey	3,859,000	543,705	32,000		1,135,534		5,570,239
Bureau of Foreign and Domestic Commerce	1,822,000	5,625					1,827,625
Bureau of Marine Inspection and Navigation [1]	2,800,000	167,825		1,066,835			1,900,990
Patent Office	4,860,200	78,565					4,938,765
National Bureau of Standards	2,968,000	118,941	684,950	540,000	88,042	308,978	3,010,955
Weather Bureau	7,424,150	560,580	15,000	56,500		157	7,943,073
Total	179,009,100	84,704,798	757,850	137,206,359	44,231,151	40,752,943	130,743,597

[1] The functions of this Bureau were transferred to Bureau of Customs, Treasury Department, and U. S. Coast Guard, Navy Department, on Feb. 28, 1942, Executive Order 9083.

Disbursements during the year ended June 30, 1942, from appropriations and from funds transferred from other departments, exclusive of emergency funds and working funds, were as follows:

Bureau or office	Appropriation for—			Total
	1940	1941	1942	
Office of the Secretary	$30,722.72	$282,604.63	$1,058,390.46	$1,371,717.81
Bureau of the Census		49,892.88	8,840,316.43	8,890,209.31
Civil Aeronautics Administration	288,262.91	15,227,028.91	78,005,073.57	93,520,365.39
Civil Aeronautics Board	2,808.98	62,724.38	1,042,832.27	1,108,365.63
Coast and Geodetic Survey	3,919.73	311,818.66	4,395,587.06	4,711,325.45
Bureau of Foreign and Domestic Commerce	1,380.82	50,427.00	1,727,526.41	1,779,334.23
Bureau of Marine Inspection and Navigation [1]	470.68	101,382.16	1,889,349.47	1,991,202.31
Patent Office	25,434.11	137,704.83	4,597,977.39	4,761,116.33
National Bureau of Standards	27,711.72	227,094.43	2,696,734.12	2,951,540.27
Weather Bureau	3,367.10	927,148.23	6,545,555.58	7,476,070.91
Total	384,078.77	17,377,826.11	110,799,342.76	128,561,247.64

[1] The functions of this Bureau were transferred to Bureau of Customs, Treasury Department, and U. S. Coast Guard, Navy Department, on Feb. 28, 1942, Executive Order 9083.

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 1942, inclusive, and the obligations incurred against these funds:

	1934 to 1938, inclusive	1939 and 1940	1941	1942	Total
Office of the Secretary:					
N. I. R. A.:					
Allotments	$947,000	$55,000	$50,000	$17,500	$1,069,500
Obligations	945,805	48,501	26,927	32,598	1,053,831
W. P. A.:					
Allotments	90,620				90,620
Obligations	90,259				90,259
P. W. A.:					
Allotments		10,000	5,000		15,000
Obligations		3,742	10,581	676	14,999
Total:					
Allotments	1,037,620	65,000	55,000	17,500	1,175,120
Obligations	1,036,064	52,243	37,508	33,274	1,159,089
Civil Aeronautics Administration: [1]					
N. I. R. A.:					
Allotments	2,083,303	2,749,600	382,000	729,530	5,944,433
Obligations	2,075,748	2,262,132	868,226	713,339	5,919,445
P. W. A.:					
Allotments	987,775	3,374,900	150,000		4,512,675
Obligations	978,964	3,180,031	344,868	8,812	4,512,675
C. W. A:					
Allotments	199,603				199,603
Obligations	198,285				198,285
W. P. A.:					
Allotments	847,980				847,980
Obligations	809,900				809,900
F. E. R. A.:					
Allotments			175,000		175,000
Obligations			164,408		164,408
Total:					
Allotments	4,118,661	6,124,500	707,000	729,530	11,679,691
Obligations	4,062,897	5,442,163	1,377,502	722,151	11,604,713

[1] The allotments and obligations for fiscal years 1934 to 1938, inclusive, were made by the Bureau of Air Commerce under the Department of Commerce, and for the fiscal years 1939 and 1940 by the Civil Aeronautics Authority, an independent agency. This organization was transferred to the Department of Commerce on June 30, 1940.

	1934 to 1938, inclusive	1939 and 1940	1941	1942	Total
Bureau of Foreign and Domestic Commerce:					
C. W. A.:					
Allotments	$372,275				$372,275
Obligations	357,886				357,886
W. P. A.:					
Allotments	100,000			$464,904	564,904
Obligations	99,968			352,906	452,874
Total:					
Allotments	472,275			464,904	937,179
Obligations	457,854			352,906	810,760
Bureau of the Census:					
C. W. A.:					
Allotments	2,524,736				2,524,736
Obligations	2,302,596				2,302,596
F. E. R. A.:					
Allotments	1,005,000				1,005,000
Obligations	893,388				893,388
W. P. A.:					
Allotments	11,100,448	$9,200			11,109,648
Obligations	10,823,381	9,180			10,832,561
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	10,000			860,000
Obligations	815,692	9,933			825,625
Total:					
Allotments	16,480,184	19,200			16,499,384
Obligations	15,834,627	19,113			15,853,740
Bureau of Marine Inspection and Navigation: [2]					
N. I. R. A.:					
Allotments	93,043				93,043
Obligations	92,039				92,039
National Bureau of Standards:					
N. I. R. A.:					
Allotments	100,000				100,000
Obligations	99,601				99,601
P. W. A.:					
Allotments	70,000				70,000
Obligations	69,997				69,997
W. P. A.:					
Allotments	75,000				75,000
Obligations	75,000				75,000
Total:					
Allotments	245,000				245,000
Obligations	244,598				244,598
Bureau of Lighthouses: [3]					
N. I. R. A.:					
Allotments	5,620,334				5,620,334
Obligations	5,607,495				5,607,495
W. P. A.:					
Allotments	20,000				20,000
Obligations	19,029				19,029
P. W. A.:					
Allotments	2,098,750	1,620,900			3,719,650
Obligations		3,265,700			3,265,700
Total:					
Allotments	7,739,084	1,620,900			9,359,984
Obligations	5,626,524	3,265,700			8,892,224

[2] The functions of this Bureau were transferred to Bureau of Customs, Treasury Department, and U. S. Coast Guard, Navy Department, on Feb. 28, 1942.
[3] This organization was transferred to U. S. Coast Guard, Treasury Department, on July 1, 1939.

	1934 to 1938, inclusive	1939 and 1940	1941	1942	Total
Coast and Geodetic Survey:					
N. I. R. A.:					
Allotments	$8, 293, 220				$8, 293, 220
Obligations	8, 286, 209				8, 286, 209
P. W. A.:					
Allotments		$2, 050, 502			2, 050, 502
Obligations		2, 049, 873	$450		2, 050, 323
W. P. A.:					
Allotments				$35, 000	35, 000
Obligations				31, 308	31, 308
Total:					
Allotments	8, 293, 220	2, 050, 502		35, 000	10, 378, 722
Obligations	8, 286, 209	2, 049, 873	450	31, 308	10, 367, 840
Bureau of Fisheries: [4]					
N. I. R. A.:					
Allotments	670, 455	328, 000			998, 455
Obligations	670, 075				670, 075
C. W. A.:					
Allotments	38, 391				38, 391
Obligations	38, 056				38, 056
W. P. A.:					
Allotments	151, 372	661, 606			812, 978
Obligations	151, 372	586, 071			737, 443
P. W. A.:					
Allotments		1, 142, 550			1, 142, 550
Obligations		911, 565			911, 565
Total:					
Allotments	860, 218	2, 132, 156			2, 992, 374
Obligations	859, 503	1, 497, 636			2, 357, 139
Weather Bureau: [5]					
N. I. R. A.:					
Allotments	193, 354				193, 354
Obligations	193, 354				193, 354
W. P. A.:					
Allotments	20, 276	54, 818	50, 909	73, 576	199, 579
Obligations	20, 276	54, 818	50, 658	49, 822	175, 574
Total:					
Allotments	213, 630	54, 818	50, 909	73, 576	392, 933
Obligations	213, 630	54, 818	50, 658	49, 822	368, 928
Total, Department of Commerce:					
N. I. R. A.:					
Allotments	18, 000, 709	3, 132, 600	432, 000	747, 030	22, 312, 339
Obligations	17, 970, 326	2, 310, 633	895, 153	745, 937	21, 922, 049
P. W. A.:					
Allotments	3, 156, 525	8, 198, 852	155, 000		11, 510, 377
Obligations	1, 048, 961	9, 410, 911	355, 899	9, 488	10, 825, 259
W. P. A.:					
Allotments	12, 405, 696	725, 624	50, 909	573, 480	13, 755, 709
Obligations	12, 089, 185	650, 069	50, 658	434, 036	13, 223, 948
C. W. A.:					
Allotments	3, 135, 005				3, 135, 005
Obligations	2, 896, 823				2, 896, 823
F. E. R. A.:					
Allotments	1, 005, 000		175, 000		1, 180, 000
Obligations	893, 388		164, 408		1, 057, 796
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	10, 000			860, 000
Obligations	815, 692	9, 933			825, 625
Grand total:					
Allotments	39, 552, 935	12, 067, 076	812, 909	1, 320, 510	53, 753, 430
Obligations	36, 713, 945	12, 381, 546	1, 466, 118	1, 189, 461	51, 751, 070

[4] This organization was transferred to the Department of the Interior on July 1, 1939.

[5] The allotments and obligations for fiscal years 1934 to 1940, inclusive, were made under the Weather Bureau, Department of Agriculture. This organization was transferred to the Department of Commerce on June 30, 1940.

National Defense Allotments

To enable the Department to carry on certain additional activities directly connected with the national defense, additional funds were made available during the fiscal years 1941 and 1942, by allotment, reimbursement, and advances under section 601 of the Economy Act, from funds appropriated for national-defense purposes. The following table shows these additional funds by Bureaus:

Bureau or office	Received by transfer appropriation warrant		Advances—Sec. 601, Economy Act—working funds		Reimbursements		Totals		Grand total
	1941	1942	1941	1942	1941	1942	1941	1942	
Office of the Secretary	$115,000						$115,000.00		$115,000.00
Bureau of the Census	75,000	$40,000		$1,059,510.16	$12,624.95	$738,811.67	87,624.95	$1,838,321.83	1,925,946.78
Civil Aeronautics Administration		2,000,000	$454,282.86	2,836,252.61		49,801.00	454,282.86	4,886,053.61	5,340,336.47
Coast and Geodetic Survey			92,300.00	1,789,330.00	91,703.87	41,730.03	184,003.87	1,831,060.03	2,015,063.90
Foreign and Domestic Commerce				368,750.00	31,162.76	45,938.06	31,162.76	414,688.06	445,850.82
Patent Office		47,950		10,000.00				57,950.00	57,950.00
Standards		150,000	718,983.00	2,855,435.00			718,983.00	3,005,435.00	3,723,418.00
Weather Bureau			429,095.00	398,325.70			429,095.00	398,325.70	827,420.70
Total	190,000	2,237,950	1,694,660.86	9,317,603.47	135,491.58	876,280.76	2,020,152.44	12,431,834.23	14,450,986.67

Miscellaneous Receipts

Office of the Secretary:	
Sale of Government property	$2,208.06
Other	345.85
Bureau of the Census:	
Statistical services	5,761.63
Sale of Government property	20.00
Other	228.98
Civil Aeronautics Administration:	
Revenues, Washington National Airport	370,865.66
Violations, Air Traffic regulations	17,234.00
Sale of Government property	12,078.46
Reimbursement, excess cost over contract price	18,193.29
Copying fees	8,661.07
Property lost or damaged	5,891.15
Other	802.07
Coast and Geodetic Survey:	
Sale of charts	51,951.67
Sale of maps	20,391.78
Sale of publications	6,441.58
Sale of Government property	943.84
Other	389.99
Bureau of Foreign and Domestic Commerce:	
Fees under China Trade Act	825.00
Sale of Government property	37.40
Other	2.10
Bureau of Marine Inspection and Navigation:	
Tonnage tax, United States	996,184.36
Navigation fees	115,627.34
Navigation fines	35,008.24
Forfeitures, all other than bonds	25,000.00
Overtime service	54,060.22
Reimbursement for loss on continuous discharge books	3,517.92
Sale of Government property	884.13
Other	925.78
Patent Office:	
Fees	3,678,028.07
Other	7.50
National Bureau of Standards:	
Testing fees	108,812.90
Sale of publications	4,709.70
Sale of Government property	175.00
Other	88.36
Weather Bureau:	
Sale of maps	322.60
Sale of Government property	3,870.33
Other	463.15
Total, Department of Commerce	5,550,959.18

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 1942:

Title of appropriation	Available	Expended [1]	Balance [1]
Printing and binding, Department of Commerce	$489,000.00	$487,732.81	$1,267.19
Printing and binding, Patent Office	860,000.00	858,000.00	2,000.00
Expenses of the Sixteenth Census, Bureau of the Census	[2]	346,422.00	----------
Salaries and expenses, Social Security Act, Bureau of the Census	[2]	5,000.00	----------

[1] Estimated. Exact figures cannot be given until all work ordered is completed and billed.
[2] Amount available for printing not stated in the appropriation item.

During the year the Division handled printing and binding to the extent of $188,433.47 for various agencies allied with the Department or housed in the building and for Bureaus from moneys transferred to them by other agencies. A list of the agencies, together with the amounts, follows:

Organization

	Expended [1]
Civil Aeronautics Administration:	
Civil Aeronautics Board	$14,750.06
Civilian Pilot Training Program	104,889.18
Development of Landing Areas	6,156.20
Coast and Geodetic Survey:	
Transferred from Federal and State Surveys	1,610.51
Transferred from Army Air Corps Work Fund	34,494.75
National Bureau of Standards: Transferred from U. S. Housing Administration	8,098.06
Weather Bureau: Transferred from Work Projects Administration	50.85
Board of Economic Warfare, Office of Exports	13,650.40
National Inventors Council	4,733.46

[1] Estimated. Exact figures cannot be given until all work ordered is completed and billed.

. Receipts from sales of publications, other printed material, and processed statements issued by the Department of Commerce during the fiscal year 1942 were $896,587.05, as compared with $968,372.71 for the fiscal year 1941. The following table presents a comparison for the 2 years, by selling agencies:

Sales by—	Receipts	
	1941	1942
Superintendent of Documents: Miscellaneous sales and subscriptions	$367,869.79	$374,118.16
Coast and Geodetic Survey: Coast pilots, inside route pilots, tide tables, current tables, charts, and airway maps	143,312.39	155,404.43
Patent Office: Specifications of patents, reissues, etc., trade-mark section and decision leaflet of Official Gazette, and classification bulletins and definitions	402,259.95	340,785.90
Bureau of Foreign and Domestic Commerce: Processed statements	54,930.58	26,278.56
Total	968,372.71	896,578.05

DIVISION OF PERSONNEL SUPERVISION AND MANAGEMENT

During the past year there has been a great increase in the personnel requirements of the various Bureaus of the Department incident to participation in the war effort and to effect replacement of employees who entered the armed forces or have transferred to other Government agencies. The Division of Personnel Supervision and Management has met these demands with as little delay as possible. This has been accomplished through the cooperation of the Civil Service Commission in furnishing liaison service between that agency and the Department and by otherwise taking prompt action on requests for certification of eligibles, appointments, etc., and through performance of much overtime work by employees of this Division.

Effective March 2, 1942, the Director of Personnel was designated to assist the Civil Service Commission in setting up its War Transfer Unit. The Division also lost a number of trained employees through

entrance into active military service and transfer to other Government agencies.

The promotion standards established by the Civil Service Commission for certain types of positions in 1941, and which were to be used as a guide in making promotions and transfers within departments and agencies without the prior approval of the Commission, were extended during the year to include positions in the stenographer, typist, and clerical series; certain positions in the scientific aid series; the drafting series; library series; and the professional series. This action had the effect of further expediting personnel transactions and eliminating unnecessary delays.

Approximately 550 positions in the Department were covered into the classified service under the Ramspeck Act and subsequent Executive orders.

The Department has taken particular pains to insure that deferment under the Selective Service Act is requested only for skilled and technically trained personnel who are engaged on work directly connected with the war effort, the loss of whose services would interfere with the Nation's war program. Energetic training programs are being carried on by the Department with a view of supplying replacements for employees who have been called for active military duty or transferred to other agencies.

During the year a classification survey of the clerical staff of the Patent Office was completed. This involved the review of the duties and responsibilities of approximately 700 positions and writing new job descriptions therefor. A survey of the permanent positions of the Bureau of the Census which will be retained after the completion of the Sixteenth Decennial Census is now in progress. The records indicate that 19,174 classification sheets covering all types of changes were received during the year as compared with 12,674 during the previous year and that 2,354 investigations were made as compared with 1,561 during the fiscal year ended June 30, 1941.

There follows a statement showing the personnel of the various Bureaus of the Department as of June 30, 1942:

	Permanent	Temporary	War service	Emergency
Office of the Secretary (includes St. Lawrence Waterway)	253	11	43	4
National Inventors Council	40	7	7	----
Bureau of the Census	3,757	391	2,169	----
Bureau of Foreign and Domestic Commerce	691	14	237	4
National Bureau of Standards	1,336	21	363	----
Coast and Geodetic Survey	1,594	261	320	22
Patent Office	1,077	5	179	----
Inland Waterways Corporation	2,544	----	----	----
Weather Bureau	2,605	12	237	95
Civil Aeronautics Administration	6,275	584	1,197	----
Total	20,172	1,306	4,752	125

During the past fiscal year the following number of personnel transactions was completed:

Appointments	1,652	Separations	915
Transfers	645	Retirements	128
Changes in grade	2,256	Miscellaneous	1,233
Administrative promotions	3,999		

DIVISION OF ADMINISTRATIVE MANAGEMENT

During the past year the Division performed various services for the divisions of the Secretary's Office and the Bureaus of the Department. The time devoted to work exclusively for the individual Bureaus of the Department has been charged to them. The following tabulation shows the distribution of time for the year ended June 30, 1942:

	Percent
Office of the Secretary	26
Civil Aeronautics Administration	46
Bureau of the Census	6
Bureau of Foreign and Domestic Commerce	3
Bureau of Marine Inspection and Navigation	3
Patent Office	1
National Bureau of Standards	3
Weather Bureau	4
Coast and Geodetic Survey	3
Subversive	5
	100

The Division has performed services in a wide variety of subjects of which the following tabulation shows the number and types of assignments completed:

Class of work	*Assignments completed*
Functional and organizational surveys; effecting consolidations; studies of methods, procedures, and policies	49
Studies of administrative problems, gathering factual data concerning them, and recommending appropriate action; drafting regulations, orders, and instructions giving effect to departmental decisions	37
Studies of personnel policies and problems	19
Inquiries into utilization of labor-saving devices; review of proposed purchases of equipment; developing new forms and revising or discontinuing obsolete ones	10
Alleged thefts, fraudulent and improper claims involving employees and contractors	8
Alleged serious irregularities, misconduct, and complaints involving employees	14
Inquiry to determine suitability for appointment in the service	18
Investigations: Protecting building and its occupants, gathering confidential data for officials, racial relations problems, union activity irregularities, and a variety of involved subjects	24
Participated in the handling and disposition of alleged subversive and disloyalty cases	86
Losses and thefts of government and personal property in building	64
	329

The tangible savings resulting from the activities of the Division have been classified as follows:

Class of service	*Savings effected*
Personal services	$23, 373. 58
Consolidations and mergers	31, 450. 00
Disapproval or revision of Bureaus' proposed operations and procedures	158, 840. 00
Equipment, supplies, forms, etc	18, 865. 72
Recoveries from false claims, losses, and thefts	1, 594. 36
Total immediate savings	234, 123. 66
Savings recommended and now being effected	60, 000. 00
Total prospective savings	294, 123. 66

As a result of studies, 182 employees were transferred to field offices where it was believed that their work could be performed more effectively, and 74 positions proposed to be set up in Washing-

ton were located at field offices. This resulted in eliminating 256 positions and the need for over 21,000 square feet of office space in Washington.

CONFERENCES AND EXPOSITIONS

Because of increasing utilization of Department of Commerce facilities on war activities, less time and personnel than usual were given during the past fiscal year to work in connection with international conferences, expositions, and exhibitions, which were reduced in number because of world conditions. In the Western Hemisphere, however, the number of such projects planned for the betterment of relations between nations increased and assumed greater significance.

Among these, the Department was represented at such meetings as the Second Inter-American Travel Congress, Mexico City, September 1941; the Fourth Pan American Highway Congress, Mexico City, September 1941; the Second Pan American Congress of Municipalities, Santiago, Chile, September 1941; and the Third Meeting of Ministers of Foreign Affairs, Rio de Janeiro, Brazil, January 1942, at which the Under Secretary of Commerce acted as adviser to the official delegation. Within the confines of our own country, representatives of the Department have participated in a number of conferences in specific fields, especially in the promotion of the war effort.

The agenda under preparation for several proposed inter-American meetings include topics coming within the scope of activities of one or more of the Department's Bureaus. Among these are the Inter-American Conference of Agriculture, Mexico City, 1942; and the Inter-American Meteorological Conference, Washington, D. C., 1942, plans for which are being handled by the United States Weather Bureau. The Fourth South American Congress of Chemistry, Santiago, Chile, late in 1942, and other events scheduled in one or another field of interest to this Department also are receiving attention.

During the past 12 months the Department was represented at a vast number of national and regional meetings in scientific fields as well as in the realm of commerce, economics, education, finance, industry and law.

The National Congress of Surveying and Mapping, the Federal-State Conference on War Restrictions, and other strictly domestic conferences were afforded assistance and facilities in the Commerce Building during the past fiscal year. Exhibits of educational value have been presented from time to time in the lobby of the Commerce Building such as one of Latin American products and one on the uses of plastics.

Many small exhibitions emphasizing defense were held in this country; a number of the larger ones enjoyed Federal participation. In this category fall such events as the Eastern States Exposition, Springfield, Mass., September 1941; the Civilian and National Defense Exposition, New York City, September–October 1941, and the Florida Fair, Tampa, Fla., February 1942. At the latter, where there was participation by about a dozen Federal agencies, the Department presented a coordinated display drawn from several of its Bureaus, including the Civil Aeronautics Administration, the Bureau of Foreign and Domestic Commerce, and the United States Weather Bureau. The exhibit was confined almost exclusively to depiction of activities of these agencies in the defense and war effort.

Office of the Solicitor

During the fiscal year ended June 30, 1942, there were 578 legal memoranda and opinions rendered; the law and facts were reviewed in 47 cases of appeals to the Secretary of Commerce involving the revocation or suspension of licenses and certificates; the law and facts were reviewed in 93 cases involving petitions for remission or mitigation of penalties for violation of the navigation and inspection laws; there were reviewed 201 cases submitted to the Attorney General and 24 cases submitted to the Comptroller General; 114 contracts, 234 leases, 12 bonds, 46 revocable licenses, 19 memoranda of understanding, and 9 cooperative agreements were examined and approved. Legislative matters handled numbered 184, involving semiweekly meetings of a legislative committee; 10 cases involving fatalities among seamen were reviewed. In addition, some 515 miscellaneous matters were handled.

All regulations issued by the Department and the Bureaus during the year were examined and approved. 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 conference with officials of the Bureaus and representatives of other Departments.

The legal work of the Civil Aeronautics Administration is set out in the report of the Administrator, and the legal work of the Patent Office is contained in the report of the Commissioner of Patents.

Bureau of the Census

The preparation of urgently needed statistics for defense and war agencies, including final reports of the Sixteenth Decennial Census, was the chief function of the Bureau of the Census in the fiscal year 1942.

Census data have had an increased importance in the past year during which the human and material resources of the Nation have been mobilized for war. The participation of the Bureau in the war effort, while paralleling that of World War I, has been much greater than it was 22 years ago. Although most of the regular reports of the Bureau of the Census have been found to be directly related to the war effort it has, nevertheless, been necessary to obtain more detailed information or to provide special compilations of data to serve the administrative needs of war agencies. In consequence, a number of surveys have been instituted; and monthly, quarterly, or annual canvasses, already a part of the Bureau operations have been expanded to meet current demands for statistics. The conversion of the Bureau to a war program basis has been greatly facilitated by the provisions of the Second War Powers Act of 1942, and by the presence in the Bureau of trained professional and supervisory decennial census personnel and decennial census equipment, which have been diverted to the preparation of statistics required for prosecution of the war.

The Second War Powers Act authorizes the Secretary of Commerce to make information on census schedules for individual respondents available to war agencies for use in connection with the conduct of the war; to defer, dispense with, or curtail any regular census or statistical work of the Department of Commerce; and to make such special investigations and reports of census or statistical matters as might be needed in connection with the conduct of the war.

The declaration of war in December 1941 found the Bureau processing and tabulating information from one of the most complete inventories of social and economic data ever taken. Because the decennial census staff had reached its peak in personnel as well as in equipment, a large efficient staff and a well developed tabulation organization was available for war work. Release of data has been and is eagerly awaited by war agencies and the Bureau has speeded up its output in order to furnish the needed detail.

STATUS OF THE DECENNIAL CENSUS

Entry of the United States into the war has made necessary considerable modification in the timing and direction of decennial census reports. Since most of the information to be presented was needed for some aspect of war planning, however, the essential features of the program have been retained; and the data will be available not only

to meet present problems but also to provide the base for studying social and economic change brought about by war conditions and for evaluating post-war needs.

Early in the year a thorough survey was made of contemplated analytical studies based on Sixteenth Decennial Census data. Lists of titles and tentative outlines were prepared and submitted to more than 125 consultants in order to obtain the evaluation of consumers of census material. The suggested studies were reviewed in terms of these responses and other pertinent factors. With the outbreak of war it was necessary to curtail further this program of special reports already severely restricted because of budgetary limitations. The studies which are almost completed, together with several new studies evaluating certain results of the census, will constitute this program according to present plans.

Publication of a statistical atlas and other general reports has been placed in abeyance. It is planned, however, to develop general indexes to make the results of this census more accessible and, thereby, more useful. An administrative report describing and discussing aspects of the taking of the census is in preparation. It is expected to be a valuable guide in the taking of future censuses.

The status of the various parts of the Sixteenth Decennial Census is summarized below, generally in terms of the final volumes which are or will be available.

Population

The results of tabulations of population data are being made available as quickly as possible through the use of sample tabulations and advance reports. Information, especially labor force data, is often made available to war agencies in advance of publication.

The program for the compilation of certain population statistics will probably have to be modified. It may be necessary to eliminate compilations on citizenship by country of birth and all statistics on State of birth, together with many tabulations on a sample basis designed to furnish statistics for analytical monographs. Certain items, such as family data, will be tabulated on a sample basis instead of completely as originally planned.

The present status of population census reports is as follows:

Volume I.—Number of inhabitants by States, counties, minor civil divisions, all incorporated places, wards in cities of 5,000 or more, metropolitan districts, and tracts in tract cities. All of the States, Territories, and possessions, and a United States summary, have been covered in separate bulletins. These have been combined into a final volume which is now being printed.

Volume II.—Characteristics of the population for small areas, including statistics on race, nativity, sex, and age; school attendance and last grade of school completed; country of birth and citizenship; and the labor force by broad occupation and industry groups. Some of the information to be found in this volume was issued in press-release form and a separate bulletin has been prepared and issued for each State. The United States summary bulletin is now being printed. The final volume will consist of this summary and the State bulletins combined.

Volume III.—Labor force statistics including employment, unemployment, occupation, and income, with data on race, age, sex, and

marital status; income by occupation, workers by industry groups and sex, major occupational groups by industry, hours worked, months worked, and duration of unemployment, for States and cities of 100,000 or more. Some of this information has already been released in multilithed reports and the printing of State bulletins has begun.

Volume IV.—Population characteristics by age, including data on single years of age; citizenship by age, school attendance by age, last grade of school completed for persons 5 years old and over, marital status by age, and relationship to head of household. This information will be available for States and urban places of 50,000 inhabitants or more and is now being tabulated.

Subject reports.—Several supplementary subject bulletins, based on data for a 5-percent cross section of the population, are planned. Of these, characteristics of the white population by nativity and parentage, foreign white stock by country of origin, mother tongue of the foreign white stock, and a bulletin on wage and salary income are scheduled for early completion. These will be followed by bulletins on occupation, industrial, and economic and social characteristics of the labor force, the characteristics of the persons not in the labor force, and the distribution of employed workers by occupation and industry.

Families and households.—Subject bulletins, based on a sample transcription, are planned to show the characteristics of families, including sex, color, and age of head, number of related workers, housing characteristics by income groups, and household characteristics by rental groups.

Fertility.—Subject bulletins on fertility, as measured by number of children ever born, number of children under 5, and number of children 5 to 9, are planned. The data, including age of woman, duration of marriage, etc., will be based on a sample of married women 15 years of age and over, with comparable data from the Census of 1910.

Institutional population.—A report on institutional population 14 years old and over, by sex, race, age, marital status, citizenship, and type of institution, for States, urban places, and counties will be issued.

Census tract statistics.—The number of inhabitants, and limited tabulations of the composition of population and the characteristics of housing for 60 cities by census tracts will be presented in separate bulletins, several of which are already available. Data on the nonwhite population are also presented for selected tracts in certain cities. Advance information on housing has been issued for all of the tract cities.

Press releases.—In addition to the releases mentioned above, other reports have been prepared and issued on topics of current importance. These reports may not appear in any of the volumes or bulletins mentioned above.

Advance releases were issued on foreign-born Germans and Italians in the United States, and on the Japanese in the United States and in Hawaii. Special releases were prepared on the potential labor supply in the United States, the reserve labor supply among women in the United States, and in conjunction with the War Department, on the educational level of men of military age in the United States. In addition, special releases on the estimated number of males to register under the Selective Service System were issued.

Housing

Housing data are now receiving increased emphasis as a result of the current war effort. Census data are being used as measures of the fuel requirements throughout the country and of the supply and characteristics of housing in critical defense areas. They are also being used as measures of rent levels during the immediate pre-war period in the rent-control areas, and are being utilized as bench marks for sample surveys for various rent and housing conditions, and housing supply in critical defense areas.

When the proper time arrives to formulate plans for post-war housing, the census figures will be used in determining the pre-war characteristics of housing in various areas of the country and in delineating areas in which rehousing is required. These uses of the results of the 1940 Census of Housing represent a considerable expansion from the uses contemplated when the census of housing was originally planned.

The status of housing census reports as of June 30, 1942, is as follows:

Volume I.—Selected data on housing for small areas. Bulletins have been issued for 35 States giving limited tabulations for States, counties, minor civil divisions, incorporated places of 1,000 or more, wards of cities of 10,000 or more, and metropolitan districts. Subjects presented for all areas are the total number of dwelling units classified by occupancy and tenure, color of occupants, number of persons per room, state of repair, and plumbing equipment. Additional subjects shown for urban and rural-non-farm areas include the number of residential structures, the average monthly rent or rental value of dwelling units, and the mortgage status of owner-occupied nonfarm units; and for rural-farm areas, additional information is shown concerning electric lighting, running water, and toilet facilities.

First series housing supplements.—Housing statistics for blocks in cities having 50,000 inhabitants or more in 1930 are being issued in a separate series of bulletins. These bulletins, each of which includes a base map, have already been issued for 144 of the 191 cities.

Volume II.—General characteristics of housing for the State, counties, and places of 10,000 inhabitants or more. State bulletins of this series will show the most important characteristics by occupancy, tenure, and color of occupants. Bulletins for seven States were available on June 30, 1942.

Volume III.—Characteristics of residential structures for States, large cities, and metropolitan districts. The preparation of the tables to be included in the series of bulletins which will be combined for this volume is well under way.

Volume IV.—Mortgages on owner-occupied nonfarm dwelling units, for States, counties, metropolitan districts, urban places, and tracts. The preparation of tables to be included in this volume is well under way.

Characteristics of housing by census tracts are included in the bulletin described in the population section.

Agriculture

The census of agriculture statistics have proved to be of vital importance in planning many aspects of the war program. Figures ob-

tained from the 1940 Census of Agriculture are being used as the basis of programs for war food production. In addition, this census contains a great deal of information on farm labor, farm machinery, and other farm items which is being constantly called for by war agencies.

At present, work on the decennial census reports is practically completed, but special tabulations utilizing decennial census data are being prepared for conducting projects to meet current requests, many of which are from war agencies.

The following reports are based on the 1940 Census of Agriculture:

Volume I.—Reports for States, with statistics for counties consisting of data from the first and second series State bulletins. These data include State and county figures on number of farms, farm acreage, uses and value of land, value of farm implements and machinery, many of the principal crops and livestock, mortgages, taxes, age of farm operator, occupancy, work off farm, labor, cooperation, expenditures, facilities; goats, mohair; purchases, sales, and slaughter of livestock; and annual legumes, vegetables, and fruits produced. This volume has been issued in 6 parts, all of which are now available.

Volume II.—Reports for States, with statistics for counties as contained in a third series of State bulletins. These bulletins included information on value of farm products (sold, traded, or used by farm households), and farms classified by major source of income for each State.

Volume III.—General report with statistics by subjects. Chapters in this volume will cover farms and farm property; size of farms; color, tenure, and race of farm operator; farm mortgages and farm taxes; work off farm, age, and years on farm; cooperation, labor, expenditures, machinery facilities, and residence; livestock and livestock products; field crops and vegetables; fruits and nuts and horticultural specialties; and value of farm products.

Special poultry report.—Statistics by geographic divisions and States for poultry of all kinds on hand and raised; by counties for chickens and chicken egg production by number of chickens on hand; by counties for farms reporting chickens and turkeys by number raised.

Irrigation.—This volume will consist of a consolidation of 18 separate bulletins each covering 1 or more of 20 irrigation States and will present data on water supply and quantity used, water rights, type of enterprise, area irrigated, physical works, investment, financing, and cost of maintenance and operation. Fourteen of these 18 bulletins have already been issued.

Drainage.—This volume will present for each of 38 drainage States data on class of enterprise, land drained, investment, financing, type of drainage works, and cost of operation and maintenance. Separate bulletins will be published for only 36 States, 33 of which are now available.

Manufactures

Data from the 1939 Census of Manufactures have furnished part of the groundwork for the mobilization of industry. The basic reports of this census gave the general picture of facilities in terms of products by industries and furnished the most complete list of manufacturing establishments available for use in conducting surveys to obtain further information. Industry summaries were used to plan the patterns of conversion and to isolate critical areas of our industrial economy which required additional study.

All work on the 1939 Census of Manufactures has been completed except for the preparation of special tabulations and other material in response to continuing specific requests, the bulk of which comes from war agencies. Because of the state of transition in the economy, it has been decided not to take a 1941 Census of Manufactures. The authority to suspend this survey was granted the Secretary of Commerce by section 1401 of the Second War Powers Act, 1942.

The status of reports as prepared or issued for the 1939 Census of Manufactures is as follows:

Volume I.—General Report. This volume will contain statistics on special subjects, such as size of establishments, type of organization, inventories, and expenditures for plant and equipment. These subjects have been covered in separate reports. The volume is now in press.

Volume II—Industry Reports. This volume, which will be issued in two parts, will combine the 65 reports for industries and industry groups which have already been issued in bulletin form. This volume is also in press.

Volume III—Reports for States and Territories. This volume will present detailed statistics for the 48 States, the District of Columbia, Alaska, Hawaii, and Puerto Rico. Separate bulletins for each of these areas, as well as summary figures, have already been issued. The final volume is now in press.

A report "Changes in Distribution of Manufacturing Wage Earners, 1899–1939," was issued during the past year. This volume is a summary of data from the censuses of manufactures showing changes in the geographic distribution of manufacturing wage-earner employment over the last 40 years, and has been assembled as a joint project of the Bureau of the Census and the Bureau of Agricultural Economics. The material was summarized and released at this time in response to requests of war officials.

There is in process of preparation a monograph on "Manufacturing Capital Expenditures in the United States." The census of manufactures returns for 1939 provided for the first time an enumeration of expenditures for plant and equipment in manufacturing industries, thus establishing a bench mark for measuring similar expenditures in future years. The monograph will include a critical analysis of the 1939 returns and will supply estimates of similar expenditures annually during the past 2 decades and an analysis of the factors which appear to be most closely related to manufacturing capital expenditures in the United States.

Census of Business

Business census reports, covering a broad field of statistics about which so little was known prior to 1929, have in the short period of 10 years become the Nation's handbooks for the study of retail trade, wholesale trade, service businesses, distribution of manufacturers' sales, and the construction industry. In normal times the Census, through its basic reports, meets an ever-increasing demand for fundamental data for use in selecting key markets, for measuring market potentialities, for the study of buying habits, and for studying related problems. Subject reports are issued from which special arrangements and analyses of the information can be made to study business trends and conditions.

In planning the conduct of the war, the war agencies have been able to obtain from the census of business a picture of the distribution system of the Nation. A great value will be attached to the use of these data in the post-war period when Government officials, economists, and businessmen alike will have need for bench marks as a starting point for future planning.

The status of reports based on the business census is as follows:

Volume I.—Retail Trade. This volume is to be issued in three parts, all of which are completed. Part 1 will include the United States summaries and general analyses. Part 2 will cover commodity sales and analyses by sales size. Commodity sales data have already been issued in a series of 13 bulletins. Part 3, giving statistics on retail trade by kinds of business for States, counties, and cities of 2,500 or more inhabitants, has already been issued.

Other reports on retail trade already issued which will be included in the above volumes, are credit sales and receivables, analysis by city size, monthly employment and sex of employees, supermarkets and self-service food stores, Negro proprietorships, and legal forms of organization. Releases were also issued giving retail trade data for the 140 metropolitan districts.

Volume II.—Wholesale Trade. A United States summary and State bulletins, giving basic data on the number of establishments, sales, expenses, personnel and pay roll for the State as a whole, for counties and for cities of 5,000 or more inhabitants, have been issued. The volume is being printed.

Reports issued in the field of wholesale trade, which will be included in this volume, cover business-size groups and an analysis of operating expenses; commodity sales; employment by months and employment and pay roll for 1 week; cash-credit analysis of sales and inventories and receivables; petroleum distribution; summaries on legal forms of organization; sales by classes of customers; ownership study; age of establishment and year acquired by present owner.

Volume III.—Service Businesses. State bulletins which will be included in this volume have already been issued giving number of establishments, receipts, personnel, and pay roll, by kind of business, for cities of 25,000 or more inhabitants. Totals are given for counties and for places of more than 2,500 inhabitants. Other reports which have also been issued and which will be included in the above volume are monthly employment and sex of employees; analysis by size, based on volume of receipts; legal forms of organization; places of amusement; hotels; tourist courts and tourist camps; and a release on beauty parlors in urban places of more than 5,000 population.

Volume IV.—The Construction Industry. In this volume, which is almost completed, the United States summary and State bulletins, which have already been issued, will be combined. Basic data on the number of establishments, value of work performed, personnel, pay roll, and cost of materials used and equipment installed, for States and for cities of 100,000 or more inhabitants, will be presented. The data will be presented by kinds of contractor for two size groups: (1) Those having work performed or contracts received in excess of $25,000; and (2) those performing less than $25,000 worth of work.

Volume V.—Distribution of Manufacturers' Sales. This volume will combine the preliminary series of 46 reports covering a total of 86 industries as well as data for other industries and a summary for all

industries. It will show primary channels through which manufacturers distribute their products. The information was collected as part of the 1939 Census of Manufactures schedule, and after checking, was processed and tabulated as part of the census of business.

Census of Mineral Industries

Industry reports have been issued for 55 mineral industries for general contract services, and for oil and gas field services performed by contractors. Considerable progress has been made in the completion of State reports and final industry results of the census. However, because of the pressure of demands for information from war agencies, the work on the reports of this census have been temporarily suspended.

SPECIAL WAR ACTIVITIES

The special war activities of the Bureau, other than the furnishing of statistical information from the regular reports at an increased tempo, are of the three general types given below. The examples described do not exhaust the major projects and no mention is made of a large number of small projects or of the many requests for specific items of information made by letter or telephone. The revision of regular Bureau reports to include additional information needed for war purposes can be considered as part of the regular activity of the Bureau.

Special Tabulations and Reports

When data regularly collected by the Bureau contain required information, special tabulations and reports presenting these data in the form needed to study specific problems are prepared. Examples of this first type of war activity are special tabulations of population data for men of military age, new reports on foreign-trade statistics, and reports on cotton, fats, and oils, as shown below.

Men of military age.—At the request of the War Department, special tabulations have been made of the marital status, education, and major occupation groups for a 5-percent sample of men of military age. Other tabulations are being made dealing with heads of families classified by the number of dependents of various types and cross-classified by other characteristics, such as age. These tabulations are needed by the Selective Service System, the War Department, and the War Manpower Commission, for proper planning of their activities.

Foreign-trade reports.—The acceleration of the war program has resulted in requests from war agencies for more comprehensive and more timely United States export and import statistics. As a result, the following reports have been instituted in addition to those previously prepared and issued:

Summary report of exports under the lend-lease program in commodity and country detail (monthly).
Reports of individual lend-lease shipments in complete detail for lend-lease accounting purposes (monthly).
Reports of shipments to the U. S. S. R. (Russia) (10-day).
Reports of all exports in commodity and country detail for the Board of Economic Warfare (monthly).
Report of shipments under individual export control licenses for the Board of Economic Warfare (monthly).

Confidential reports of shipments of military equipment on commercial vessels (10-day).
Reports of imports of strategic and critical materials for the War Production Board (monthly).
Report on exports to countries under "blocked" exchange regulations (10-day).

In order to make these reports as comprehensive as required by war agencies, the Division has expanded its export commodity classification code by more than 1,000 code numbers.

Reports on cotton, fats, and oils.—Detailed information and special statistical services to war agencies on cotton, cotton linters, cotton seed, and related products, and animal and vegetable oils and fats have been furnished by the Bureau. Reports prepared in this field include a special analysis of "Other Vegetable Oils" shown in the Fats and Oils bulletin, giving factory production and consumption for the years 1938 to 1941, and factory and warehouse stocks as of December 31 for 1937 and 1941; a special analysis of "Miscellaneous Products" given in the annual report on the factory consumption of primary animal and vegetable fats and oils by class of products for the years 1935 to 1941, inclusive; a special analysis of "Other Edible Products" given in the annual report on the factory consumption of primary animal and vegetable fats and oils by classes of products for the years 1940 and 1941; a monthly report on consumption of Egyptian, Peruvian, and Sea Island cotton; a report on cottonseed crushed cake and meal produced from August 1940 through July 1941, by geographical groups; and a report on the number of cotton spindles in place, classified according to size of establishments as of October 1941.

Surveys

When information in Bureau records is inadequate because of the date of the survey or the detail collected, new surveys are undertaken. Two examples of such surveys are the quarterly survey of metal requirements and the monthly report of plant operations.

Metal requirements.—Each manufacturer who uses significant quantities of metals is required to report to the War Production Board the inventory, consumption, and requirements for a list of basic metals and metal compounds. The Bureau of the Census collected and compiled this information for that agency during the first and second quarters of 1942.

The first quarterly survey of this type involved the mailing of forms to more than 11,000 manufacturers in February and the final tabulation for the quarter included over 9,000 reports. In April the forms for the second survey were mailed to approximately 20,000 establishments. Reports were received from nearly all of these; by the middle of June tabulations covering approximately the 13,500 firms which had used significant amounts of metals had been forwarded to the War Production Board. Preliminary tabulations were in the hands of that agency in less than 1 week after the actual closing date of the survey.

Plant report of operations (WPB 732).—Each month the Bureau of the Census surveys for the War Production Board approximately 14,000 large plants using metal-working machinery in 150 industries. This survey is designed to furnish information on the extent of conversion of plants to war work, the volume of unfilled orders both for war work and civilian work, the utilization of production facilities,

the anticipated peak month of operations on war work, and supplementary information on difficulties that prevent full utilization of production facilities. Final tabulations for the June survey included over 2,000 separate tables. In addition to final results, special preliminary tabulations are delivered each month in advance of final reports for use in connection with policy matters.

Service Activities

Because of the experienced staff and facilities available, the Bureau is often called upon by other agencies to render service on unusual problems encountered by them. For example, the Bureau was requested to edit, code, and tabulate the Selective Service occupational questionnaires, although it does not collect this information. Consultations are held with war agencies on their problems, and mailing lists developed within the Bureau are used for conducting surveys and distributing material by other agencies.

Selective Service occupational questionnaire.—A tabulation is being made for the Selective Service System from the occupational questionnaires for the 40,000,000 men included in 4 Selective Service registrations who were not in the armed forces. The project includes a preliminary hand count of the occupational skills reported, processing of the questionnaires, and machine tabulations. These tabulations show, by local boards, the deferment characteristics of registrants upon which quotas are determined, and employment status and dependency characteristics of men reporting occupational skills. After card punching, questionnaires from men reporting professional occupations are selected and sent to the National Roster of Scientific and Specialized Personnel.

Consultations.—Not only does the Bureau have a large staff and a substantial installation of equipment which are being utilized for war projects, but it has accumulated experience over many decades in the conduct of large scale projects. This type of experience has been made available to war agencies through consultations on problems that these agencies have faced or are facing, and, occasionally, through the loan of personnel.

As an example of this type of cooperation, the Bureau of the Census was active in the establishment of the statistical branch of the Wartime Civilian Control Administration of the Western Defense Command and Fourth Army. The policy to evacuate all Japanese, both alien and nonalien, and all German and Italian aliens from that portion of the west coast area which might become a theater of war operations was definitely determined late in February 1942. The Chief Statistician of the Division of Statistical Research was detailed to the War Department to head the statistical branch of the organization to carry out this program, and to cooperate in preparing the forms and procedures of the civilian evacuation program.

During the year many consultations were held with officials of the War Production Board, Office of Price Administration, War and Navy Departments, and other Federal and State agencies. Although some of these conferences have culminated in projects to be conducted by the Bureau, in many instances decisions were reached to eliminate work which would have resulted in no definite advantage to the agency involved.

Mailing list service.—One of the first steps taken to prepare the Bureau for its work on defense and war projects was the preparation of an address stencil for each manufacturer who reported in the 1939 Census of Manufactures. As the work has progressed, these lists have been checked and supplemented so that this file of stencils is the most complete listing of manufacturers to be found anywhere. Thus, for almost any survey in the field of industry the Bureau of the Census can furnish a basic mailing list.

In addition to Bureau mailings, announcements, regulations, and other materials are sent out for war agencies. The extent of this work can be gaged by the fact that during the last 9 months of the year 1,200,000 envelopes were addressed as part of this service.

ADMINISTRATIVE AND SERVICE ACTIVITIES

Machine Tabulations

For every working minute of the past fiscal year, based on a 44-hour workweek, over 400 cards were punched, over 20,500 cards were sorted, and over 5,400 cards were tabulated. These averages indicate the magnitude of the tabulation service of the Bureau.

About four-fifths of the tabulation work was devoted to Sixteenth Decennial Census work which includes war information tabulated from the records of that Census. About 8 percent of the work was that of the Bureau other than the Sixteenth Decennial Census work, including foreign-trade statistics and other projects yielding important war information. Projects for other Government agencies accounted for about 11 percent of the work, while special tabulations for non-Government agencies called for less than 1 percent of the punching, sorting, and tabulating in this Division.

The number of cards punched, sorted, and tabulated is summarized in the table below:

Machine tabulation activity

[In thousands of punched cards]

Project	Punched	Sorted	Tabulated	Percentage
Total	55,268	2,816,179	741,914	100
Sixteenth Census	32,334	2,238,875	643,840	80
Other census	8,707	224,508	42,979	8
Other Government	14,134	326,545	53,286	11
Non-Government	93	26,251	1,809	1

Sampling

Administrative problems arising in connection with the war effort have emphasized the need for obtaining information quickly in considerable detail. The Bureau of the Census has been utilizing scientific sampling techniques to an increasing extent in order to meet this type of demand and has shared the results of its experience with other governmental agencies.

In the course of enumerating the population of the United States for the 1940 Census a 5-percent cross-section sample was segregated by predesignating certain lines on each schedule. The sample so

chosen has proven very valuable, not only in making basic information available much more quickly, but also in enabling the Bureau to furnish more detail than would be possible under existing budget limitations if complete runs of the information were necessary.

At the request of the Bureau of the Budget, the Bureau of the Census outlined last year a plan for taking an annual sample census of population, housing, and agriculture. During the past year, experience and information gained in the course of work have helped to crystallize these plans to a point where the blueprint for taking such a census is practically complete and could be put into operation as soon as the proper authorizations are received. Contributing to this information was a project cosponsored by the Bureau and the Work Projects Administration for studying the efficiency of various sampling designs. As a result of this study, it will be possible to determine effective sampling units and modes of stratification for estimating important population and housing items.

As the war program developed, the Bureau has been called on more and more frequently to contribute technical assistance, and to cooperate with various war agencies in planning sample inquiries for necessary war information. The Governmental Requirements Branch of the War Production Board and the Fuel Rationing Division of the Office of Price Administration are two of the groups which have called upon the Bureau for this type of service.

Field Service

The Field Service work of the Bureau has two aspects—that of geographical planning and that of actual field operations. In planning for the Sixteenth Decennial Census a large collection of maps had been assembled so that the entire country could be divided on a geographic basis into enumeration districts in such a manner that no area was duplicated and no area was omitted. This arrangement has also furnished the Bureau a logical classification system for filing its schedules and other information.

When information is desired about any individual person the first step, therefore, in referring to the schedule is to determine in what enumeration district that person lived at the time of the census. During the past year over 500,000 addresses were allocated to enumeration districts preparatory to referring to the population schedules. Most of these searches were made for personal census record transcripts but a large number of these cases involved segregating information for special tabulations.

Over 2,200 maps and charts were prepared during the year for inclusion in Bureau publications. A large number of copies of maps, as well as boundary descriptions of blocks and enumeration districts, were furnished to war agencies, other governmental agencies, planning commissions, business concerns, and educational institutions at cost. Material of this type is extremely useful in connection with making surveys, in market analyses, and in other studies using census data for small areas.

Analytical work designed to evaluate techniques used in planning decennial census enumerations and to study problems which will arise in taking national sample surveys was conducted during the year.

Field operations of the Bureau during the past year were conducted for various censuses and projects mentioned throughout this report.

Distribution of Publications and Information

Public interest in census information is reflected in the distribution of printed and processed materials, and in replies to mail, telephone, and personal requests from the public and from Government officials. While war conditions have necessitated curtailment of original plans for distributing the publications of the Sixteenth Decennial Census to the public, requests for specific items of information have greatly increased.

It was necessary to announce to the 150,000 groups and individual persons that had requested inclusion on the mailing lists to receive census bulletins that all such lists would be discontinued for the duration of the war and that free bulletins would be sent only where justified. The need for curtailing the use of paper, the shortage of printing and processing capacity, plus the increased cost of materials and labor, made this action absolutely necessary.

In order that the information might be readily available for reference throughout the Nation, approximately 1,600 libraries were designated as depository centers for Census publications. Individual applicants were urged to restrict their demands to specific bulletins instead of blanket service; so that they might be informed of the character and nature of Census publications, a catalog of publications was prepared and distributed.

The bottleneck created by the overloading of press association wires in Washington by war news made difficult the announcement of results of the Sixteenth Decennial Census and other census reports. This situation was met in part by emphasizing information of interest to a particular State or local area and transmitting the news directly through channels for that region. National summaries usually accompanied these regional reports. This technique was particularly effective because a relatively large amount of information for small areas, such as block data in the census of housing and data on metropolitan districts and tracts, had been prepared for publication.

Microfilm

The Bureau now has microfilm reproduction of the population census schedules for the censuses of 1840 through 1880, and 1910, the manufactures schedules of 1929 and part of those for 1935, the tabulation and consolidation sheets of vital statistics from 1900 to the present, as well as other material. The microfilming of the 1935 Census of Manufactures schedules is continuing and plans have been made to microfilm the 1940 population schedules.

Microfilm is of great value for preserving irreplaceable records, saving office and storage space, and for the transportation of bulky material reduced in size for convenient handling. For example, the microfilming of the 1940 population schedules will reduce the active filing space needed by almost 98 percent and will obviate the necessity for binding the 2,000,000 schedules into volumes convenient for handling. In order to preserve the census schedules used for personal record searches, positive microfilm copies are now used instead of the original documents.

Transfer of Early Population Census Records to Archives

Because of pressure in meeting requests for transcriptions of population census information for establishing the facts of age and citizenship for persons now living, the Bureau was forced to discontinue all genealogical work even though this work was done on a reimbursable basis. This action made available for transfer to The National Archives all original population census records from 1790 through 1870. In addition, manufactures census schedules for 1820, schedules of mines, agriculture, commerce, manufactures, etc., for 1840, and various records other than original schedules for early censuses which had remained in the custody of the Bureau of the Census, were transferred. Microfilm copies of the original population schedules from 1840 on were retained by the Bureau.

Special Studies and Tabulations

The census is so designed that while the information of greatest utility is published, additional detail of great value is retained in the Bureau for analytical and other purposes. After the regular work connected with the census has been completed, special studies and tabulations are made for interested groups which are willing to pay for the cost of the work. In the field of agricultural statistics these special jobs included approximately 2,000 transcriptions of minor civil division data, a tabulation of cotton products by bale groups showing acreage and income, a cooperative mortgage study, crop production by soil type for a Colorado county, and similar studies for other business and governmental groups. In the field of population, one of the largest special jobs other than those mentioned elsewhere was the count of citizens by blocks for selected cities in New York. This was made at the request of the Secretary of the State of New York and is needed in order to comply with the requirements of the New York State constitution for delimiting legislative districts.

Outside Contacts

The general Census Advisory Committee appointed by the Board of Directors of the American Statistical Association continued its important service to the Bureau. The committee met three times during the past year to survey the work accomplished and evaluate technical policy and procedures, making recommendations on these matters. In addition, other advisory committees within the subject matter fields expressed their recommendations on problems within the areas covered by these committees.

The third annual work conference of State Registration Executives was held in St. Louis, Mo., and was attended by representatives from Federal agencies, 46 States, and 3 municipalities. Papers and discussions were focused on problems of delayed birth registration, advantages and disadvantages of national registration, health for national defense, and technical problems of vital statistics. The meeting served as a general clearing house for problems in the field and helped further interstate and Federal-State cooperation in dealing with problems of vital statistics.

Objectivity and practical usefulness of census data was forcefully brought out at a 2-day clinic of business and research representatives

of daily newspapers arranged by the Bureau. Representatives of 165 of the largest daily newspapers attended and the exchange of ideas will probably result in the extension of the use of Census information and Census services.

In addition to consultations held in Washington, a number of members of the staff consulted with and advised State and local vital statistics officials regarding technical aspects of registration. Visits were made to a large number of State offices and, on special requests of State officials, surveys of office procedures were made in several States.

Members of the technical staff of the Bureau attended meetings of professional societies during the year and at most of these meetings presented papers and participated in discussions on technical problems, thereby acquainting technicians with the work of the Bureau and gaining information which will be of help to the Bureau in maintaining its technical standards.

Legislation

During the past year, two acts were passed which bore specifically upon the work of the Bureau. The apportionment act (Pub. 291, 77th Cong., 1st sess.) was signed November 15, 1941, and the Second War Powers Act, 1942 (Pub. 507, 77th Cong., 2d sess.) became effective March 27, 1942. In addition, under date of January 8, 1942, Foreign Trade Statistics regulations were transferred from the Bureau of Foreign and Domestic Commerce to the Bureau of the Census.

Apportionment.—When the report of the Seventeenth Decennial Census is transmitted to Congress by the President in 1951, the apportionment computations which accompany this report will be made by only one method, that of equal proportions. The States will be informed of the number of Representatives to which they will be entitled 15 days after this report is made to Congress.

The law which this act replaces required a report by two methods—equal proportions and major fractions—and gave Congress 60 days to decide which to use. If no action was taken in that time, an apportionment by the method used in the last previous apportionment was automatically effective.

Second War Powers Act, 1942.—Two sections of this act directly affect the Bureau of the Census. Section 1401 empowers the Secretary of Commerce, subject to the President's approval and regulation, to make special investigations and reports of census and statistical matters as needed in connection with the conduct of the war, also to dispense with or curtail any regular census or statistical work which he deems unnecessary subject to the President's approval and regulation. One of the actions taken under the authority granted in this section was the elimination of the 1941 Census of Manufactures. It was felt that this census would have limited value due to the fact that industry was in the process of conversion to war production at the time the census was scheduled and more useful information could be obtained by increasing the program of current surveys, rather than by taking a general census.

The Secretary of Commerce was also empowered in section 1402 of the same act to make available to war agencies any information

contained in schedules as reports of the Bureaus in the Department. Information is to be furnished subject to regulations imposed by the President (Executive Order No. 9157, dated May 13, 1942) and persons using the information are subject to penalty provisions against disclosures similar to those which apply to Census employees.

ACTIVITIES OTHER THAN THE DECENNIAL CENSUS

Foreign-Trade Statistics

The past year has witnessed the integration within the Bureau of a new field of basic statistics—that of foreign trade. The transfer of this division to the Bureau of the Census from the Bureau of Foreign and Domestic Commerce was completed on July 1, 1941.

Publications in this field include detailed commodity reports, monthly summaries, and an annual volume, "Foreign Commerce and Navigation of the United States." Because of the value of this information from the standpoint of economic warfare, the release of export data by country of destination was suspended with reports for April 1941. Import statistics by country of origin were continued through the September 1941 report. With the outbreak of war in December 1941, the issuance of all detailed statistics on exports and imports was suspended for the duration of the war effective with October reports. Copies of the results of the tabulations are now made available to specified Government agencies for war use only.

During the past year the Bureau cooperated with the Division of Statistical Standards of the Bureau of the Budget in developing plans for extending the scope of foreign-trade information by the publication of gross-weight statistics for commodities moving between the United States and foreign countries. This information is essential for the study of the effectiveness of the ship-utilization program. As the first step in furthering this program, revised export declarations were issued during May 1942 and revised import entries were issued shortly thereafter. The principal additions to the forms are items calling for gross weights and port of loading or unloading.

The new reports in this field, initiated to meet the requirements of the war effort, are discussed in an earlier section of this report.

Current-Manufactures Reports

To meet the needs of war agencies for current detailed reports and tabulations supplementary to information collected for the census of manufactures, the Bureau has revised and extended its program of monthly and quarterly reports on industry. Extension of this work was made possible by the cooperation of war agencies and by the personnel and funds made available when it was decided not to take the 1941 Census of Manufactures.

Reports have been revised and extended to a considerable extent to meet current needs. Examples of this are the reports on chemicals and on wool consumption. New reports have been started when needed, usually in cooperation with the War Production Board.

At the time the defense effort was getting under way one of the primary statistical tasks was the measurement of the flow of materials under the priority system. This project called for the tabula-

tion of information contained on the preference-rating certificates and orders of the Office of Production Management. The number of documents involved increased continuously and steps were taken to decrease the work involved by sampling the smaller orders, so that reports could be made available more quickly. The volume continued to increase, however, a peak being reached in the month of December when, in spite of the use of the sampling plan, over 194,000 transcription sheets were forwarded for tabulation.

The development of the war production program and information obtained from the tabulations of preference-rating certificates and orders pointed to the need for more information on metals because of the importance of that type of material. A special survey of inventories and consumption of scarce materials, concerned primarily with metals and metal compounds, was made. In addition, experimental work was done on the basic form of the Productions Requirements Plan, PD–25A, which was used for allocating critical materials to certain firms.

Out of the steps outlined above, a new comprehensive survey "Manufacturers' Reports of Metal Requirements" (PD–275), mentioned earlier in this report, was evolved. This survey has now been made for two quarters by the Bureau as collecting and compiling agent for the War Production Board. An important part of this survey was the tabulation of information on the use of metals within 184 fairly homogeneous product groups. This type of information, until now practically unobtainable for industry as a whole, is extremely important in planning a policy of allocating critical materials so that the emphasis in war production can be placed on military requirements without curtailing excessively essential civilian needs.

To meet the need for uniform description and classification of products in groups, the Bureau, in cooperation with the Bureau of Research and Statistics of the Office of Production Management, and with the Division of Statistical Standards of the Bureau of the Budget, developed the "Defense Program Product Classification."

Adaptations of the classification have been used in establishing product groupings for tabulation of use and shipments of materials reported on the "Report on Metal Requirements" and under the Production Requirements Plan. The classification has also provided basic information for the grouping of products within branches of the War Production Board.

At the end of the year 14 monthly and 13 quarterly surveys of industrial operations were being conducted in addition to the current manufactures reports regularly undertaken by the Bureau. On 4 additional projects, the flow of forms into the Bureau was continuous, with reports prepared as required. In addition, 30 special surveys were taken to survey the condition in an industry, the production and productive capacity for a given product, or the consumption of certain materials.

State and Local Government

Census of Governments, 1942.—Plans for the decennial Census of Governments, 1942, traditionally called "Wealth, Debt, and Taxation," were in preparation at the close of the year. Since 1850, this canvass has been the basic source of comprehensive information on the number, distribution, finances, and characteristics of all of the approxi-

mately 175,000 distinct and separate governmental units in the United States. Present problems of war and national defense accentuate the need for current data on local governments, as policing, fire protection, sanitation, etc., become vital problems in areas affected by wartime concentrations. The last previous survey, in 1932, is now entirely obsolete because its data not only reflect depression conditions, but, more seriously, they predate the development of the most significant types of intergovernmental relations now existing. The 1942 survey will provide current comprehensive information, not otherwise available, for general purposes and also for use by war agencies in planning war finance and Federal relations with State and local governments.

Innovations in the 1942 canvass will include a classified summary of all governmental units according to organization and type, the report for large metropolitan areas, the type-of-government and subject series of reports, and the inclusion of employment and pay-roll statistics.

Annual and current reports.—The 3-volume arrangement of annual reports on financial statistics of States and of cities has been altered for 1941. The series constituting volume I give complete detail for each individual State and city. The second volume is now a series of summaries and analytical reports, and the third is a condensed statistical compendium. The method of compiling data in the field was changed to avoid artificial classifications and consolidations. Public-service enterprise data are now reported on a utility basis.

The report "State and Local Government Debt, 1941," presented statistics from the second annual Nation-wide survey of public debt as of June 30, 1941, classified by type of government, by size classes, and by selected debt concepts. Data on interest payments and maturities were included for the first time.

The third annual current survey of State tax collections was completed. Collections for every State by each type of tax for 1941, with the amounts of State taxes distributed to local units, were published in February 1942.

A comprehensive report on financing Federal, State, and local governments was prepared for 1941, detailing revenues and expenditures by levels of government. Allied studies, likewise stressing intergovernmental relations, were of Federal and State fiscal aid in 1941 and of property tax in 1941.

Quarterly employment survey reports have been altered to show personnel and pay rolls allocated to each function of government, by States, cities over 25,000 population, and counties over 50,000 population. Employment status of employees in individual governmental units and trends and total employment in all units of government continue to be summarized quarterly. Monthly estimates of public employment in each State, and reports of trends in selected government functions of special wartime significance are in preparation for 1942. The complete list of governments responding to the quarterly employment survey inquiries, showing classification of their pay rolls and employees, is now published only in January, instead of quarterly as heretofore.

A survey for 1941 of pension and retirement systems governing State and local government employees is in process and a preliminary report has been issued.

The usual analyses, by subject, type of measure, and votes, were included in the annual reports on State and city proposals voted upon in elections.

Municipal Reference Service.—The Municipal Reference Service now includes official reports from the 48 States, cities having a population of more than 50,000, approximately 100 of the larger counties, and many other units of government. The collection now includes over 27,000 books and pamphlets and approximately 5,000 pieces of other material.

The growing value of this service to Federal, State, and local officials, as well as to private research agencies, was evidenced by an increase of 102 percent over the preceding year in material lent and service provided. The extent of individual requests has also expanded markedly. Especially valuable to war agencies has been the large collection of building codes which has been used in recommending revised specifications to conserve war material.

Vital Statistics

During the past year activities in the vital-statistics field included the development and improvement of national statistics on mortality, natality, marriage, divorce, mental institutions, prisons, criminal courts, and hospitals. Assistance was rendered to Federal and State agencies in developing standards for the issuance of delayed birth registrations and in meeting problems caused by this procedure. Inter-American cooperation in vital statistics and consulting and advisory service to State vital statistics offices were also developed further during the year. Plans were made for the sampling of current mortality data so that an index of mortality can be released at a very early date to help delimit problem areas in maintaining war production at a high level from a health standpoint.

Special tabulations of vital statistics are being utilized in a number of war activities. For example, prison statistics are used in estimating manpower available from that source; marriage estimates are used for planning rationing programs and production requirements; mortality data for delimiting health problem areas; and natality and mortality data for preparing consumption estimates.

Mortality summaries.—During the year the issuance of mortality summaries containing statistical data for the more important causes of death was started. Each mortality summary deals with a particular disease or cause of death, and gives concisely, in a few pages, most of the salient facts about that selected cause. The mortality-trend data shows the progress of a particular disease through a period of 41 years. Developments in the fields of medicine and public health since the turn of the century are reflected by the information presented. The data for 1940, the latest year for which both mortality and population statistics are available, show the status of health in the prewar period. These data provide an essential reference point from which to measure the course of health progress during the critical war years.

Current mortality sampling.—Preparatory work for the issuance of a current index of mortality based upon a relatively small sample of certificates is well advanced. The plan involves the transcription of

1 out of 10 death certificates as they come into State vital-statistics offices and immediate transmittal to Washington for editing, coding, and tabulation. Approximately 45 days after the close of the month of death, a short report is to be issued, which will contain tabulations of deaths by cause and by geographic region, such regions being chosen as much as possible for their importance in the war production economy. This publication will eventually replace the present monthly Vital Statistics Bulletin.

Delayed birth registration.—It has been estimated that there are approximately 54,000,000 people in the United States who do not have a birth certificate on file and who must, therefore, furnish other proof as to the facts of birth when called upon to do so. During the past year such evidence had to be furnished prior to employment in war industries. Because of the crushing load of work in meeting the demand for these certificates, many State agencies have continued to seek assistance in meeting the problem. A national W. P. A. vital-statistics project which was cosponsored by the Bureau has met the problem in part. Consultations have been held with State organizations struggling with this problem to assist them as much as possible.

Motor-vehicle-accident definitions.—Differences in the definitions employed in presenting statistics on motor-vehicle accidents have affected comparability of data published by various National, State, and local agencies. In order to facilitate the classification of motor-vehicle accidents and to secure greater uniformity, a manual of "Uniform Definitions of Motor Vehicle Accidents" was prepared by the National Conference on Uniform Traffic Accident Statistics under the leadership of the Bureau. The manual will be published soon by the Bureau of the Census.

Birth registration test project.—The birth registration test project which was planned and carried out in connection with the Sixteenth Decennial Census of Population has accomplished the principal task of furnishing data on the completeness of birth registration by counties. Wide variation was shown to exist among the various counties in the registration of births. The test indicates that in 1940 more than 200,000 births throughout the United States were not registered.

Plans made before the outbreak of war had called for an extensive campaign in areas where registration deficiencies were shown to exist. These plans were revised to limit the work to counties with the greatest underregistration. Members of the staff were sent to a number of these areas in 14 States to study and analyze the registration machinery in the local areas, and to make an intensive effort to improve the local registration mechanism.

Institutional statistics.—During the fiscal year information on approximately 449,000 mental-patient admissions, discharges, and deaths; 190,000 prisoner admissions, discharges, and deaths; 34,000 jail admissions and discharges, and 77,000 criminal defendants, was tabulated. Publications in this field included: Prisoners in State and Federal Prisons and Reformatories, 1939; Judicial Criminal Statistics, 1940; Prisoners Admitted under Fine to the Baltimore City and District of Columbia Jails, January to March 1940; admissions to the Baltimore City and District of Columbia Jails, 1940; and Patients in Mental Institutions, 1938.

Population Estimates and Special Censuses

The demand for postcensal estimates of population, which has always been heavy, has greatly increased because of the needs of administrative agencies in war-boom areas. Even though recent unprecedented shifts of population make it increasingly difficult, it is necessary to construct estimates for more kinds of areas and by more characteristics than usual and with less lag in time.

During the past year estimates have been made of the population of continental United States, by months, from July 1, 1940, to July 1, 1941, and of the District of Columbia, by 6-month periods, from July 1, 1940, to January 1, 1942. Special estimates have also been made in connection with war demands. Of the estimates prepared, the following are examples which have been published: Number of males in the United States, by race, 21 to 27 and 28 to 35 years of age on July 1, 1941; number of males 21 to 35 in each State on October 16, 1940, for comparison with number of men registering for Selective Service, as allocated to State of residence; number of males 18 to 64 and 20 to 44 years of age, by race, in the United States as of January 1, 1942; number of males 45 to 64 years of age registering for Selective Service on April 27, 1942; and number of males 18 to 20 years of age registering for Selective Service on June 30, 1942.

Special censuses of population were taken during the year in several areas at the request of local authorities.

Life Tables

"U. S. Life Tables for White and Nonwhite, by Sex, 1930–39 (Preliminary)" and "U. S. Abridged Life Tables, by Geographic Divisions, Color, and Sex, 1930–39 (Preliminary)" have been issued to date as two of the life-table studies based on the Sixteenth Decennial Census.

These life tables are the only official publications of this type based upon the general population rather than upon a selected group such as insurance risks, and are very useful in demographic research for indicating trends in mortality rates, expectation of life, survival rates, and related values.

Life tables for the rural population, urban population living in cities of more than 100,000 inhabitants, and for other urban residents, based on deaths of the year 1939, are now in preparation. These tables have been made possible by the fact that mortality data are now tabulated by place of residence as well as by place of occurrence and will indicate for the first time urban-rural differences for the entire United States in terms of life-table functions.

Personal Census Records Searches

The increase in the demand from the public for transcriptions of census records to enable citizens to prove age and place of birth, and in many cases, to enable them to secure employment in war industries, has made necessary tremendous expansion of this activity during the year. Since there are an estimated 54,000,000 native-born Americans who do not have birth certificates, many hundreds of thousands of persons have been compelled to rely on data from census records to support their claims.

During the past 12 months 737,132 applications for transcripts were received in the Bureau—more than double the number received during the previous fiscal year. The growth of the demand for this service is shown by the fact that of the 1,727,484 applications received by the Census Bureau in a 10-year period, 943,808 were received in the 18 months from January 1, 1941, to June 30, 1942. In 1933 the total of such applications received was 13,226. During the closing weeks of the fiscal year the Bureau completed arrangements for collecting a minimum fee of $1 for future searches of the census records.

Basic Materials Reports (Cotton and Oils)

During the past year the preparation and publication of regular reports on cotton and other agricultural basic materials continued.

Cotton ginnings.—During the cotton-ginning season, 12 periodic reports are issued showing the quantity of cotton ginned prior to specified dates. In March a final report is released showing the total ginnings and production of cotton in each of the cotton-producing States. Detailed statistics showing cotton production, ginning, and bale weights have been summarized and presented in an annual bulletin entitled "Cotton Production in the United States, Crop of 1941." Reports on cotton ginnings are collected periodically from approximately 12,000 cotton ginneries.

Cotton consumption and stocks.—Reports on cotton consumption and stocks are issued monthly, usually on the 14th of the month following the month to which the report relates. The basic data for these reports are collected monthly from approximately 2,000 consuming establishments and 3,000 cotton-storage places. An annual bulletin entitled "Cotton Production and Distribution, Season of 1940–41," summarizing the statistics on cotton production, consumption, and stocks for the crop year ending July 31, was issued in January 1942.

Cotton spindle activity.—The reports showing the hours of operation of cotton spindles during the previous month are issued on the 18th of each month. The data used in the compilation of these reports are collected from approximately 1,000 cotton-spinning mills.

Cottonseed and cottonseed products.—Detailed statistics showing the quantity of cottonseed crushed, the quantity of crude cottonseed oil, linters, cake and meal, and refined cottonseed oil produced during the month and the stocks at the end of the month are published monthly. These reports are based upon data submitted by 500 cottonseed-oil mills and 300 cotton-oil refiners and consumers. The cottonseed and cottonseed-products reports are issued on the 12th day following the month to which the statistics relate.

Factory production, consumption, and stocks of animal fats and vegetable oils.—Reports showing the production, consumption, and stocks of more than 60 primary animal fats and vegetable oils and their byproducts are released quarterly—usually during the month following the end of the quarter. These reports are compiled from detailed questionnaires submitted by more than 4,000 establishments producing, consuming, and storing fats and oils.

Consumption of fats and oils in the manufacture of various products.—In March the report showing the quantity of each animal fat and vegetable oil used during the calendar year 1941 in the manufacture

of shortening, oleomargarine, soap, and other products was issued. Detailed statistics showing the production, consumption, stocks, and the quantity of each animal fat and vegetable oil used in the manufacturing of various classes of products are embodied in an annual bulletin, entitled "Animal and Vegetable Fats and Oils."

Current Business Statistics

Trends in retail sales of independent stores have been provided by the Current Statistical Service in monthly reports issued for 34 States and a combined summary for the United States. Percent changes based on month-to-month comparisons, and comparisons for the current month and current year to date, with the corresponding month and period a year ago, were shown by kinds of business for these States and six of the largest cities, and for all kinds of business combined by city-size groups. Approximately 40,000 retailers participated voluntarily in this current survey.

Trend data on sales, inventories, and credits for 35 kinds of business are shown each month, by geographic divisions, for approximately 4,000 wholesale establishments throughout the United States.

The monthly survey on automobile financing, transferred to the Current Statistical Service December 1941, has been expanded and now includes the financing of furniture, radios, refrigerators, other household appliances, residential building repair, etc., through sales finance companies. In the light of these changes the title of this report has been changed to "Sales Finance Companies."

The Current Statistical Service also provides monthly reports on confectionery and competitive chocolate products manufacturers' sales and credits, and on illuminating glassware manufacturers' sales and credits.

War agencies are particularly interested in surveys now being conducted of canned, preserved, dried, and quick-frozen foods, green coffee, cocoa beans, and spices. Special projects, such as the survey of wholesalers, retailers, and other dealers, to determine the number, location, and availability of certain types of small arms, have been made as an aid to the War Department and the Office of Civilian Defense.

Statistical Abstract

The 1941 edition of the "Statistical Abstract" contained statistical data summarizing the social and economic conditions of the population, and the industrial, commercial, and governmental activities of the Nation. The current issue also includes a brief bibliography of sources of statistical data. This bibliography makes the volume more useful as a convenient reference work for businessmen, economists, statisticians, students, and others who need a statistical compendium covering a wide range of subjects.

Census of Religious Bodies

The Census of Religious Bodies, 1936, was completed during the past fiscal year with the publication of volume I. In this volume an analysis of the results obtained are presented, as well as summary and detailed tables of principal statistics by denomination and by

geographic divisions, States, counties, and principal cities. Volume II, issued last year, is a compilation of reports on 256 separate denominations and includes statistics, history, doctrine, and organization for each group.

PERSONNEL AND FINANCE

Personnel

The rate at which employees have been separated from the Bureau because of completion of decennial census operations is much slower than the rate after the last census. On June 30, 1932, the number of employees in the Bureau was 30 percent of the peak number employed on the Fifteenth Census staff, while the number on June 30, 1942 is 60 percent of the peak number for the present census. The primary reason for this decrease in the rate of separation is the fact that many employees are being retained for work on war projects.

The number of permanent employees at the end of the fiscal year was 865 as compared with 795 a year ago. This is partly due to the fact that 184 permanent employees, 32 in Washington and 152 in New York City, were transferred to the Census Bureau from the Bureau of Foreign and Domestic Commerce with the Foreign Trade Statistics Division. The personnel of the Bureau on June 30, 1942, and appointments and separations during the fiscal year of 1942, are shown in the accompanying table. Of the 5,931 employees on the Washington rolls, 449 are in military service.

In addition to the information shown in the table below, there were on the rolls as of June 30, 1942, 2,253 temporary special agents (196 in the Washington office, and 2,057 outside of Washington) appointed for limited periods at $1 per annum, or without compensation. Of this number, 63 special agents without compensation were employed on the W. P. A. project in the Washington office, and 965 on the projects in New York City. There were 185 appointments of special agents at $1 per annum, or without compensation, made during the fiscal year in the Washington office and 1,892 outside of Washington; and 241 and 2,132 separations, respectively.

Personnel June 30, 1942, and appointments and separations, fiscal year 1942

	Bureau total	Washington office	Field
Total employees on roll, June 30, 1942	6,936	5,931	1,005
Permanent	1,654	724	930
Temporary	5,282	5,207	75
Total appointments, fiscal year	3,662	3,228	434
Permanent	300	57	243
Temporary	3,362	3,171	191
Total separations, fiscal year	5,397	5,062	335
Terminations	1,758	1,591	167
Expirations of appointments	121	86	35
Transferrals	2,384	2,350	34
Resignations	1,067	977	90
Retirements	28	28	
Deaths	18	14	4
Change from temporary to permanent	21	16	5

Finance

Bureau appropriations accounted for 79 percent of funds made available for work during the past year; during the fiscal year 1941 this proportion was over 99 percent. The amounts allotted or transferred from other Federal agencies either for work done on a reimbursable basis or as working funds totaled $2,083,859, compared with $77,230 for the previous fiscal year. Practically the entire amount went for services to war agencies. Funds received from nongovernmental sources totaled $135,056 compared with $21,250 for the previous fiscal year.

Appropriations and other funds made available to the Bureau of the Census, by source, fiscal year ended June 30, 1942

Purpose	Total	Source of funds		
		Bureau appropriations	Allotted or transferred from other Federal agencies	Nongovernmental
All Bureau work	$10,417,910	$8,198,995	$2,083,859	$135,056
Regular salaries and expenses:				
Expenses of the Sixteenth Census	7,693,000	7,693,000	----	----
Salaries and expenses, Social Security Act	110,360	110,360	----	----
Customs Statistics, Department of Commerce	395,635	395,635	----	----
Emergency fund for the President, War [1]	----	----	----	----
Work for other Federal agencies:				
Reimbursable basis [2]	984,349	----	984,349	----
Working funds	1,059,510	----	1,059,510	----
Defense aid, administrative expenses (allotment to Commerce, 1941–43)	40,000	----	40,000	----
Work for outside organizations or individuals	135,056	----	----	135,056

[1] Unexpended balance of $75,000 reported in 1941.
[2] Based on work done in fiscal year 1942 (whether billed or not).

Civil Aeronautics Administration

INTRODUCTION

During the fiscal year 1942 all services of the Civil Aeronautics Administration were concentrated on aiding the war effort, the groundwork having been laid by participation in the defense program up to December 7, 1941.

On December 13, 1942, the following Executive order (No. 8974) brought a closer coordination of civil aviation with military needs.

EXECUTIVE ORDER

Control of Civil Aviation

By virtue of the authority vested in me by section 1 of the act of August 29, 1916, 39 Stat. 645 (U. S. C., title 10, sec. 1361), and as President of the United States, it is hereby ordered as follows:

1. In the administration of the statutes relating to civil aviation the Secretary of Commerce is directed to exercise his control and jurisdiction over civil aviation in accordance with requirements for the successful prosecution of the war, as may be requested by the Secretary of War.

2. The Secretary of War is authorized and directed to take possession and assume control of any civil aviation system, or systems, or any part thereof, to the extent necessary for the successful prosecution of the war.

FRANKLIN D. ROOSEVELT.

THE WHITE HOUSE,
December 13, 1941.

Thousands of graduates of the CAA pilot-training program entered the armed services, and arrangements were placed in effect whereby all future trainees would be Army or Navy reservists.

The Federal Airways System met wartime demands for strict traffic control and close coordination with air-defense commands, while its facilities in Alaska and Hawaii proved of great service to the military air forces.

The airport-construction program, a defense measure from its inception, was accelerated by our entrance into the war, and before the year's end appropriations for this purpose were about doubled.

Safety-regulation personnel handled the huge task of checking the loyalty and reinstating of more than 140,000 airmen whose certificates had been temporarily suspended after Pearl Harbor; of reporting the location of their 25,000 aircraft; and of designating from the Nation's 2,600 landing areas those which complied with new wartime regulations on guards, clearance officers, etc.

Legal, information, personnel, and other administrative service units of the organization discharged effectively the additional responsibilities growing out of wartime operations.

FEDERAL AIRWAYS SERVICE

Although material and equipment priorities have had the effect of delaying the establishment of improved types of air navigation facilities, such as ultra-high-frequency radio ranges and instrument-landing systems, the work of developing further improvements in airways aids has continued, notable achievements in this line being the development of the ultra-high-frequency ranges to provide two-course visual as well as aural ranges. Furthermore, as a contribution to economy in the use of critical materials, specifications for airways equipment have been modified so as to substitute steel and plastics for the more critical aluminum, copper, and bronze.

The total lighted-airways mileage in continental United States at the close of 1942 was 32,734 miles, and on June 30, 1942, air-navigation facilities in operation were as follows:

	Fiscal year—	
	1942	1941
Airway beacon lights	[1] 2,240	2,276
Lighted intermediate landing fields	311	309
Full-power radio-range communication and broadcast station	129	114
Medium-power radio-range communication and broadcast station	[2] 133	139
Low-power radio-range communication and broadcast station	43	39
Nondirectional radio marker beacons	34	38
Ultra-high-frequency fan markers	167	118
Teletype, schedules A, C, primarily for weather reporting (miles)	54,000	29,422
Teletype, schedule B, primarily for air-traffic control (miles)	[3] 8,843	13,292
Interphone (miles)	30,012	

[1] The number of old sites canceled was greater than new sites added.
[2] Some ranges had power increased and were moved into full-power class.
[3] Traffic-control teletype (schedule B) is being replaced by interphone circuits.

Expansion and Development of Airways and Airway Aids

The program of extending the Federal Airways System in the United States was carried forward on a somewhat reduced scale. The following airways which were substantially completed at the close of the fiscal year 1941 were completed and put into operation during the fiscal year just closed:

	Miles
Cheyenne–Huron	492
Dayton–Toledo	126
Pueblo–Wichita	430
Los Angeles–San Francisco (coastal)	364

In addition, the following airways were undertaken and completed during the fiscal year 1942:

	Miles
Kansas City–Minneapolis	174
Bismarck–Minot	107
Grand Rapids–Traverse City	128

Thus the mileage of the Federal Airways System was increased during the year by 1,821 miles of airways equipped with radio ranges, lighted fields, and communications facilities. While the programs for conversion of the intermediate frequency range system to ultra-high-frequency-type radio ranges and for the installation of instrument-landing systems at airports have been considerably delayed

due to the effect of the priority ratings on essential materials, further tests have been conducted over the Chicago-New York airway, on which 8 ultra-high-frequency ranges have been placed in operation, with the result that there was worked out during the year a more well-developed long-range plan for conversion of the radio ranges to the ultra-high-frequency type. Also it was found possible by the use of available equipment to proceed with the installation of instrument-landing systems at Atlanta, Ga., Washington, D. C., LaGuardia Field, N. Y., and Cleveland, Ohio. The work at the former two points is substantially complete, while at the latter two airports tests had been completed and preliminary installations were under way at the close of the year. Furthermore, essential steps were taken looking to the installation of instrument-landing systems at 63 airports to serve military requirements, this work having been instituted by the Civil Aeronautics Administration at the specific request of the War Department.

During the fiscal year 1942 work was completed on the high-powered intercontinental radio communication stations at New York, N. Y., San Francisco, Calif., Everett, Wash., Anchorage, Alaska, and Honolulu, T. H. These stations are now fulfilling urgent military needs for dependable long-range high-speed communication circuits. These facilities are all being operated and maintained by the Civil Aeronautics Administration under the supervision of the War Department. Construction of a facility of similar type at New Orleans was substantially completed at the close of the fiscal year, while surveys and field investigations had been made for another of this type to be established in the Canal Zone under special arrangements with the War Department and the Navy Department.

During the year funds were obtained from Congress for the purchase of low-frequency radio equipment for installation at the radio communication stations in Alaska for the purpose of remedying faults in the existing high-frequency services resulting from adverse meteorological conditions encountered in that area. The necessary equipment was purchased, and the installation was well under way at the close of the year. Further improvements were effected at the Alaska stations during the year in order to speed up the communication service.

Communications

During the last half of the year, the communication systems underwent a rearrangement and expansion in order to provide a more adequate means for rapid dissemination of aircraft movement and control messages as shown in the table on page 56. The system for disseminating Notices to Airmen and hourly meteorological information was also rearranged in the latter part of June 1942. An additional system, containing a total of 24,300 miles of teletype circuits, was established during the latter part of September 1941. The primary purpose of this system is the rapid dissemination of synoptic meteorological reports for map making and forecasting.

Toward the close of the fiscal year, it became necessary to initiate a training program to fill the complements of the communications stations. Initial funds therefor were obtained in the Sixth Supplemental Defense Appropriation Act, 1942. Training centers will be established in each of the eight regional headquarters. Several of

these centers were in operation before the close of the year and the others will be started shortly thereafter. It is expected that trainees will be qualified to assume regular duty as aircraft communicators within from 4 to 6 months after entering the training classes.

Air Traffic Control

Airway traffic control.—At the request of the Secretary of War, 9 new airway traffic control centers were established during the fiscal year 1942, bringing the total centers to 23.

The service handled 6,223,608 aircraft operations during the fiscal year 1942—an increase of nearly 425 percent over the preceding year. The addition of the 9 new centers brings the total number of miles of controlled airways, as of June 30, 1942, to 32,259 miles, covering the entire civil airway system of the United States, with the exception of 475 miles.

The establishment of the additional centers involved the complete redesignation of the civil airways, airway traffic control areas, control zones of intersections, and radio fixes. The airway traffic control centers supplied valuable information on the identification of aircraft to 12 Army information centers at various locations in the United States and supplied 88 airway traffic control personnel for liaison duties in connection therewith.

Airport traffic control.—At the request of the Secretary of War, the Civil Aeronautics Administration assumed the operation of 59 airport traffic-control towers and is in the process of commissioning 8 more.

Training.—Seven training classes were established during the year—one in each of the seven regions of the Civil Aeronautics Administration—to provide preliminary training of controller personnel prior to assignment to airway traffic control centers and airport traffic control towers.

The Army and Navy have at various times during the year requested that the Civil Aeronautics Administration provide training for certain of their personnel. In answer to these requests, training was given to all personnel sent to the training classes. A special short, intensive course is being prepared for the purpose of satisfying future demands of the service branches.

Technical Development

In cooperation with the Coast and Geodetic Survey, the production; editing, and flight checking of the new types of airways navigation charts, instrument-approach charts, and instrument-landing charts reported a year ago, progressed satisfactorily. This work has been expanded far in excess of its original limits in order to meet the needs of the Army and Navy.

Although emphasis has been given to cooperation with the armed services in the development of wartime airport and seadrome lighting, civil requirements have not been neglected. At the Administration's experimental station at Indianapolis, construction was started on a permanent experimental approach-light lane where different types of approach-light systems can be subjected to comparative tests. A similar installation was started at the same place for comparative testing of airport boundary lights. The development of seadrome lights and day markers was materially advanced.

Further progress was made toward the solution of the many problems connected with soil stabilization and with equipment to effect soil stabilization.

The program to develop instrumentation for the study of aircraft vibration and flutter has progressed satisfactorily. The first apparatus developed under this program was turned over to the Administration's Aircraft Engineering Division and is now being used in connection with airworthiness tests of both civil and military aircraft. More complete and flexible apparatus is now being developed.

Powerplant fire tests have continued throughout the year. These have included tests on the newer, more closely cowled air-carrier aircraft type installations and tests on private-owner aircraft type installations. Results of the earlier tests of this series are now being incorporated in the design of present large aircraft.

The development of photographic instrument-recording apparatus and photographic flight-recording apparatus has continued.

A satisfactory stall-warning indicator for small private-owner type of aircraft has been developed and an automatic-recording accelerometer for determining landing shocks has been completed and is now ready for tests. A fabric-testing device has been developed and is now undergoing tests. The development of an aircraft-control-characteristics recorder was started.

As a result of several accidents and near accidents to airline aircraft, a test program was started to develop means to prevent damage to windshields by birds in flight.

Further work was conducted with a view to obtaining more satisfactory aircraft lighting.

In the field of radio aids to air navigation, emphasis was placed on the development of a two-course visual ultra-high-frequency radio range with aural sector and station identification and having simultaneous voice. The work accomplished has enabled decisions to be made relative to equipping the airways of the country with this type of facility.

With respect to the present low-frequency radio ranges, an automatic monitor system was developed and is now undergoing tests. A similar monitor for fan markers was developed and also is undergoing tests.

Three frequency-modulated airport-traffic-control transmitters have been installed at LaGuardia, Newark, and Philadelphia airports and are ready for comparative tests with the ultra-high-frequency amplitude-modulated transmitters installed and tested a year ago.

The development of a radio obstruction marker has progressed and shows promise of resulting in a practical radio aid to air navigation. An improved fan marker is nearing completion and preliminary tests show it to have merit.

Considerable progress was made in the development of ground-direction-finder equipment. The development of ultra-high-frequency aircraft-direction-finder equipment was started.

Further improvements in instrument-landing equipment were made and progress in the development of microwave instrument-landing equipment was satisfactory.

A great deal of work in the field of radio aids to navigation has been done in cooperation with the Army Air Force and the Army Signal Corps. Personnel of the Army Signal Corps are installed in the

Administration's experimental station and several cooperative experiments and tests are under way.

SAFETY REGULATION

Air Carrier Division

During the year, the Air Carrier Division planned, directed, and carried out enforcement of safety regulations of scheduled air carriers; inspected air-carrier aircraft and components for acquisition by the military services and Lend-Lease Administration; assisted in the training of pilots on multiengine equipment and in instrument flight for the Army Air Force; inspected electrical and radio installations of military aircraft, particularly of the transport category; furnished technical assistance to the Military Director of Civil Aviation; furnished technical personnel to Army Air Force, Engineering Division, Wright Field, Ohio; represented the Civil Aeronautics Administration on committees for the allocation of new aircraft and aircraft engines to the air-carrier operators, and the standardization of new aircraft in order to make standard types available in event of diversion to military services; participated in establishment of special operating procedures for use in military-control areas; collected, consolidated, and made available to military and military contract services detailed information regarding navigational, maintenance, communication, and weather-reporting facilities available for use by such services outside the continental United States; and assisted and advised military services in the utilization of air-carrier facilities and personnel.

On July 1, 1941, the former Air Carrier Inspection Section was reorganized as the Air Carrier Division, composed of Air Carrier Operations, Air Carrier Maintenance, and Radio and Electrical Sections.

In October, a chief, Air Carrier Branch, was appointed in each of the seven regions within the continental limits of the United States, and was made responsible for regulation of all air-carrier activities conducted within his region and for the direction and coordination of the activities of the Air Carrier Division personnel assigned thereto.

At the same time, Air Carrier Division district offices, under the supervision of a senior air carrier inspector, were established at 16 points within the United States. These offices were so distributed that either a regional or district office is now located at, or reasonably near, the operating headquarters of all air carriers. Air Carrier district offices also were established in Alaska and the Territory of Hawaii, and an Air Carrier Division suboffice in the Panama Canal Zone.

This reorganization, which was accomplished without any material increase in personnel, enabled the Air Carrier Division to decentralize its work to an extent never before possible. As an example, authority for issuance and amendment of all air-carrier operations specifications was, early in 1942, delegated to the various Air Carrier Branch chiefs.

From time to time during the year, numbers of air-carrier aircraft were transferred from scheduled operations to the military forces. Although this situation resulted in a considerable decrease in the number of aircraft engaged in scheduled air-carrier operations, the

work load on the Air Carrier Division remained fairly level or in some instances even increased due to the number of special assignments undertaken in connection with the war effort.

Aircraft Engineering

Federal law requires that all commercial aircraft, engines, propellers, and appliances bear an airworthiness certificate issued by the Administration. In the past year, however, the experienced aeronautical engineering staff of the CAA has been devoting an increasingly large share of its efforts to the handling of military projects. Engineering representatives have been stationed at the materiél center and other points to coordinate handling of such projects. While retaining its close supervision over necessary civil activity and the safety thereof, a large number of projects of the following general type have been handled for the Army and Navy at their request:

1. Examination of engineering data covering complete aircraft procured by the services.
2. Approval of the structural integrity and detail design of aircraft.
3. Furnishing of consulting assistance to manufacturers.
4. Vibration tests and flutter studies of combat aircraft.
5. Development of glider conversions for light airplanes.
6. Preparation of Army-Navy-Civil standards for aircraft. The necessary trend toward the use of wood in place of metal has been facilitated by the recently completed Wood Handbook prepared under the chairmanship of the Civil Aeronautics Administration.

A summary of Administration approvals of aircraft, engines, propellers, and appliances during the year follows. While issued on the basis of civil regulations, a large number of these approvals cover military projects.

	Aircraft	Engines	Propellers	Appliances	Special approvals	Total
New type approvals issued	11	2	11	8	8	40
New models added to old type approvals	30	30	30	38	7	135
Specifications prepared or revised	328	67	43	34	24	496
New production certificates issued	5	0	0	4		9
Aircraft repairs and alterations						2,605

Flight Engineering and Factory Inspection

The activities of the Flight Engineering and Factory Inspection Division for the past fiscal year, in addition to the regular functions as prescribed by Federal law, have also been altered to a considerable degree in order that the experience gained from handling the flight test and factory inspection work of all commercial aircraft might be utilized by the Army Air Forces and the Bureau of Aeronautics in their enormously expanding aircraft procurement program.

During the latter part of 1941, the military services began ordering large numbers of training and transport-type aircraft on the basis of compliance with Civil Aeronautics Administration standards and procedures, and contracts often required that a CAA type certificate be obtained by the manufacturer before delivery was accepted. Concurrently, our inspectors were requested by both the Army and Navy to carry out the inspection and flight testing of large quantities

of these aircraft built after CAA approval of the prototype. During the year, inspectors of this division have handled approximately 80 such projects, and are assigned at the present time in 19 aircraft factories producing military airplanes. Furthermore, additional official requests have been received from the military services for the handling of all factory inspection and acceptance flight testing of aircraft currently being ordered from 19 additional aircraft plants. Two inspectors and one engineer from this division were assigned to the U. S. Army Air Corps, Matériel Center, at Wright Field, and have been on continuous duty assisting in coordinating the new Army procurement program.

Several hundred flight tests have been conducted by flight engineering inspectors on all types of commercial aircraft, ranging from the largest 4-engine flying boats to the smallest training glider, a considerable amount of which work has been on aircraft for use in the Civilian Pilot Training Program, Civil Air Patrol, and other Government agencies indirectly contributing to the war effort.

Factory inspectors have inspected and certificated a total of 6,239 airplanes during this period, with an additional 698 being inspected and certificated for export. A total of 19,240 conformity inspections have been conducted by our inspectors on all types of aircraft being built under their jurisdiction.

Special military projects handled included:

(*a*) Measurement of landing and take-off performance of various military aircraft, using special photographic equipment developed by this Division. At the request of the services two fields have been equipped for this type of investigation and more installations are in prospect;

(*b*) Preparation of pilots' handbooks for various service type airplanes; and

(*c*) Performance estimates for various commercial airplanes sought by the services.

Special civil projects included:

(*a*) Preparation of a manual of the photographic investigation of take-off and landing performance;

(*b*) A study of a satisfactory method of relating take-off and landing performance to airport dimensions from the standpoint of operational safety, and the preparation of a report thereon;

(*c*) Investigation and preparation of a report relative to the possibility of a serious loss of propeller thrust having been the possible cause of a serious air-carrier accident during the year;

(*d*) Investigation of the stalling characteristics of the Douglas DC–3 airplane, at the suggestion of the Select Committee to Investigate Air Accidents;

(*e*) Revision of spin requirements for primary training airplanes in conjunction with the Army and Navy, under the auspices of the ANC Committee on Aircraft Design Criteria; and

(*f*) Revision of chapter X of the Inspection Handbook for use of flight engineering inspectors in conducting tests for type certification.

Aviation Medicine

The work of the Aviation Medical Division for this period is summarized as follows: Physical examinations, regular, 113,435; Civilian Pilot Training, 44,860; grand total, 158,295.

Activities other than pilot physical examinations include:

The authorization of Civil Aeronautics Administration medical examiners to act as Army civilian physicians by the respective corps area commanders for the purpose of administering physical examinations to applicants for Air Corps Enlisted Reserve;

The writing of a separate medical part for Civil Air Regulations, Part 29, "Physical Standards for Airmen," which has been adopted by the Civil Aeronautics Board;

Setting up a method of medical classification that permits the holder of one type of airman certificate to obtain another that requires like or less stringent physical standards, without the necessity of a physical examination;

Institution of a uniform physical examination for all airmen, administered semiannually to airline transport pilots and annually to all others, which eliminates the multiple time periods heretofore associated with each type of airman certificate;

Institution of a form of medical certification independent of the airman certificate, which allows for either permanent or periodic airman certification and eliminates, to a large extent, the confusion and subsequent correspondence necessary under the old method of certification; and

A new "Handbook for Medical Examiners" which incorporates the procedures relative to all of the foregoing.

A codification of the medical records has been made preparatory to a punch-card analysis. Such analysis will include studies to show the relationship between physical defects and aircraft accidents; estimates of the type of performance of the individual medical examiner; the geographical distribution of physical defects; and any others which would improve pilot selection methods.

Pilots in training for the Army Ferry Command, at the Standardization Center, Houston, Tex., received demonstrations on numerous cross-country flights in the CAA Douglas "flying laboratory," of the effects of anoxemia and the proper use of oxygen equipment under actual flight conditions. The trainees were observed closely and their reactions recorded. The intensity of the training required long hours of flying almost daily by students and instructor. Evidence of mental and physical break-down was sought throughout the course. Any and all complaints regarding fatigue were carefully investigated. A special check of visual acuity and ocular muscle function was made on some of the students before making flight and upon return.

During the fiscal year, medical examiners were designated in all of the Latin American countries after personal interview by the Assistant Chief of the Division. By virtue of these designations it was possible to examine approximately 500 applicants for enrollment in the Inter-American Aviation Scholarship to be trained in this country. It is now possible for our pilots to obtain the necessary physical examination in at least one place in each of the countries south of the Rio Grande.

Inspection of Airmen and Nonscheduled Aircraft

The functions of the General Inspection Division are to develop, recommend for promulgation or revision, and interpret standards for the rating of nonscheduled aircraft as to their continued airworthiness, and of airmen and air agencies as to competence; to assist the industry

in the promotion of aeronautical activities; to investigate accidents and make reports as to the cause and recommendations for prevention of their recurrence; the enforcement of Civil Air Regulations; the investigation of air navigational hazards; the certification of aids to air navigation; to participate in public hearings relative to accidents; and, with the advent of war, the investigation of citizenship and loyalty of all certificated airmen. This latter function required the reinstatement of all airmen certificates, the designation of all landing areas from which civil aircraft were to be allowed to operate, the investigation of all management personnel for citizenship and loyalty, and the location of all civil aircraft in the United States.

The field force of the General Inspection Division did the majority of the physical work incident to the functions mentioned above. This work included the examination and testing of aircraft, aircraft engines, propellers, and their appliances for continued airworthiness; testing of all types of airmen, which includes pilots of all grades, mechanics, parachute riggers, flight and ground instructors, air-traffic control-tower operators, and aircraft dispatchers; air agencies, which includes flight and ground schools, mechanic schools, and aircraft repair stations; the supervision and conduct of air meets and other aeronautical demonstrations; the actual investigation and inspection of accidents; and the investigation of complaints and violations of the Civil Air Regulations.

Work Performed

During the past year, 163,213 examinations were given for original airman certificates (this includes all grades of pilot, mechanic, parachute rigger, ground instructor, flight instructor, dispatcher, control-tower-operator certificates, etc.); 43,221 examinations for the renewal of such certificates (the periodic renewal of airman certificates was discontinued in January of this year); reinstatement of airman certificates, investigation of citizenship and loyalty, and issuance of identification cards, 140,157; aircraft inspected for original airworthiness certificate, 23,361; aircraft inspected for renewal of aircraft certificates, 15,257 (periodic inspection of aircraft for renewal was discontinued in February 1942); flying and ground schools inspected for air-agency certificates, 2,434; aircraft, and aircraft-engine repair stations inspected for air-agency certificates, 138; accidents investigated, 4,658; violations investigated and reported, 1,651; complaints investigated, 3,042; air meets supervised, 917; investigations of potential air hazards, 3,593; aids to air navigation investigated and certificated, 1,718; airport designations issued, 1,175; and aircraft located and base of operations verified, 24,858.

Standardization Center

The Standardization Center at Houston, Tex., established in January 1941, completed its first full fiscal year of activity. The original program of standardizing and refreshing CAA personnel was expanded with the outbreak of war to include training of multiengine pilots for ferrying duty with the Army Air Forces. This project was completed to the satisfaction of the Army, and other courses have been initiated for training flight officers, and Link Trainer instructors.

WASHINGTON NATIONAL AIRPORT

The fiscal year 1942 was the first full year of operation for the Washington National Airport, which was opened for use on June 16, 1941.

During this year construction work went forward. Five additional hangars were constructed and are now being occupied; runways and taxistrips were completed and lighted, and the landscaping program and the roads and parking areas were completed.

The Washington National Airport became, during the year, the second largest airport in the country, from the point of scheduled air-carrier operations. Also, the Washington National Airport provided facilities for the operation of certain essential Army and Navy services, and it is expected that additional use will be made of the airport by the military services.

A portion of the blind-landing system was completed during the year and construction of the approach lights for this system was begun.

Revenues accruing to the Government for the fiscal year 1942 were ahead of estimates; the airport will return to the Government approximately $100,000 in excess of operating costs.

It is estimated that over 4,000,000 people visited the airport during the year, and of these approximately 600,000 paid admission fees to the observation terrace.

During the year, there were 79,164 aircraft arrivals and departures from this airport, and 636,729 airline passengers enplaned and deplaned.

AERONAUTICAL LEGAL ACTIVITIES

Prior to the declaration of war the Aeronautical Legal Office continued progress in the simplification of enforcement procedures, revision of the Civil Air Regulations, and other normal activities begun in 1941. This work was discontinued after December 7, 1941, because of the immediate necessity of work in connection with the war effort. The following is a resume of the work performed in the three general categories of legal services rendered by the Aeronautical Legal Office:

Civil Air Regulations

In general work relating to the Civil Air Regulations, 2,466 individual interpretations of the Civil Air Regulations were rendered, 587 separate items were reviewed, and 95 opinions were issued. In comparison with the report for the fiscal year 1941, this represents an increase of over 100 percent. This office likewise prepared seven new parts of the "Regulations of the Administrator of Civil Aeronautics" and nine Administrative Orders which were issued by the Administrator.

Immediately following the declaration of war it was necessary to impose certain additional requirements on civil aviation in the interests of internal security. In connection with this activity this office prepared 45 emergency war regulations which consisted of 27 separate amendments to the Civil Air Regulations, 14 special regulations, and 4 actions by the Administrator in connection with the designation of civil airways.

Enforcement

During the fiscal year 1942, the Aeronautical Legal Office received a total of 1,651 cases requiring enforcement action. This constitutes an increase of approximately 40 percent over the number of cases received during the fiscal year 1941. Of these cases, proceedings to suspend or revoke the certificate of the airman involved were instituted in 276 instances; civil penalties were imposed in 474 instances; reprimands were issued in 409 cases; and 206 cases were filed for record, either because the pilot involved was deceased or because there was neither the evidence nor the jurisdiction necessary to support remedial action.

In connection with the proceedings to suspend or revoke certificates, the members of the staff of the Aeronautical Legal Office were required to appear on behalf of the Administrator in 48 separate hearings, all of which were held outside of Washington. This is an increase of approximately 60 percent over the fiscal year 1941. This includes some cases in which action to ground an airman was taken because of reported subversive activities.

In the imposition of civil penalties, the Administrator collected $16,425, as compared to $10,725 collected during the fiscal year 1941. Of the total number of civil penalties imposed, 353 were compromised and 30 were referred to the Attorney General for collection by June 30, 1942.

GENERAL LEGAL SERVICES

In carrying forward the Development of Landing Areas Program, a form contract with each of the public agencies sponsoring airports was prepared and used during the fiscal year as the basis for construction of over 300 airports. In four instances it was also necessary to provide a War Risk Insurance contract for contractors engaged in work on airports outside of the United States.

The form contracts used by both flight and ground contractors in the Civilian Pilot Training Program were revised extensively from time to time during the fiscal year 1942 and several new contract forms were prepared under which new types of training required by the war effort were undertaken. All of these contracts now contain provisions calculated to prevent any possibility of sabotage or other subversive activity and have been drawn to provide the greatest possible flexibility.

During the year the operation of the Washington National Airport required the negotiation and preparation of 16 additional contracts. In connection with these and other contracts of the Civil Aeronautics Administration, the Aeronautical Legal Office rendered 192 interpretations. In addition, 263 opinions on general legal questions were rendered and 269 items were reviewed for legality.

In interpreting the emergency war regulations already noted, the Aeronautical Legal Office directed the investigation of 103 cases of alleged subversive activities by airmen active in civil aviation. In many instances these investigations resulted in the permanent grounding of the individual involved.

CIVILIAN PILOT TRAINING PROGRAM

The fiscal year 1942 witnessed a complete subordination of the resources of Civilian Pilot Training to the needs of national defense and, after December, to the war effort. From the fall session of 1941 the enrollment of men was made contingent upon a pledge to place their training at the disposal of the armed air forces upon call. This call was made upon the trainees of the following spring session, and 84 percent had fulfilled this pledge at the end of the year with the enlistment procedure still in progress.

In response to the increasing demands from air-transport agencies and the armed forces for flyers with advanced training and with qualifications as instructors, more resources have been devoted to the advanced training and the production of instructors, with a corresponding decrease in those devoted to elementary training.

Facilities and Equipment

The average numbers of institutions, units of equipment, and specialists engaged in the training activities of Civilian Pilot Training during the year are as follows:

Educational institutions	600
Individual flight schools	550
Airports and seaplane bases	700
Rated flight instructors	2,500
Rated ground instructors	1,000
Rated mechanics	1,300
Aircraft	3,800

Warranting special comment is the fact that in keeping with the design of the administration of the program the personnel of the flight instruction force has been in a state of constant movement, employment in Civilian Pilot Training serving as a seasoning period for instructors who have been engaged by the Army and Naval Air Forces and replaced by graduates of the CPT instructor courses. Approximately 45 percent of the instructors in the Army Civilian Primary Schools were drawn from the CPT instruction force. At the close of the year one-fourth of CPT instructors were products of the CPT instructor schools, with this fraction rapidly growing with the increase of the output of these schools.

Safety Record

The safety record, which was set during the preceding years of operation and which exceeded expectations, was maintained in 1942 notwithstanding the revisions in training and the extensive introduction of instruction utilizing faster and heavier ships. Approximately 1,500,000 hours were flown corresponding to approximately 130,000,000 miles. Sixteen trainees and five instructors received injuries requiring medical treatment. Thirteen trainees and six instructors were fatally injured, accounting for 6,800,000 miles flown per fatality, as compared with the records for the period since the beginning of the program of 6,180,000 miles per fatality.

Courses	Trained previously to June 30, 1941	Extent of training—fiscal year 1942		
		Enrolled	Completed	In-training
Elementary	57,760	28,576	17,181	5,150
Secondary	8,075	10,362	6,874	1,773
Refresher	[1] 9,076			
Instructor	[2] 1,593	7,404	3,108	3,532
Cross country		4,787	2,839	1,613
Instrument flying		196	121	56
Flight officer		182	62	80
Total	76,504	51,507	30,185	12,204

[1] Commercial pilot and instructor refresher course.
[2] Apprentice instructor course of 1940.

Inter-American Training

The Civil Aeronautics Administration, with cosponsorship by the State Department, Coordinator of Inter-American Affairs, Defense Supplies Corporation, War and Navy Departments, and Civil Aeronautics Board, undertook an inter-American aviation training program. A total of 484 students from the 20 American Republics began training in this country during January—78 at Army Air Forces schools, and the balance at schools under CAA supervision. Of the CAA trainees, 182 started courses leading to a commercial pilot certificate with instructor's rating; 121 entered the airplane service mechanic course; 87 the instructor mechanic course, and 16 the administrative aeronautical engineer course. Most of the students were still in training at the end of the fiscal year.

RESEARCH ON SELECTION AND TRAINING OF PILOTS

Under a grant from the Civil Aeronautics Administration a program of research on methods of selecting and training pilots has been carried out by representatives of the National Research Council in more than 20 universities. Such substantial results have been achieved that one of the military services is utilizing for its screening tests in pilot selection methods developed by the Council. One of the services is also utilizing throughout its entire training program instruction devices worked out by the Council. The Civil Aeronautics Administration is now using these same screening tests for the selection of aircraft pilots who are being trained for Army service in its Civilian Pilot Training.

Methods which yield full records of conversations in actual flight during periods of instruction are now available and are being used to improve instruction.

A series of validated and objective observations which may be used to estimate progress of a student pilot have been welded into a flight inventory. In addition to this inventory, rating scales have been built which provide the optimal values of this type of evaluation. Both the inventory and the rating scales are now included in experiments which will develop their best practical uses in the Civilian Pilot Training Program.

Psychological and physiological tests which might be expected to yield prediction of success in flight training have been evaluated.

This evaluation shows that certain tests, some of which have had extensive use, are valueless and that three particular tests—"Two-Hand Coordination," "Mashburn Serial Reaction," and "Otis Intelligence,"—used together on candidates for advanced training will eliminate a large proportion of those who would ultimately fail.

Analyses of extensive personality and biographical materials have sifted these to an approved set which show correlation with success in training. These analyses are continuing since the elements must show relations with flying success under various circumstances, before we can be certain of their association apart from other factors. It has been shown that none of the standard personality tests used in toto is of value.

Research in the field of physical fitness has shown that tests now used to estimate cardiovascular efficiency should be discarded. This includes the Schneider test which enjoys wide use in medical examination of pilots. A better test of this important element has been constructed and is now being perfected. The new test will distinguish between cardiovascular changes after exercise and cardiovascular changes which occur with postural change.

The medical tests now being used in connection with certification of pilots have been shown to lack objectivity. A great deal of inconsistency in doctors' findings has been found. For this reason more pertinent tests in the field of hearing, vision, and heart, are being constructed.

The theory, that physical defects (registered by doctors but not held to be sufficient for grounding the pilot) indicate a higher probability of accident, has not been found to be verifiable.

Elements of the mental hygiene of the air are being explored in the hope that we may make early diagnosis and correction of emotional disturbance and physiological imbalance.

Elements of vision, with special emphasis on peripheral space perception, are being examined.

Tests have been constructed to measure the oft-repeated psychological quality described as "ability to take it." Application of these measurements to experimental situations in Navy training are being tried out.

The psychological and physiological causes for air sickness are being investigated.

AIRPORTS

Major development in the airport picture in 1942 was the continuation by Congress of the Airport Development Program for which $40,000,000 was appropriated in 1941. During the year $159,593,050 additional was appropriated for this work and the number of locations at which development could be undertaken was increased from 250 to 504.

To expedite construction, cooperative agreements have been worked out with the War and Navy Departments and the Work Projects Administration, whereby the construction details for many projects were undertaken by these agencies.

Certificates of Air Navigation Facility Necessity

During the year the services of the field and departmental airport engineers continued to be available to individuals, cities, and other

governmental agencies in planning the selection of airport sites, designing the airport layout, including runways, lighting systems, buildings, and the general preparation of projects for airport improvement.

Detailed investigations were made on all projects involving the expenditure of Federal funds on civil airports, and certificates of air navigation facility necessity were prepared for the action of the Administrator and the Board under section 303 of the Civil Aeronautics Act of 1938. During the year, 380 of these certificates involving $67,669,975 of Federal funds and $12,227,685 of sponsors' funds were issued.

Other Activities

The military services were supplied with current information on the facilities available at the civil airports throughout the United States.

The standard specifications for airport paving and lighting, previously prepared and distributed, were revised in order to conserve critical materials.

Efforts were continued to foster and encourage the enactment of State and local airport legislation in the interests of civil aeronautics and national defense. Particular attention was given to the State enabling legislation necessary to permit municipalities and counties to establish airports and to prevent, by the zoning method, the establishment of hazards within the aerial approaches of airports. These efforts met with considerable success, the results including the enactment of six State airport zoning acts essentially similar to a model act prepared by the Civil Aeronautics Administration last year.

STATISTICAL MATERIAL

The following statistical material indicates the status of various activities of the Civil Aeronautics Administration:

Status of Federal Airways System as of June 30: 1936 through 1941

	1937	1938	1939	1940	1941	1942
Total mileage Federal Airways System	22,399	22,994	24,249	28,745	30,913	32,734
Lighted routes operating (miles)	21,782	22,834	24,249	28,745	30,913	30,476
Lighted routes not operating (miles)	441					
Day routes (miles)	176	160				
Total airways personnel	1,846	2,151	2,552	3,228	3,525	5,053
Personnel per thousand airway-miles	82	94	105	112	114	154
Total expenditures [1]	$5,708,459	$8,851,997	$11,500,654	$14,623,068	[2] $16,469,110	27,225,278
Expenditures per airway-mile	$255	$385	$474	$509	$533	$832
Fields and lighting						
Total intermediate fields	280	270	273	296	310	311
Lighted fields	275	268	265	279	280	274
Supplied with commercial current	205	207	214	233	235	232
With local electric generators	66	60	50	45	44	41
Lighted with acetylene gas	4	1	1	1	1	1
Airports—lighting maintained by CAA			7	16	29	15
Day fields	5	2	1	1	1	1
Seaplane landing areas					1	1
Approach light lanes				14	[3] 14	18

See footnotes at end of table.

Status of Federal Airways System as of June 30: 1936 through 1941—Continued

	1937	1938	1939	1940	1941	1942
Fields and lighting—Continued						
Fields per thousand airway-miles	12.5	11.7	11.3	10.7	10.0	9.5
Total beacon lights (includes beacons at fields)	1,916	1,939	2,016	2,205	2,276	2,240
Rotating beacons	1,676	1,772	1,803	1,986	2,066	2,098
Supplied with commercial electric current	1,160	1,292	1,354	1,531	1,647	1,699
With local electric current	516	480	449	455	419	399
Flashing beacons	240	167	213	219	210	142
Supplied with commercial electric current	105	64	109	115	121	69
With wind electric generators	13	12	12	8	8	7
Acetylene gas	122	91	91	93	70	65
With local electric generators	----------	----------	1	3	11	1
Beacons per thousand airway-miles	86	84	83	79	74	68
Airways mechanicians	103	110	103	120	124	124
Beacons per mechanician	19	18	20	18	18	18
Caretakers	[4] 227	259	233	264	267	309
Cost—operation and maintenance—fields and lighting	$1,343,982	$1,684,795	$1,574,367	$1,773,144	$1,788,585	$1,708,261
Cost per airway-mile—fields and lighting	$60	$73	$65	$62	$58	$52
Radio and communications						
Combined broadcast and radio range stations (full power)	59	64	78	81	85	97
Broadcasting stations (full power)	14	13	1	1	1	----------
Radio range stations (full power)	33	33	15	24	[3] 28	32
Medium-powered radio range stations (with voice communication)	57	67	[5] 117	136	139	133
Low-powered radio range stations (with voice communication)	15	25	[6] 28	33	39	43
Low-powered nondirectional marker stations (with voice communication)	55	53	48	42	38	46
Ultra-high-frequency radio range stations	----------	----------	----------	[7] 2	8	8
Ultra-high-frequency fan markers	----------	----------	[8] 20	45	118	164
Trans-Pacific communication stations	----------	----------	----------	----------	----------	4
Trans-Atlantic communication stations	----------	----------	----------	1	1	1
Instrument landing systems at airports	----------	----------	----------	[7] 1	1	1
Point-to-point (radio-telegraph) stations	64	23	17	15	15	13
Cost of operation and maintenance—radio and communication (excluding teletype circuit rental)	$2,735,773	$3,414,710	$3,907,217	$5,319,430	$7,154,340	$10,598,868
Cost per mile of airway—radio and communications	$122	$148	$161	$185	$232	324
Teletype (telephone-typewriter) stations	219	298	232	368	414	446
Teletype circuit mileage—weather reporting	13,780	21,790	23,658	27,068	29,422	54,000
Teletype circuit mileage—traffic control	----------	3,783	10,676	11,880	13,292	8,843
Teletype circuit rentals	$394,862	$890,246	$1,000,099	$1,250,793	$1,379,038	$1,708,089
Radio and communication personnel	1,175	1,425	1,641	2,001	2,290	3,160
Gross cost per passenger-mile domestic scheduled airlines	$0.012	$0.017	$0.019	$0.016	$0.008	$0.018

[1] Includes establishment, operation, and maintenance.
[2] Includes national defense program and Navy Department funds transferred to the Administration.
[3] Includes facilities constructed with national defense and Navy Department funds.
[4] Decrease due to addition of automatic equipment.
[5] Includes 15 stations without voice.
[6] Includes 3 stations without voice.
[7] Experimental operation.
[8] In addition, there are 14 markers established by the State of Pennsylvania which were taken over and maintained by the Civil Aeronautics Administration in fiscal year 1940.

Status of airports and landing fields by States, June 30, 1942

State	Municipal	Commercial	Intermediate	Navy	Army	Miscellaneous Government	Private	Total	Lighted fields
Alabama	22	9	4		6			41	15
Arizona	22	25	10		1	1	2	61	16
Arkansas	13	15	3					31	7
California	78	88	17	4	7	7	2	203	49
Colorado	26	11	4		1		1	43	8
Connecticut	9	11	1					21	5
Delaware	3	8						11	1
Dist. of Col	1			1	1			3	3
Florida	82	20	7	6	4		1	120	26
Georgia	33	6	12		3			54	22
Idaho	24	6	6			7	1	44	12
Illinois	16	62	6		2			86	19
Indiana	14	37	6					57	15
Iowa	24	24	3				1	52	10
Kansas	28	15	4		2			49	10
Kentucky	8	8	3		1			20	4
Louisiana	20	10	4		2			36	13
Maine	14	1						15	5
Maryland	4	18			2		1	25	5
Massachusetts	14	30	1	1	1		1	48	5
Michigan	90	34	1	1	2	4	6	138	18
Minnesota	29	14	2				1	46	8
Mississippi	23	4	7		1			35	14
Missouri	13	26	11					50	19
Montana	39	2	15			13	1	70	22
Nebraska	31	11	5		2			49	12
Nevada	6	10	8			2		26	10
New Hampshire	9	6						15	3
New Jersey	9	35		2	1			47	6
New Mexico	24	16	13					53	19
New York	31	77	6		4	1	1	120	21
North Carolina	19	27	2	1	1			50	10
North Dakota	22	1	9					32	10
Ohio	30	69	10		2		3	114	23
Oklahoma	28	27	7		1			63	16
Oregon	20	6	6			1		33	13
Pennsylvania	36	82	5	1	1		1	126	26
Rhode Island	3	1		1			1	6	1
South Carolina	18	8	3	1	1		2	33	10
South Dakota	18	3	2					23	[1]4
Tennessee	11	5	8					24	14
Texas	89	81	31	1	10	2	4	218	52
Utah	16	4	10					30	14
Vermont	8	2			1			11	[1]1
Virginia	17	31	8	3	1			60	16
Washington	33	10	7	2	4	4		60	18
West Virginia	10	11	2		1			24	[1]3
Wisconsin	23	24	3			1		51	10
Wyoming	22		10			1	2	35	15
Total	[1]1,182	[1]1,031	282	25	66	44	32	2,662	658

[1] 51 municipal and commercial fields taken over for Army and Navy operations and training.

Certificated aircraft and pilots, by States, as of June 30: 1939 through 1942

State	Certificated aircraft			Certificated pilots		
	June 30, 1942	June 30, 1941	June 30, 1940	June 30, 1942	June 30, 1941	June 30, 1940
Alabama	175	152	110	1,036	935	349
Arizona	179	130	85	827	588	234
Arkansas	194	171	96	1,376	924	237
California	1,998	2,174	1,383	12,228	9,965	5,826
Colorado	226	220	145	1,608	1,260	530
Connecticut	209	244	159	959	721	465
Delaware	110	123	75	271	211	113
District of Columbia	309	258	166	841	667	374
Florida	586	499	333	2,726	1,859	989
Georgia	355	326	176	1,733	1,325	643
Idaho	127	103	72	803	727	248
Illinois	1,292	1,221	822	5,056	3,838	2,319
Indiana	614	622	448	2,189	1,971	1,168
Iowa	513	468	311	2,400	1,882	792
Kansas	508	469	232	2,580	2,019	663
Kentucky	181	157	95	744	508	273
Louisiana	269	252	158	1,550	1,239	492
Maine	179	174	122	553	451	223
Maryland	368	308	165	1,191	899	502
Massachusetts	507	503	347	2,656	1,955	1,264
Michigan	997	895	608	3,899	3,160	1,712
Minnesota	552	512	321	2,245	1,764	787
Mississippi	128	143	116	870	663	209
Missouri	576	602	431	3,317	2,680	1,140
Montana	158	155	92	875	719	241
Nebraska	239	192	144	1,426	1,111	402
Nevada	83	66	42	240	238	83
New Hampshire	81	80	51	408	344	161
New Jersey	606	625	402	2,610	1,962	1,236
New Mexico	152	120	71	617	529	140
New York	1,601	1,610	1,153	7,759	5,765	3,371
North Carolina	461	432	279	1,491	1,207	706
North Dakota	106	121	80	595	591	192
Ohio	1,124	1,174	736	4,375	3,577	1,905
Oklahoma	508	443	279	2,741	2,095	706
Oregon	292	268	169	1,636	1,293	611
Pennsylvania	1,784	2,163	972	5,506	4,109	2,389
Rhode Island	139	164	116	380	321	134
South Carolina	210	202	115	1,121	861	318
South Dakota	117	103	78	729	578	215
Tennessee	305	285	174	1,673	1,482	599
Texas	1,472	1,237	721	7,235	5,493	2,226
Utah	124	99	55	992	763	230
Vermont	63	69	42	310	287	109
Virginia	384	372	220	1,516	1,222	680
Washington	421	374	242	2,645	2,121	1,035
West Virginia	218	196	129	1,130	946	430
Wisconsin	449	427	311	1,750	1,322	614
Wyoming	95	80	52	434	358	133
Foreign and territorial [1]	243	242	177	1,024	772	588
Total	22,587	22,025	13,878	[2] 104,876	[3] 82,277	41,006

[1] Figures for these countries are for aircraft and pilots registered by the United States.
[2] Includes 3,698 women pilots divided as follows: 246 commercial and 3,452 private.
[3] Includes 2,733 women pilots divided as follows: 154 commercial, 17 limited commercial, and 2,562 private

Certificated pilots classified by grade

	Airline	Commercial	Limited commercial	Private	Solo	Total
July 1, 1942	1,646	17,279	(1)	85,951	(1)	104,876
July 1, 1941	1,510	12,583	[1] 421	67,763	(1)	82,277
July 1, 1940	1,242	7,326	876	22,153	9,409	41,006
July 1, 1939	1,161	6,679	930	11,647	5,727	26,144

[1] Civil Air Regulations, Part 20, "Pilot Certificates" (effective May 1, 1940, as amended), provided for the discontinuance of solo pilot certificates on May 1, 1941, and of limited-commercial pilot certificates on May 1, 1942, which accounts for the drop in number of these two classes of certificates.

Progress of Civil Aeronautics in the United States

[All statistics are as of Dec. 31 of each year]

	1937	1938	1939	1940	1941
Scheduled air-carrier operations					
Airplanes:					
In service and reserve:					
Domestic [1]	282	253	265	358	359
International and territorial [1]	104	92	74	82	95
Total	386	345	339	440	454
Average number of passenger seats per plane (domestic) [1]	12.53	13.63	14.63	16.52	17.41
Average speed (domestic)	153	153	153	155	159
Airways (domestic, international, and territorial): [1]					
Services in operation	108	139	170	211	189
Express mileage	63,656	70,652	79,562	94,079	
Domestic			35,213	41,054	47,703
Mail mileage	57,480	63,292	74,338	90,369	
Domestic			34,519	40,461	45,454
Passenger mileage	63,656	71,199	80,109	94,079	
Domestic			35,213	41,054	47,703
Total mileage:					
Domestic [1]	31,084	35,492	35,213	41,054	47,703
International and territorial [1]	32,572	35,707	43,528	53,025	
Total	63,656	71,199	78,741	94,079	47,703
Accidents:					
Domestic: [1]					
Number of accidents	42	33	33	42	33
Miles flown per accident	1,573,131	2,111,177	2,502,167	2,590,487	4,030,990
Fatal accidents	5	5	2	3	4
Miles flown per fatal accident	13,214,301	13,933,765	41,285,762	36,266,812	33,255,670
Fatal accidents per 1,000,000 miles flown	0.08	0.07	0.02	0.03	0.03
Pilot fatalities	4	3	1	3	3
Miles flown per pilot fatality	16,517,877	23,222,942	82,571,523	36,266,812	44,340,893
Copilot fatalities	5	4	1	3	3
Crew fatalities (other than pilot and copilot)	3	3	1	4	3
Passenger fatalities	40	25	9	35	35
Passenger miles flown per passenger fatality	11,915,079	22,308,771	83,309,677	32,784,141	42,620,991
Ground crew and third party fatalities	0	0	0	0	0
Passenger fatalities per 100,000,000 passenger miles flown	8.39	4.48	1.20	3.05	2.35
Total fatalities	52	35	12	45	44
Fatalities per 1,000,000 miles flown	0.79	0.50	0.15	0.41	0.33

See footnotes at end of table.

Progress of Civil Aeronautics in the United States—Continued

	1937	1938	1939	1940	1941
Scheduled air-carrier operations—Continued					
Accidents—Continued.					
International and territorial:					
Number of accidents	8	11	6	11	7
Miles flown per accident	1,078,591	775,310	1,400,757	974,257	2,169,838
Fatal accidents	1	3	1	0	1
Miles flown per fatal accident	8,628,730	2,842,804	8,404,540	----------	15,188,865
Pilot fatalities	1	3	1	0	0
Miles flown per pilot fatality	8,628,730	2,842,804	8,404,540	----------	----------
Copilot fatalities	1	3	1	0	0
Fatal accidents per 1,000,000 miles flown	0.12	0.35	0.12	----------	0.07
Crew fatalities (other than pilot and copilot)	1	13	2	0	0
Passenger fatalities	11	7	10	0	2
Passenger-miles flown per passenger fatality	5,295,953	8,587,236	8,503,115	----------	92,607,278
Passenger fatalities per 100,000,000 passenger-miles flown	18.88	11.65	11.76	----------	1.09
Total fatalities	14	26	14	0	2
Fatalities per 1,000,000 miles flown	1.62	3.05	1.66	----------	0.13
Domestic, international, and territorial:					
Number of accidents	50	44	39	53	40
Miles flown per accident	1,494,005	1,777,210	2,332,720	2,255,042	3,705,289
Fatal accidents	6	8	3	3	5
Miles flown per fatal accident	12,450,040	9,774,655	30,325,354	39,839,087	29,642,309
Fatal accidents per 1,000,000 miles flown	0.08	0.10	0.03	0.03	0.03
Pilot fatalities	5	6	2	3	3
Miles flown per pilot fatality	14,940,047	13,032,873	45,488,032	39,839,008	49,403,848
Copilot fatalities	6	7	2	3	3
Crew fatalities (other than pilot and copilot)	4	16	3	4	3
Passenger fatalities	51	32	19	35	37
Passenger-miles flown per passenger fatality	10,487,425	19,307,185	43,937,802	36,149,545	45,322,952
Passenger fatalities per 100,000,000 passenger-miles flown	9.54	5.18	2.28	2.77	2.21
Ground-crew and third-party fatalities	0	0	0	0	0
Total fatalities	66	61	26	45	46
Fatalities per 1,000,000 miles flown	0.88	0.78	0.29	0.38	0.31
Express and freight carried:					
Pounds (domestic) [1]	7,127,369	7,335,967	9,514,229	12,506,176	19,209,671
Pounds (international and territorial) [1]	[2] 1,114,008	[2] 1,269,980	[2] 1,397,956	[2] 1,682,002	3,105,416
Total	8,241,377	8,605,947	10,912,255	14,188,178	22,315,087
Ton-miles (domestic) [1]	2,156,070	2,173,706	2,705,614	3,469,485	5,242,529
Fuel (consumed) (domestic, international, and territorial): [1]					
Gasoline—gallons	41,424,384	45,310,192	55,937,135	74,534,929	92,926,178
Oil—do	844,570	829,870	921,186	1,287,807	1,616,691
Mail:					
Carried by contractors:					
Pounds [3] (domestic) [1]	----------	----------	----------	----------	----------
Pounds (international)	426,261	484,712	675,422	----------	----------
Total	----------	----------	----------	----------	----------
Ton-miles [3] (domestic) [1]	6,698,230	7,422,860	8,584,891	10,035,638	12,900,405

See footnotes at end of table.

Progress of Civil Aeronautics in the United States—Continued

	1937	1938	1939	1940	1941
Scheduled air-carrier operations—Continued					
Miles flown (revenue):					
Daily average (domestic, international, and territorial) [1]	204,658	214,239	249,249	326,550	406,059
Mail (domestic, international, and territorial) [1]	46,896,584	54,659,684	61,111,831	72,176,283	90,574,019
Domestic routes [1]	66,071,507	69,668,827	82,571,523	108,800,436	133,022,679
International routes [1]	[2] 8,628,730	[2] 8,528,412	[2] 8,404,540	[2] 10,716,827	15,188,865
Total	74,700,237	78,197,239	90,976,063	119,517,263	148,211,544
Operators (number of):					
Domestic [1]	17	18	17	16	17
International and territorial [1]	7	8	8	8	7
Total	[4] 21	[4] 23	[4] 22	[4] 22	[4] 21
Passenger-miles flown (1 passenger carried 1 mile):					
Domestic,[1] revenue	407,295,893	476,402,280	677,672,955	1,041,173,558	1,369,584,231
Domestic,[1] revenue and nonrevenue	476,603,165	557,719,268	749,787,096	1,147,444,948	1,491,734,671
International and territorial revenue	----------	----------	78,168,601	111,248,022	179,014,221
International and territorial,[1] revenue and nonrevenue	[2] 58,255,487	[2] 60,110,655	[2] 85,031,146	[2] 117,719,111	185,214,555
Total	534,858,652	617,829,923	834,818,242	1,265,164,059	1,676,949,226
Passengers carried:					
Domestic,[1] revenue	958,510	1,176,858	1,717,090	2,727,820	3,768,892
Domestic,[1] revenue and nonrevenue	1,102,707	1,343,427	1,876,051	2,959,480	4,060,545
International and territorial revenue	----------	----------	161,163	216,846	311,055
International and territorial,[1] revenue and nonrevenue	[2] 139,955	[2] 144,686	[2] 168,970	[2] 225,798	320,065
Total	1,242,662	1,488,113	2,045,021	3,185,278	4,380,610
Passenger seat-miles flown (domestic) [1]	828,188,184	949,421,755	1,207,869,577	1,797,329,431	2,316,205,507
Passenger load factor:					
Domestic,[1] revenue (percent)	49.18	50.18	56.10	57.93	59.13
Domestic,[1] revenue and nonrevenue (percent)	57.55	58.74	62.08	63.84	64.40
Passenger fare (average per mile) (domestic) [1]	$0.056	$0.057	$0.051	$0.0506	$0.0503
Personnel employed (domestic, international, and territorial): [1]					
Mechanics and ground crew	3,280	3,415	4,006	5,409	----------
Pilots	755	820	836	1,046	----------
Copilots	602	605	872	1,232	----------
Stewards and stewardesses	420	451	639	1,040	----------
Other hangar and field personnel	2,356	2,635	3,015	4,249	----------
Operation and office personnel	4,179	5,383	6,555	9,080	----------
Total	11,592	13,309	15,923	22,056	----------
Trips.					
Percentage completed of those started (domestic) [1]	95.41	95.37	95.30	96.02	95.69
Percentage started of those scheduled (domestic) [1]	93.82	94.88	97.16	94.85	95.35
Percentage completed of those scheduled (domestic) [1]	89.51	90.48	92.59	91.07	91.24
Passenger, average length (miles) (domestic) [1]	432	415	400	388	367
Private flying operations (all domestic)					
Airplanes in operation (certificated and uncertificated)	10,446	10,718	12,274	16,903	----------

See footnotes at end of table.

Progress of Civil Aeronautics in the United States—Continued

	1937	1938	1939	1940	1941
Private flying operations (all domestic)—Continued					
Accidents:					
Number of accidents	1,917	1,882	2,175	3,446	
Miles flown per accident	53,832	68,735	81,778	76,610	
Number of fatal accidents	185	172	194	208	
Miles flown per fatal accident	557,818	752,088	916,846	1,269,231	
Pilot fatalities	152	141	161	183	
Copilot or student fatalities	16	15	7	18	
Passenger fatalities	112	115	139	124	
Aircraft crew fatalities (other than pilot, copilot, or student)	2	1	4	3	
Ground crew and third-party fatalities	1	3	3	2	
Total fatalities	283	275	314	330	
Miles flown per pilot fatality	678,923	917,440	1,104,771	1,442,623	
Miles flown per passenger fatality	921,396	1,124,862	1,279,627	2,129,032	
Fuel (consumed):					
Gasoline—gallons	10,618,240	10,201,053	16,394,335	22,400,000	
Oil—do	310,851	287,875	460,189	660,000	
Miles flown	103,196,355	129,359,095	177,868,157	264,000,000	
Passengers carried:					
For hire	1,295,904	1,238,133	1,161,292	1,175,000	
Not for hire	284,508	337,018	432,794	425,000	
Total	1,580,412	1,575,151	1,594,086	1,600,000	
Airports and landing fields					
Airports:					
Commercial	414	433	456	496	930
Municipal	764	791	643	788	1,086
Intermediate—CAA—lighted	278	265	266	289	283
Intermediate—CAA—unlighted	5	2	0	0	0
Auxiliary—marked	602	628	665	507	(5)
Army, Navy, Marine Corps, National Guard, Reserve, Private, and miscellaneous airports	236	255	250	251	185
Total airports in operation	2,299	2,374	2,280	2,331	2,484
Lighted, total	720	719	735	776	662
Of entry, regular	21	37	39	37	36
Of entry, temporary	34	23	21	21	19
Federal airways system and aids to air navigation					
Communication:					
Radio broadcast stations	83	91	92	111	125
Radio range beacon stations	167	225	244	281	312
Radio marker beacons	55	48	48	42	48
Weather-reporting airway and airport stations:					
Weather Bureau and CAA operated, long-line, teletypewriter-equipped	271	314	298	376	453
Traffic-control stations, teletypewriter-equipped	----------	----------	114	129	139
Miles of weather-reporting teletypewriter service	20,588	23,771	26,803	28,052	55,268
Miles of traffic-control teletypewriter service	----------	----------	9,939	12,260	12,621
Weather Bureau—first-order stations (does not include airport stations)	198	182	185	146	139
Airway lighting:					
Beacons:					
Revolving	1,717	1,753	1,875	2,045	2,110
Flashing	252	214	214	216	164
Beacons—privately owned and certified	466	530	650	720	----------

See footnotes at end of table.

Progress of Civil Aeronautics in the United States—Continued

	1937	1938	1939	1940	1941
Federal airways system and aids to air navigation—Continued					
Airway lighting—Continued					
Intermediate landing fields, lighted	278	271	274	289	279
Mileage lighted	22,319	23,723	27,074	30,480	32,679
Miles under construction at close of year	945	1,849	2,192	496	780
Certificates					
Uncertificated aircraft (active):					
Airplanes	1,684	1,159	943	577	----------
Gliders	320	176	177	104	----------
Certificated (active):					
Airplanes	9,152	10,000	12,829	17,351	24,836
Gliders	41	45	44	39	65
Instructors, ground	55	92	446	1,948	4,815
Mechanics	9,314	9,884	10,296	11,177	14,047
Pilots, airplane	17,681	22,983	31,264	63,113	100,787
Pilots, glider	161	172	170	138	----------
Riggers, parachute	362	397	425	444	----------
Student pilot certificates (issued yearly):					
Airplane	21,770	15,556	29,839	110,938	93,366
Glider	125	98	263	419	549

[1] Domestic air carriers are American companies operating within the continental United States. International and territorial carriers are American companies operating in United States Territories and in other countries.

[2] Does not include the operations of the following affiliated companies of Pan American Airways System: Cia Mexicana de Aviacion S. A., Cia Nacional Cubana de Aviacion, and Panair do Brasil, which prior to the year 1936 were included with foreign and territorial statistics.

[3] The mail pound-miles flown by Inter-Island Airways, Ltd., are included with the domestic mail pound-miles as this company holds a domestic air-mail contract. All other operations statistics for this carrier are included with the figures for international and territorial operations.

[4] In several cases the same carrier operated both domestic and foreign services.

[5] Auxiliary are now classified as to ownership, commercial or municipal.

Appropriations for fiscal years 1941 and 1942

	1941	1942
General administration	$1,078,200	$990,000
Maintenance of air-navigation facilities	11,896,550	16,323,720
Technical development	557,000	520,000
Technical development 1942-43	----------	223,702
Enforcement of safety regulations	2,484,453	2,906,000
Establishment of air-navigation facilities	7,356,280	12,036,000
Establishment of air-navigation facilities 1942-43	----------	9,732,290
Civilian pilot training	36,814,504	25,000,000
Maintenance and operation, Washington National Airport	255,650	377,645
Development of landing areas	40,000,000	100,477,750
Development of landing areas 1942-43	----------	59,115,300
Construction of hangars	2,700,000	[1]
Emergency relief, Commerce, administrative expenses	175,000	[2]
Printing and binding, Commerce	72,900	[2]
Total	103,390,537	227,702,407

[1] 1941 funds carried over to 1942.

[2] Funds to be allotted from Department of Commerce.

Coast and Geodetic Survey

During the past year all facilities of the Coast and Geodetic Survey were employed in supplying products and services required for national defense and the prosecution of the war. The essential nature of the Bureau's part in the war effort is indicated by the following summary of activities, which include extensive projects for the armed forces under specific requests.

Nautical and aeronautical charts.—The issue of nautical charts during the year totaled 1,081,000 copies—over 3 times the number issued in any year prior to the inauguration of the defense program. About 60 percent of these was furnished to the Navy, while the greater part of the remainder was utilized by merchant-marine vessels engaged in war transportation. The distribution of some 3,000,000 aeronautical charts was nearly 8 times the prewar issue. Approximately 90 percent of these charts was supplied to the air forces of the Army and Navy. In addition to the production and distribution of these charts, the Bureau constructed a number of special nautical charts for naval operations and carried on a large aeronautical charting program for the Army Air Force. In the interests of national security, the distribution of all aeronautical charts and planimetric maps, as well as nautical charts for certain strategic areas, was placed on a restricted basis. Various steps were taken to insure the availability of charts and related publications under any conditions which may occur.

Coastal surveys.—These surveys are the principal source of data for the production of nautical charts. All equipment available for this work was fully employed during the year in expediting the charting of strategic areas, providing data for special charts required for naval operations, and accomplishing special projects for the Army and Navy. The volume and variety of the latter taxed the Bureau's facilities to the utmost, necessitating careful planning and frequent revision of its program of operations.

Geodetic control surveys.—This activity provides accurately determined and suitably distributed monuments and bench marks which serve as basic reference points for topographic mapping, nautical and aeronautical charting, and other engineering and industrial projects. During the past year all work of this nature was carried on to provide control for topographic mapping in strategic areas as required by the War Department and for other military purposes, including surveys for the development of continental and island bases, establishment of artillery fire-control systems, control for mine sweeping, and other war activities.

Tide and current surveys.—These surveys are required for nautical chart construction and for the compilation of annual tide and current

tables which are essential for sea navigation. They also provide data, in considerable demand during the year, for planning the launching of ships, military construction projects along the coasts, submarine net installations, and other war purposes.

Geomagnetics.—This work is essential for the procurement of magnetic data for nautical and aeronautical charts. The earth's magnetic forces are applied in a number of war operations and the Bureau conducted investigations and furnished much special data for these purposes.

Seismological investigations.—The principal earthquake data disseminated by the Bureau are past records of the frequency and severity of earthquakes, the nature and extent of stresses for which structures in earthquake regions must be designed to withstand, and the measurement of periods of vibrations of structures. A considerable amount of such information was required during the year in connection with the location of shipbuilding, airplane, and munitions plants, and the construction of dams, barracks, hospitals, hangars, and other military structures.

Transfer of Personnel and Equipment

In time of national emergency the President is empowered by law to transfer personnel and equipment of the Coast and Geodetic Survey to the War and Navy Departments. Under this authority 56 commissioned officers were transferred during the past year. Several additional officers were detailed to temporary duty with special units of the armed services. In general, the officers transferred have been assigned to special duties for which they are particularly qualified by reason of their training and experience in the technical work of the Bureau. Thirty-two civilian members holding reserve commissions in the armed forces, and specially trained in their duties, were furloughed to join their respective organizations on a war basis.

Early in the year the survey ships *Discoverer*, *Pioneer*, and *Guide* were transferred to the Navy Department. The Bureau was provided with three substitute vessels. Later in the year these vessels were returned to the Navy Department. Near the end of the year, two additional survey ships, the *Oceanographer* and the *Hydrographer*, were transferred to that Department. The transfer of these vessels was a handicap to planned chart extension and reduced the effective areas of completed surveys in waters now hazardous for passage or without available detailed hydrographic information. Recommendations to restore the latter two vessels to surveying assignments in foreign waters have been approved.

Training of Personnel

In the expansion of the activities of the Bureau, the standard of accuracy and prompt distribution of results were maintained in spite of the many changes of personnel in both field and office. This was accomplished in the office through in-service training of new employees, the selection of assignments after instruction periods, the shifting of members from one section to another, and the elimination of those not qualified or temperamentally unfit for the technical work. In the field, over 100 college students were recruited and received training which should be of further benefit to them and to the Bureau.

Selection of candidates for employment was deemed an essential provision and administrative officers devoted much time to overcoming handicaps inherent in the service of Government personnel procurement. New methods for advancing both field and office work were constantly under consideration and many time-saving improvements were adopted.

Philippine Islands

When war was declared, five commissioned and two civilian officers of the Bureau were on duty in the Philippine Islands. The remainder of the force engaged in surveying and charting the archipelago—some 200 in number and all but two being Filipinos—were employees of the Insular Government. Commander George D. Cowie, Coast and Geodetic Survey, the representative of the Department in charge of all coastal surveys in the Philippines, was killed during a bombing raid on Manila on December 24, 1941. Two other commissioned and one civilian officer were stationed in Manila and presumably are interned there. One commissioned and one civilian officer escaped to Corregidor and served with Army forces there until the island was captured. Official communications ceased with Manila on December 30 and, except for brief reports up to the fall of Corregidor, no information has been received from the personnel of the Bureau in these Islands.

The two survey ships, the *Fathomer* and *Research*, operating in the Philippines, were badly damaged by bombing and other war activities and are assumed to be lost. The *Fathomer* was owned and maintained by the Insular Government. The *Research* (formerly the *Pathfinder*), owned by the United States, was an old ship which was built in the United States in 1899. This vessel was laid up to be disposed of several years ago. Subsequently it was recommissioned at the request of the Insular Government, which has since provided funds for her maintainance and operation.

Upon occupation of Manila by the enemy it became necessary for the Bureau's Washington office to undertake the publication of the nautical charts of the Philippine Archipelago which formerly were printed in Manila. This was accomplished without delay. Arrangements had been made for this emergency by maintenance of prepared copies of the latest Manila chart editions in anticipation of their use for this purpose.

Cooperation With American Republics

The Coast and Geodetic Survey continued its participation in the program of the State Department for cooperation with the American Republics. Extensive magnetic surveys were accomplished in those countries bordering on the Caribbean Sea and in the West Indies. The results of this work are of immediate importance for nautical and aeronautical charting and other war purposes. The number of stations occupied in each of these countries is tabulated in the section of this report covering magnetic work. Gravity observations were carried on in Colombia and 13 base stations had been completed up to the outbreak of the war when this work was discontinued.

Two field parties serviced instrumental equipment at the eight ports where tide stations were previously established and installed six additional stations in Mexico and on the west coast of South America. The countries cooperating maintained these stations and

forwarded the records to the Coast and Geodetic Survey for analysis. These records have supplied data for the calculation of tidal predictions at a number of ports in the American Republics, thus providing information of considerable value for sea navigation.

All countries cooperating in these programs have contributed to the cost of the work and are interested in the continuation of the various projects.

CHART PRODUCTION

Throughout the year practically the entire effort of the Chart Division was devoted to war work. To meet the increasing demands of the armed forces for charts, maps, survey data, and related material, the personnel of the Chart Division was increased 300 percent; in common with other office divisions the hours of work were lengthened and the major portion of the personnel and facilities of the Division was placed on a two- or three-shift basis.

The importance of nautical and aeronautical charts in the war effort is indicated in the following table which gives the number of charts issued annually and the percentage increases for the past 3 years. The 1940 and 1941 issues reflect the development of the defense program. The 1942 issue indicates the heavy additional demand for charts after the United States had entered the war.

Charts issued	1939	1940	1941	1942
Nautical	350,062	407,186	621,663	1,081,072
Aeronautical	366,353	463,917	912,339	3,135,297
Total	716,415	871,103	1,534,002	4,216,369
Increase over preceding year:				
Number		154,688	662,899	2,682,367
Percent		22	76	175

The increase of 74 percent in the issue of nautical charts over the preceding year reflects the rapid growth of the Navy and Merchant Marine. Through close contact and cooperation with the Navy, the Bureau was able to meet all demands for existing charts and to effect the prompt construction and delivery of new special charts needed to meet changing requirements as the war was brought closer to our coasts.

The number of individual nautical charts published at the end of the year was 821. To produce these charts, there were 1,165 printings as follows: 10 new charts, 107 new editions, 788 new prints, and 260 reprints. Of the 10 new charts, 7 were constructed for the Navy. Although a considerable percentage of these charts was reprinted at least twice during the year, it was necessary, due to rapid changes in important navigational information, to apply 4,685,074 hand changes to correct the charts to the date of issue. The principal data received during the year for the improvement and correction of nautical charts consisted of 116 topographic surveys, 110 hydrographic surveys, 987 surveys from other organizations, and 798 reports containing charting data.

Dangers requiring hand corrections and other navigational information were supplied to the U. S. Coast Guard and Hydrographic Office for publication in the Weekly Notice to Mariners.

The standard series of aeronautical charts of the United States and its possessions, consisting of 126 charts, was completed during the year. In addition, 67 new charts were compiled and printed for the Army Air Forces. To produce the charts published during the year there were 681 printings, as follows: 70 new charts, 90 new editions, 42 revisions, 51 new prints, 170 reprints, and 258 base printings. The increase of 244 percent in the annual issue of aeronautical charts reflects the military expansion in aviation.

In addition to this remarkable increase, the Bureau was called upon to undertake a world-wide program of aeronautical charting required by the Army Air Forces. The development of special methods reduced the time required for a new chart compilation about 50 percent. At the same time the cartographic quality was maintained in spite of a large number of inexperienced workers.

While not reflected in the increased issue of standard charts, many special compilation and reproduction projects, which in the aggregate constitute a very substantial contribution to the war effort, were completed or are in progress. Among these is the production of a series of airport charts for the Army, Navy, and Civil Aeronautics Administration. This project, which includes field surveys of some 350 airports, will result in safe-landing and approach charts. A series of 37 radio facility charts was completed during the year for the Civil Aeronautics Administration.

Reproduction of detailed topographic and hydrographic surveys, for the use of war agencies, reached large proportions during the year. Copies of surveys were furnished for a wide variety of projects in connection with military activities along the coasts, ranging from the construction of shipyards and airports to research into methods of combatting submarines.

A precise mechanical projection ruling machine, developed by Bureau engineers, was utilized to good advantage both in meeting the Bureau's extensive needs and, by operation on extra shifts, in supplying some 300 projections and military grids for other Federal agencies engaged in war mapping.

Other assistance rendered to governmental agencies included special reproduction work for the Army Map Service, Bureau of Naval Operations, Office for Emergency Management, Board of Economic Warfare, Office of Production Management, Maritime Commission, Civil Aeronautics Administration, Federal Power Commission, Bureau of the Census, and Forest Service.

COASTAL SURVEYS

Results accomplished during the year in hydrographic and topographic surveys and coastal triangulation are summarized in the following table. The volume of this work was less than in the previous year because of disruption of Alaskan surveys at the height of the season in order to effect an early transfer of three ships to the Navy Department and the necessity for executing a large number of widely scattered projects to meet special needs of the armed forces.

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*
Coast of Maine	5,705	[1] 267	323,955	82				2
South coast of Massachusetts	288	16	5,994	10	1			
Atlantic coast: Block Island to Charleston, S. C.	7,362	[2] 1,545	102,608	413	1,262	4	5	13
James River, Va.	427	16	18,799	17	4	12	25	54
Southern Florida				1,094	698	270	160	34
Gulf of Mexico	10,755	9,709	93,793					
Interior United States areas	55	[3] 20	1,554			5	11	13
Puerto Rico				61	12	13	140	32
San Francisco Bay and tributaries	1,080	46	32,676	28	17	19	7	31
Puget Sound	771	64	18,390	34	14	10	26	51
Strait of Juan de Fuca	1,590	86	35,238	22	4	135	1,902	109
Southeastern Alaska	982	113	39,066	52	27	52	70	31
Central Alaskan coast	400	16	9,663	12	4			
Cook Inlet	140	90	4,696					
Alaskan Peninsula	1,451	[4] 69	30,942	6			24	33
Aleutian Islands	8,320	4,103	54,805	64	17	11	19	18
Hawaiian Islands	4,742	44	22,739	20	2	12	20	41
Total	44,068	16,204	794,918	1,915	2,062	543	2,409	462

[1] Includes 132 square miles of wire drag.
[2] Includes 123 square miles of wire drag.
[3] Wire drag.
[4] Includes 22 square miles of wire drag.

NOTE.—Philippine Islands statistics not available.

On the Atlantic coast the *Oceanographer* was engaged on hydrographic surveys along the coast of Maine, including extensive wire-drag investigations. The launches *Mitchell, Ogden, Marindin,* and *Rodgers* assisted in this work. A winter project of hydrographic surveys off the coast of South Carolina was discontinued after the outbreak of hostilities.

The *Lydonia,* assisted by the motor vessel *Gilbert,* completed a deep wire-drag survey south of Block Island and a special wire-drag survey east of the Isle of Shoals, and in addition extended hydrographic surveys along the coast of Maine. Extensive wire-drag surveys, on which the *Marindin* and *Rodgers* cooperated, were made of this area. At the end of the year, current surveys by the *Mitchell* and *Ogden* and inspection of air photographs were in progress.

The *Gilbert* executed a small project in Great Salt Pond, Block Island, and during the winter season was engaged in a survey of the James River, Va. Surveys in Nantucket Sound and Buzzards Bay, Mass., were in progress at the end of the year.

The *Cowie,* acquired in the fall of 1941, executed a small scheme of triangulation in the James River and established speed trial courses for ships and aircraft off the north shore of Long Island. Special hydrographic investigations off the south Atlantic coast were begun.

The *Hydrographer,* assisted by the motor vessel *Faris,* continued hydrographic surveys in the eastern part of the Gulf of Mexico. The *Faris* completed triangulation, traverse, and leveling in the vicinity of Pensacola Bay, Fla. A special triangulation survey at Eglin Field, Fla., was in progress at the end of the year.

A shore party under the direction of the officer in charge of the magnetic observatory at San Juan, P. R., completed detailed topographic surveys of the east end of the island.

On the Pacific coast, during the period between Alaska field seasons, the *Surveyor* continued hydrographic surveys in the vicinity of the San Juan Islands and undertook a triangulation project in the

Strait of Juan de Fuca. After the *Surveyor* discontinued work to prepare for the Alaska season, the triangulation project was continued by the motor vessels *E. Lester Jones* and *Patton*. The motor vessel *Westdahl* completed a triangulation project at the upper end of San Juan Island. Several other small projects in the Puget Sound area were completed.

Three vessels acquired from the Navy Department, and later returned, were available for a few months during the year. These ships carried on projects in Admiralty Inlet and Port Townsend, Wash., and executed surveys, including field inspections of air photographs, in San Francisco and Suisun Bays, Calif.

The *Explorer* began surveys in the vicinity of Midway Island which were discontinued after the attack on the Hawaiian Islands. En route to Honolulu this ship rescued the crew of a plane which had landed in the ocean with fuel exhausted.

In Alaska the ships *Guide*, *Discoverer*, and *Pioneer* began surveys in the Aleutian Islands but were recalled early in the year for transfer to the Navy Department. The *Explorer* continued surveys westward along the Aleutian Islands. Triangulation control was extended to the eastern end of Atka Island and hydrography was extended to Seguam Island. Special surveys were made in the vicinities of Captains Bay and Dutch Harbor.

The *Surveyor* continued resurveys of Yakutat Bay during July 1941 and then took up surveys of Cold Bay and approaches, assisted in the latter project by the tender *Wildcat*. The *Westdahl* was engaged in surveys of Sitka Sound while the *E. Lester Jones* continued resurveys of the approaches to Anchorage and completed original surveys in Raspberry Strait.

In the Philippine Islands the *Research* and *Fathomer* continued surveys in the Sulu Sea area. Early in November these vessels took up operations in the vicinity of Manila Bay which were continued until the outbreak of hostilities when they were placed at the disposal of the military authorities.

Offices for the processing of field records continued in operation at Norfolk, Va., Pensacola, Fla., Oakland, Calif., and Seattle, Wash.

Air photographs of the coastal area of Maine, the navigable portion of the James River in Virginia, the northern part of San Francisco Bay, the south shore of the Alaska Peninsula and other selected areas in Alaska, were made with the Bureau's 9-lens camera. Field inspection of air photographs was in progress in these areas, except in Alaska; and in the vicinity of Tampa and Lake Okeechobee, Fla. Air photographic compilation units continued in operation in Baltimore, Md., and Tampa, Fla.

With funds provided by the War Department, an extensive mapping program was undertaken in areas adjacent to the coast of South Carolina, North Carolina, Maryland, Delaware, and Virginia, which States were photographed with the 9-lens camera. Rapid progress was made in field and office work connected with this project.

The field stations of the Bureau continued to render valuable service in supplying information for the correction of charts, in disseminating nautical and engineering data in response to requests from local public and official sources, and in cooperating with naval and military authorities on matters pertaining to the war effort.

The 13 United States coast pilot volumes contain a wide variety of important information supplemental to that shown on nautical charts.

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These volumes are kept current by annual supplements and revisions. New editions of the coast pilots are published as often as is warranted by the number of changes that have been made and the amount of new information available. Three supplements were issued during the year and a new edition of the Atlantic Coast Pilot, Section A, was published. The manuscript for a supplement to the Alaskan Coast Pilot, Part II, was prepared, and field data collected for a new edition of the Alaskan Coast Pilot, Part I.

Construction was continued on the new survey ship *Pathfinder* by the Lake Washington Shipyards at Houghton, Wash. The vessel was scheduled for completion in August 1942. The motor vessel *Patton*, a sturdy 88-foot tender of wooden construction, was completed in January and was assigned immediately to field work. Contracts were let for the construction of two 65-foot Diesel-powered wooden wire-drag launches, the *Hilgard* and *Wainwright;* and two 30-foot Diesel-powered tenders. These boats were scheduled for completion in the fall of 1942. The *Cowie*, a 103-foot diesel-powered vessel of wooden construction, was acquired by purchase and assigned to surveys along the Atlantic coast.

GEODETIC CONTROL SURVEYS

Activities carried on during the year in this branch of work are summarized in the following tables:

Locality	Length of scheme	Area
First-order triangulation	*Miles*	*Square miles*
Goodridge to Pinecreek and Warroad to Hallock, Minn	150	1,800
Crookston, Minn., to Earl, N. Dak	355	4,150
Blain to Johnstown, Pa., and Philipsburg, Pa., to Cumberland, Md	165	2,075
Chadron, Nebr., to Lusk, Wyo	90	1,260
Goldendale to Leavenworth, Wash	155	2,790
Pittsfield to Ashland, Maine	235	2,820
Seattle to Bellingham, Wash	65	790
Wilton to Warren, Ark	120	1,440
Marlinton, W. Va., to Washington, Pa., and Clarksburg, W. Va., to Winchester, Va	260	3,120
Lost Valley to Long Creek, Oreg	60	1,080
Williamsburg, Va., to St. George Island, Md	100	1,500
Maydelle to Oakhurst, Tex	85	1,105
Evergreen to Houston to Rosenberg, Tex	100	1,000
Clayton to Oswego, N. Y	115	1,150
Cortland to Laurens, N. Y	50	500
Total	2,105	26,580
Second-order triangulation		
Portland to Cape Small, Maine	25	250
Richmond to Port Royal and Beaverdam to King William, Va	80	800
Vicinity of Mare Island, Calif	7	25
Hopewell to Boykins, Va	75	990
Vicinity of Rogersville, Tenn	10	80
Valdez to Fairbanks, Alaska	200	2,345
Vicinity of Fairbanks, Alaska	25	325
Dinwiddie to Oilville, Va	50	900
Louisa to Culpeper to Fredericksburg, Va	55	670
Big Bend area, Tex	165	2,750
Mobile, Ala., to Wiggins, Miss	65	880
LaPlata to Point Lookout, Md	70	610
Cambridge to Wingate, Md	35	300
Remington, Va., to Brunswick, Md	70	1,020
Columbia River, The Dalles, Oreg., to Pasco, Wash	130	650
Berlin to Pocomoke City, Md	40	370
New Church to Eastville, Va	50	250
McKittrick to Avenal, Calif	165	2,110
Nicholson to Honesdale, Pa	35	315

Locality	Length of scheme	Area
Second-order triangulation—Continued	*Miles*	*Square miles*
Wilmington to Tabor City, N. C	120	770
Doylestown to Easton, Pa., to Culvers Lake, N. J	75	650
Sloatsburg to Otisville, N. Y	35	465
Manlius to De Ruyter, N. Y	25	220
Vicinity of Arcata, Calif	30	390
York to Mercersburg and Carlisle to Liverpool, Pa	140	2,135
Hershey to Reading, Pa	40	700
Vicinity of Grays Harbor, Wash	40	900
Special areas	75	335
Total	1,932	22,205
First-order base lines		
Wortmann, Alaska	1.1	
Worthington, Alaska	1.1	
Tsina, Alaska	0.8	
Stuart, Alaska	1.1	
Willow Creek, Alaska	4.2	
Miller, Alaska	1.9	
Chena, Alaska	3.7	
Ladd, Alaska	1.4	
Beales, Alaska	5.0	
Patten, Maine	6.8	
Prescott, Ark	4.4	
Houston, Tex	5.3	
Total	36.8	
Second-order base lines		
Three special bases	1.8	
First-order reconnaissance		
Spokane base net, Wash	20	240
Lovelock base net, Nev	10	75
Lake Champlain to Oswego, N. Y	260	3,500
Moapa, Nev., to Wendover, Utah, and Caliente to White Blotch Spring, Nev	380	9,170
Williamsburg, Va., to St. George Island, Md	100	1,500
Total	770	14,485
Second-order reconnaissance		
Newhalem to Skykomish, Wash	85	1,410
Hopewell to Boykins and McKenney to Smithfield, Va	125	1,450
Rapids to Fairbanks to Broad Pass, Alaska	300	2,970
Fairbanks to Circle, Alaska	80	950
Portland to Cape Small, Maine	25	250
Dinwiddie to Oilville, Va	50	900
LaPlata to Mechanicsville, Md	25	230
Vicinity of Bracketsville, Tex	85	1,755
Louisa to Culpeper to Fredericksburg, Va	55	670
Mobile, Ala., to Merrill, Miss., to Pascagoula, Miss	90	1,080
Leonardtown to Point Lookout, Md	30	260
Morganza to St. Leonard, Md	15	120
Remington, Va., to Brunswick, Md	70	1,020
Lost Hills to Parkfield, Calif	100	1,130
Cambridge to Wingate, Md	35	300
Pocomoke to Berlin, Md	40	370
New Church to Eastville, Va	50	250
York to Mercersburg, Pa	90	1,540
Big Bend area, Tex	40	400
Wilmington to Tabor City, N. C	120	770
Carlisle to Liverpool, Pa	50	595
Poplarville to Merrill to Biloxi, Miss	85	980
Doylestown to Easton, Pa	25	275
Vicinity of Easton, Pa	20	125
Washington to Culvers Lake, N. J	30	250
Hershey to Quakertown, Pa	75	1,500
Vicinity of Mare Island, Calif	7	25
Special areas	75	335
Humboldt Bay, Calif., to Oregon State line	100	1,110
Warwick to Phoenicia, N. Y	90	1,380
Garberville to Willits, Calif	75	1,675
Manlius to Leonardville, N. Y	70	645
Prince Frederick to LaPlata, Md	30	350
Alexandria Bay to Cranberry Lake to Massena, N. Y	180	2,975
Margaretville to Greenville, N. Y	90	1,155
Utica to Gloversville to Cobleskill, N. Y	120	1,850
Total	2,632	33,050

State	First-order	Second-order
Leveling	*Miles*	*Miles*
California	191	1,384
Colorado	74	404
Delaware		44
Idaho	358	2
Maryland	49	365
New Jersey	64	184
New Mexico	233	693
New York	746	1,178
North Carolina	9	449
Oklahoma	5	12
Oregon	779	8
Pennsylvania	696	1,143
Texas	167	2,099
Virginia	84	911
Washington	88	
Total	3,543	8,876

State or region	Determinations		
	Latitude	Longitude	Azimuth
Astronomy			
Alaska	3	3	3
Arkansas	1	1	
Idaho	1	1	1
Louisiana	2	2	
Maine	1	1	1
Michigan		1	1
Midway Island	1	1	1
Minnesota	1	1	
Nevada	1	1	
North Dakota	1	2	2
West Virginia	1	1	1
Total	13	15	10

State or region	Determinations	
	New	Repeat
Gravity		
Maryland	22	2
North Carolina	1	
Pennsylvania	11	
Virginia	3	
Colombia, South America	12	
Total	49	2

The work was accomplished by 5 double-unit triangulation parties, 3 six-unit leveling parties, and 6 triangulation reconnaissance parties, operating throughout the year, and by 2 triangulation, 1 astronomic and 2 gravity parties which operated during a part of the year. These units carried on surveys in 24 States and in Alaska. One of the gravity parties conducted investigations in Colombia as mentioned previously in connection with the program for cooperation with the American Republics. Variation of latitude observatories at Ukiah, Calif., and Gaithersburg, Md., were maintained throughout the year.

While geodetic surveys in the United States were carried on chiefly to provide control for military mapping, a number of other projects, necessary for or related to the war effort, were accomplished. The more important of these projects are mentioned below.

Triangulation, traverse, and leveling were extended over several

coastal defense areas for the purpose of coordinating military installations in those areas. This work was carried on in cooperation with the Engineer Corps of the Army, which defrayed the cost of the work. Geodetic control was provided in several Army and Navy reservations to furnish data required for study and training in bombing, air photographic, and artillery operations.

The Coast and Geodetic Survey cooperated with the Weather Bureau by determining elevations at all airports adjacent to the lines of leveling run during the year. This information was required for calibration of barometric instruments. All air beacons which could be sighted in connection with triangulation observations were located for the Civil Aeronautics Administration. Assistance was rendered to the National Grazing Service in establishing reconnaissance for triangulation required for mapping in eastern Nevada and to the Massachusetts Institute of Technology in connection with research on certain problems of navigation. Surveys in Alaska were carried on with funds provided by the War Department—primarily to provide control for war mapping.

The work involved in the computation, adjustment, and distribution of geodetic data in the Washington office was especially heavy on account of the greater output of field surveys, the increasing needs for such data for war purposes, and the necessity for completing the processing of unfinished records accumulated from 1932 to 1935. While much of the latter work is being accomplished by computing offices in New York and Philadelphia, the work must be laid out and distributed by the office force in Washington, which in itself is a considerable task. During the fiscal year, 8,285 adjusted geographic positions were added to the files.

The computation and adjustment of leveling in the alluvial valley of the Mississippi River were completed during the year and a summary of elevations was furnished to the Mississippi River Commission. This cooperative project between the Commission and the Coast and Geodetic Survey was undertaken about 3 years ago in order that lines of leveling, necessary to coordinate thoroughly all levels in that region, could be completed and the resulting records processed.

Computing offices at New York and Philadelphia, maintained by the Work Projects Administration and sponsored jointly by the Office of the Chief of Engineers and this Bureau, continued in operation throughout the year with an average of about 160 employees at each office. These offices were engaged in the processing of field records obtained through many of the State local control surveys as well as the basic triangulation required in the adjustment of the former work. These offices assisted in the work of other divisions of the Bureau.

Advantage was taken of extensive building operations in the District of Columbia and vicinity to investigate the effects of such operations on the elevations of nearby bench marks. This study and the information obtained will be of interest to all organizations which establish or utilize bench marks throughout the country.

During the year three members of the Division of Geodesy gave lectures and courses of instruction at George Washington University, Howard University, and the College of the City of New York, in connection with the Engineering, Science and Management Defense Training.

At the request of the Turkish Legation, made through the State Department, four officers of the Turkish Navy were assigned to temporary duty in the Division of Geodesy for the purpose of studying methods of field and office work. Each of these officers spent about 4 months in the Bureau and visited several triangulation, leveling, and astronomical parties during the period.

TIDE AND CURRENT WORK

During the year a large part of the tide and current work of the Bureau was devoted to war activities. Detailed tide and current surveys were made, special predictions were calculated, and information concerning the action of tides and currents in various theaters of the war was furnished for military and naval operations. Correlated assistance, including the compilation of tidal data and information pertaining to tidal bench marks, was extended to engineers, contractors, and others engaged in the construction and operation of shipyards, air fields, and other war developments in coastal areas.

In addition to these special services there was a material increase in the demand for tide and current tables and tidal current charts, necessitating several reprints and resulting in the issue during the year of nearly 60,000 copies as compared with a maximum annual issue of about 38,000 copies prior to the inauguration of the defense program.

During the fiscal year, 46 primary and 52 secondary tide stations were in operation—41 on the Atlantic coast, 43 on the Pacific coast, and 14 in Central and South America. Sixty-seven of these stations were conducted in collaboration with other agencies, including the U. S. Engineers, the Navy Department, Territory of Hawaii, city of New York, city of Santa Monica, port of Willapa Harbor, Los Angeles Harbor Department, Oxnard Harbor district, Woods Hole Oceanographic Institution, Chesapeake Biological Laboratory, the Oceanographic Laboratories of the University of Washington, and Central and South American Republics.

Observations from these stations supply basic data for tide predictions, hydrographic surveys, reduction of the results of short series of observations to mean values, accurate determination of datum planes, and study of changes in the mean level of the sea. Shorter periods of observations at approximately 100 additional stations were obtained in connection with hydrography and other activities.

The tide survey of the Columbia River was continued throughout the fiscal year in cooperation with the U. S. Engineer Office at Portland, Oreg.

Data received from tide stations estabished in cooperation with the American Republics enabled the Bureau to calculate and include in its tide tables for 1943 tide predictions for the ports of Salina Cruz, Mexico; La Union, El Salvador; Punta Arenas, Costa Rica; Buenaventura, Colombia; Guayaquil, Ecuador; and Matarani, Peru.

The motor vessel *E. Lester Jones*, using a newly developed radio current meter, measured the currents at 12 stations in Puget Sound, Wash. Current observations were also secured by hydrographic parties at a number of locations in other important waterways.

Through the continued cooperation of the Coast Guard, a 12-month series of hourly current observations was completed at *Portland* light-

ship, and similar observations covering a period of 7 months were secured at *Frying Pan Shoal* lightship.

Reciprocal agreements for the exchange of tide predictions between the United States and England, Canada, and India remained in effect. The lapse of similar agreements with France, The Netherlands, and Germany necessitated the prediction of tides by the Coast and Geodetic Survey for the eight ports in those countries for which predictions are published in the tide tables. Data were available for five of these ports which permitted direct prediction by means of the Bureau's mechanical tide predictor. Special calculations were necessary for the other three ports.

MAGNETIC INVESTIGATIONS

The primary purpose of magnetic observations is to obtain information concerning the constantly changing magnetic forces of the earth to promote safety in navigation on the sea and in the air. This information is used extensively for other purposes by land surveyors, prospectors for oil and mineral resources, by radio and telegraph companies, and by scientific investigators. It also has a number of applications in military operations.

Magnetic observatories, at which continuous observations are recorded, were maintained throughout the year at Cheltenham, Md.; Tucson, Ariz.; Honolulu, T. H.; Sitka, Alaska; and San Juan, P. R. During the first half of the year a field party obtained supplemental observations in Virginia, North Carolina, and South Carolina. Observations of declination—the angle between true and magnetic north—were made at numerous additional points during the course of other field surveys. A number of special projects was accomplished for the armed forces.

The distribution of magnetic observations during the year is shown in the following table:

Location	Repeat stations				Other stations		Total
	New		Old		Declination only	Other	
	Complete	Declination only	Complete	Declination only			
Alabama						1	1
California			3			1	4
Delaware						1	1
Florida			2			4	6
Louisiana						2	2
Maine					5	1	6
Massachusetts	1						1
Maryland	2						2
New York						1	1
North Carolina		3					3
Oregon						1	1
Pennsylvania						1	1
Rhode Island	1					1	2
South Carolina	1			1		1	3
Texas						1	1
Vermont					1		1
Virginia	1	1	1			2	5
Washington			1		3	2	6
Alaska					36		36
Hawaii					6	1	7
Mexico	2						2
Canal Zone	1					1	2
Costa Rica			1			1	2
El Salvador	1		2				3
Guatemala	1		1				2
Honduras	1		1				2
Nicaragua		1	2				3
Panama	2		1				3
Brazil	1		1				2
Colombia	2	1	1				4
British Guiana	2		1				3
Uruguay			1				1
Venezuela	3		5				8
British West Indies	1		1			2	4
Cuba	2		2	1		3	8
Dominican Republic	1		1				2
Haiti	1						1
Jamaica	1		1			2	4
Trinidad	1		1			2	4
Total	29	6	30	2	51	32	150

The following geophysical activities were continued with the cooperation of the Department of Terrestrial Magnetism, Carnegie Institution of Washington: Operation of a cosmic ray meter at Cheltenham Observatory; maintenance at Cheltenham Observatory of international magnetic standards; and observation of atmospheric and earth electric currents at Tucson Observatory (with the Mountain States Telephone & Telegraph Co. and Bell Telephone Laboratories also cooperating).

In the office, isogonic maps for the United States and Alaska were completed and published. The former map, showing magnetic declination and annual rate of change throughout the country, is published at intervals of 5 years, while the Alaska map is issued at 10-year intervals. A special office unit was organized to furnish magnetic data for a world-wide series of aeronautical charts. An office

in New York City maintained by the Work Projects Administration continued to assist in the processing of magnetic data. Ionosphere observations were continued at San Juan, P. R., in cooperation with the University of Puerto Rico.

SEISMOLOGICAL WORK

The program of the Coast and Geodetic Survey for cooperative seismologic studies continued to provide valuable information concerning areas affected by earthquakes in the United States and possessions, the nature and extent of earthquake motions, and the design of earthquake-resistant structures. A considerable amount of information of this character was furnished during the year to war agencies and to engineers and contractors engaged in war construction. Several special investigations were made for this purpose.

Seismographs were operated at magnetic observatories, with the exception of Cheltenham, and at the Ukiah latitude observatory. Assistance was afforded to several colleges in the maintenance of seismographs, and to a number of independent stations through study and interpretation of their records.

Sixty strong-motion seismographs were in operation during the year at 52 stations in Western States and the Canal Zone. Thirty-six strong-motion records were obtained for ten earthquakes. A special analysis was made of the ground motions recorded at El Centro, Calif., during the destructive Imperial Valley earthquake of May 18, 1940.

Vibration tests were made in six buildings for the study of earthquake effects on buildings. Ground vibration tests were made at five locations for the study of probable action of certain soil response to earthquakes, and two special tests were made.

Three tilt meters were operated on a cooperative basis with the University of California and one at Long Beach, Calif., in cooperation with that city. They were operated near earthquake faults to observe any tilt effects preceding and following earthquakes which might occur in the vicinity of the instruments.

In collecting earthquake information, close contacts were maintained with many commercial agencies and public-utilities organizations, the Weather Bureau, a number of seismological organizations, and several universities. Postmasters and hundreds of other individuals assisted in this service. Building owners furnished free space for 50 strong-motion seismographs. Questionnaire coverage was made for 10 earthquakes which approached destructive character. In all, more than 3,000 reports were received for some 300 earthquakes.

Science Service paid for the transmission of foreign and domestic earthquake code messages needed to locate immediately important earthquakes from instrumental data. Thirty-two epicenters were located in this way and results were furnished to all cooperating stations.

The Bureau was closely associated with the seismological laboratory of the California Institute of Technology in the study of seismological problems. The Massachusetts Institute of Technology cooperated in problems relating to the design of structures. Much of this engineering research at the California Institute of Technology was sponsored by the county of Los Angeles.

Operation of seismographs in the Lake Mead region was continued as a joint undertaking of the Bureau of Reclamation, National Park Service, and the Coast and Geodetic Survey.

INSTRUMENTAL WORK

The Bureau's Instrument Division completed the development of a new and improved signal lamp for night triangulation observations and redesigned the portable tide gage to simplify this instrument and reduce construction costs. Experiments were continued in developing better theodolite bearings and circles. This division cooperated in the design and construction of new instruments required for war purposes. A course of instruction in the use and care of precision instruments was given to personnel of the U. S. Engineers.

The Bureau's Electrical Laboratory developed the Dorsey chronograph, a precision instrument operated by a quartz crystal, for use in radioacoustic position finding. The use of this instrument in the field demonstrated that time intervals can be scaled from tapes in about one-fourth the time formerly required. A new type of current meter, permitting remote control of current observations, was devised by the Bureau's field personnel. This instrument, named the Peters-Roberts radio current meter, was used with good results in Puget Sound, Wash., during the year.

A number of improvements in instrumental equipment at magnetic observatories were effected during the year, including the installation of new magnetographs at San Juan and Sitka. Assistance was also extended to other agencies in testing new types of magnetic instruments.

PERSONNEL AND FINANCES

The number of persons in the service of the Coast and Geodetic Survey at the close of the fiscal year 1942 was 2,250, distributed as follows:

	Commissioned	Civilian	Total		Commissioned	Civilian	Total
Washington office:				Field service:			
Regular appropriations	19	415	434	Regular appropriations	93	691	784
Emergency funds		22	22	Working funds		498	498
Working funds		512	512	Total	112	2,138	2,250

Acquisitions by the library and archives included 110 hydrographic and 116 topographic sheets; 953 blueprints (mostly by the U. S. Engineers); 21,962 maps; 7,302 charts; 11,409 field, office, and observatory records; 150 negatives; 1,078 prints; 44 lantern slides; 1,612 books; and 1,860 periodicals.

Collections covering miscellaneous receipts, including nautical and aeronautical charts and related publications, totaled $158,126, as compared with $144,864 during the preceding year.

The following funds, from the sources indicated, were available to the Bureau during the fiscal year 1942:

Regular appropriation	$3, 859, 000. 00
Supplemental appropriation, Second Deficiency Act, 1941	361, 000. 00
Third Supplemental National Defense Appropriation Act, 1942	182, 705. 00
Total appropriations	4, 402, 705. 00
Transfers and reimbursements to credit of appropriation for:	
Salaries, office	9, 688. 09
Aeronautical charts	51, 472. 11
Office expenses	4, 297. 47
Total transfers and reimbursements	65, 457. 67
Working funds received from:	
Bureau of Reclamation (seismological work, Boulder Dam)	10, 000. 00
War Department (aeronautical charts)	472, 500. 00
Navy Department (magnetic work)	4, 649. 86
War Department (control surveys in Alaska)	75, 000. 00
Navy Department (magnetic work)	2, 500. 00
War Department (mapping of strategic areas)	750, 000. 00
War Department (aeronautical charts)	413, 700. 00
War Department (harbor defense developments)	9, 000. 00
War Department (aeronautical charts)	31, 500. 00
War Department (surveys of bombing areas)	10, 000. 00
War Department (harbor surveys)	16, 000. 00
War Department (control surveys for harbor defenses)	9, 130. 00
State Department (cooperation with American Republics):	
Gravity surveys	9, 000. 00
Tidal investigations	13, 000. 00
Magnetic surveys	10, 000. 00
Total working funds	1, 835, 979. 86
Allotments from:	
Work Projects Administration (administrative expenses)	35, 000. 00
Civil Aeronautics Administration (aeronautical charts)	19, 000. 00
Civil Aeronautics Administration (aeronautical charts)	171, 360. 00
Department of Commerce (travel)	25, 900. 00
Department of Commerce (printing and binding)	50, 400. 00
Department of Commerce (contingent expenses)	2, 850. 00
Total allotments	304, 510. 00
Total funds available	6, 608, 652. 53

Bureau of Foreign and Domestic Commerce

The Bureau of Foreign and Domestic Commerce during the fiscal year went through a steady change of emphasis from its statutory functions of serving business. This change was reflected in an ever-increasing service of supplying essential facts to practically every Government agency engaged in some phase of war work. The increasing volume of requests from emergency agencies reached such a height during the early autumn of 1941 that the Bureau had to decide how it could best serve the national interest with its limited personnel.

B. E. W. Gains Seasoned Research Organization

The Bureau, as a result, offered to the Board of Economic Warfare a working agreement by which the Bureau not only gave priority to the needs of that Board but, in effect, became its research organization. The agreement was accepted by the Board, and the Bureau pledged the equivalent of 40 percent of its appropriation to this work with the understanding that the Board would, from its emergency funds, augment the personnel of the Bureau in the fields in which it was understaffed to meet the requirements of the Board. Thus the Board of Economic Warfare acquired the services of a seasoned and experienced research organization—housed, staffed, equipped, and in possession of the largest store of commodity, economic, and international information in the Nation. The taxpayers of the country were saved the expense that inevitably arises from recruiting, housing, equipping, organizing, and training a new unit, and, also, the cost and delay in effective functioning that would otherwise be involved in acquiring complete files of information. This agreement was in effect when the country was forced into war in December 1941.

As a result of war requirements, considerably more than 60 percent of the Bureau's available services, measured in terms of the Bureau's appropriations, has been engaged in work for the Board. Practically all of this work is of a confidential nature and currently concerns, in addition to hundreds of general studies, special or continuing reports on some 400 commodities involving 79 friendly foreign nations. Specific requests from the Board of Economic Warfare concerning commercial interests in foreign countries totaled 52,236 during the year.

In addition to its work for the Board of Economic Warfare, the Bureau has made investigations and confidential reports to many other agencies. Among these are the War Department, Navy Department, War Production Board, Office of Strategic Services, Office of Price Administration, Office of Defense Transportation, War Shipping Administration, and the Office of the Coordinator of Inter-American Affairs.

Bureau Continues Service to Business

The ability of the Bureau to serve so many agencies and also maintain a considerable service to business arises from the dual nature of the Bureau's operations. The first, and most time-consuming, phase of the Bureau's work concerns the gathering, assembling, and filing of information and statistics. The second phase involves the reporting of information in answer to special requests, and the dissemination of nonconfidential information through the publications of the Bureau. Because of the continuing effort on the first phase of the Bureau's work, it is often possible to answer in a few moments, questions which might otherwise require days or weeks of individual research.

Additional Activities Primarily for Government

The Bureau has continued to appraise the effect on American commerce of existing and new laws of all countries and provide assistance in this field to the war agencies. Some aid has also been given to the Department of State through a study of the method of taking evidence abroad in commercial and civil lawsuits, and to the Securities and Exchange Commission through a collection of the accountancy laws of foreign countries. The promotion of unification of law and legal custom benefitting international trade, such as the Uniform Practice for Documentary Letters of Credit and the adoption of arbitration clauses, has been continued. Data which may be useful in settling the legal phases of commerce after the war is being accumulated.

The Bureau continued its annual surveys on the balance of international payments of the United States and the international investment position of the country. Numerous surveys of detailed economic data bearing on the monetary and economic position of various countries were made for war agencies' day-to-day use. These studies were used also by the United States delegation to the conference held in January 1942 at Rio de Janeiro and by the Board of Economic Warfare in its preparation of a series of handbooks on the economic and financial structure of Latin American countries.

International Trends Studied

A comprehensive study is under way on the international transactions of the United States between World War I and World War II in order to appraise the long-range trends of the Nation's international commercial and financial relationships. Studies of the international position of other important countries have also been undertaken as part of intensive work on wartime and post-war developments in the international economy.

The importance of American patents and trade-marks abroad in the promotion of our foreign trade now and in the post-war period caused the Bureau to maintain its vigilance to prevent infringements in foreign countries. More than 400 instances of attempted piracy abroad of American brands and trade names were investigated. Their owners were promptly advised whether to file opposition within the statutory period.

Trade Agreements

The Bureau continued to represent the Department of Commerce in the interdepartmental trade-agreements organization, contributing a large share of the greater cooperative effort called for by a heavier schedule of agreement studies. Trade agreements were concluded during the year with Argentina, Cuba (second supplementary), Peru, and Uruguay. Announcement of intention to negotiate with Iceland, Bolivia, and Mexico was made during the fiscal year while confidential basic studies looking toward agreements with other nations were carried on and will be continued into the next fiscal year.

Basic Economic Data

The national income and national product work of the Bureau has been widely recognized as the underlying statistical blueprint for planning the economic aspects of the armament program. As a result, the Bureau produced numerous estimates which provided the war agencies with information basic to the problems of production planning, fiscal policy, price control, and rationing. The need for more frequent estimates than the annual figures customarily developed by the Bureau led to making and reporting on a quarterly basis the estimates of national income, corporation profits, construction activity, consumers' savings and expenditures, and gross national product. Furthermore, all estimates and analyses have been completed soon after the close of the period studied.

In order to fill gaps in the Bureau's previous estimates of national income, and to adapt the measures and concepts to wartime conditions, detailed estimates and analyses were prepared of commodity flow by type of commodity, of the relation between war and nonwar output and expenditures, and of the disposition of consumers' income.

Constant Refinement of Activities

Special economic analyses were made for the War Production Board, the Office of Price Administration, the Joint Committee on Internal Revenue Taxation, War Shipping Administration, and the Senate Small Business Committee, as well as weekly economic reports for the Secretary of Commerce and other Government officials. Several basic measures of economic activity were developed during the year. These are either now being published or circulated confidentially among Government agencies prior to publication. They are continuing activities of the Bureau which are being constantly refined for greater effectiveness.

In addition to the aforementioned activities primarily used for war purposes by other Government agencies at this time, the Bureau has loaned many members of its personnel to war agencies for periods ranging from a few days to several months, in order to organize or to expedite war work. Furthermore, members of the Bureau serve on many committees on war work. Their contribution is threefold—first, they contribute their own knowledge gained in their work in the Bureau; second, they bring to the attention of committee members, the

information available in the Bureau; and third, they point out the far-reaching facilities of the Bureau for obtaining additional information quickly and economically. As a result, many reports on price controls, wage controls, black markets, and other phases of wartime economy in European countries have been made for Government agencies here.

Civilian Services

The conversion of the Bureau to war work has coincided largely with the conversion of industry and business to the same end. However, the Bureau considers that its responsibility for maintaining civilian supplies and the civilian supply system does not end with the adaptation of its facilities to the service of other Government agencies. Therefore, it has constantly endeavored to develop and disseminate everything possible to aid business in adjusting itself to wartime conditions and to maintain civilian supply.

The Bureau has been active in interpreting to business new export-control regulations and procedures and in expediting the movement of essential products to Allied and friendly countries. It has aided other agencies in preparing export instructions and assisted in effecting prompt compliance with them.

Better factual information in the construction field has been developed and made available to both Government and business to facilitate planning the over-all construction program.

Bureau Aids Exporters and Importers

Aid was given to American firms whose shipments on Far Eastern seas had to be diverted, because of war, to other than original ports of destination. The Bureau assisted exporters and importers in making severance with agents and distributors in 8,511 cases stemming from the "Proclaimed List of Certain Blocked Nationals"; 255 agency replacements were effected in Latin America. Business purchased over 9,000 world trade directory reports and almost 5,000 trade lists. Over 1,100 trade opportunities, import and export, were directed to those in Government or business who needed certain imports or had available material to care for the needs of friendly nationals through private channels.

Over 4,400 informational requests concerning trade associations were compiled for governmental agencies upon specific request during the year, and 2,700 for the use of business. Members of the Bureau played an active part in arranging closer cooperation of war agencies with trade associations to expedite war production. An authoritative directory of trade associations was published. The Office for Emergency Management bought 10,000 copies for the use of consultants in its agencies, and several thousand additional copies have been sold to the public.

More than 11,000 requests from business for practical information were answered by supplying governmental publications; almost 10,000 such inquiries requiring special replies were handled on a 24-hour basis. Incoming reports totaling 322,121 were reviewed, and pertinent data culled for the Bureau's reference files. A total of 53,540 inquiries, including the above-mentioned requests from business, were handled during the year, and the Bureau's reports on over 600,000 firms

throughout the world and lists of over 1,000,000 classified enterprises have been actively used.

Interstate Trade Barriers

On November 6, 1941, by Presidential Letter No. 153, the work of the Marketing Laws Survey—the Nation-wide research project established under the auspices of the Work Projects Administration—was consolidated with the Bureau's efforts toward the removal of interstate trade barriers.

The Survey included:

1. The compilation, review, and analysis of the text of all the State laws directly affecting the marketing of goods from the point of production to the point of consumption.
2. Entry into business or market; sales-promotion devices; transportation, storage, and warehousing; financing and security; marketing organization and commodity exchanges; cooperatives; regulation of price policies and practices; regulation of monopolies and practices in restraint of trade; barriers to trade between the States; governmental purchasing and distribution; taxes directly affecting the marketing of goods.
3. Reported decisions of Federal and State courts interpreting State marketing laws cited and restated. The legal principles and doctrines evolved in significant cases are coordinated with and analyzed under each of the topics covered.
4. Statutes and cases relative to the composition, substantive powers, and procedures of State administrative agencies in the field of marketing.
5. The publication of the various compilations in such form as to be useful as reference books to Federal and State public agencies, the lawyer, the research worker, and the business executive who is faced with the problem of formulating marketing policies in conformity with the myriad regulatory laws of the various States.

Business, industry, and Government have not had ready access to this vital material scattered through 508 volumes of State codes, scores of thousands of pertinent court decisions, and growing at the rate of 12,000 new State laws each legislative year (2 calendar years).

Federal-State Conference Achieves Results

Outstanding achievements toward the removal of trade barriers have resulted from the Federal-State Conference on War Restrictions, authorized by the President and held under the auspices of the Department in the Commerce Auditorium, May 5, 6, and 7, 1942. As a result, the Federal War Agencies Committee was established and the Bureau continues active in carrying on the work of the Committee which is seeking State cooperation in amending or setting aside for the duration of the war restrictive legislation concerning manpower, agricultural commodities, transportation, and construction.

The trend of State legislation during 1941 was definitely against the enactment of laws creating trade barriers. In several States corrective action removing barriers was taken. Efforts toward the removal of trade barriers were made through the Interdepartmental Committee on Interstate Trade. Channels through which influence was developed included the Council of State Governments, its various organiza-

tions of State executives, regional conference of governors and other executives, trade associations, educational institutions, and other groups.

The following publications concerning various trade barriers were published during the year:

Comparative Charts of Barriers to Trade Between States (Marketing Laws Series).
State Milk and Dairy Legislation (vol. III, Marketing Laws Series).
State Occupational Legislation (vol. VI, Marketing Laws Series).
State Anti-Trust Laws (vol. I, Marketing Laws Series, 1940).
State Price Control Legislation (vol. II, Marketing Laws Series, 1941).
A Study of the Effect of Trade Barriers in Michigan.
Bibliography of Interstate Trade Barriers.
Community Pools and Defense Production Associations (a bibliography).
Case and Citation Manual for Marketing Laws Studies.
Charts of Motor Vehicle Weight and Length Restrictions:
Series A—State Laws Below Formula of War Agencies Standard.
Series B—State Laws Above Formula.
Highway Trade Barriers and How They Work.
Legal Obstacles to Motor Truck Transportation in War Time.

Practical Aids to Small Business

Prior to the beginning of the fiscal year, the Bureau had studied carefully the possibilities of revamping and stretching its available resources in order to aid small business, and particularly small business in the distributive trades. It was apparent that the funds in hand and the personnel available in periods between war jobs would not permit much attention to individual cases. Therefore, emphasis was placed on methods by which small businesses could help themselves or could be reached in groups with the least expenditure of time and money by the Bureau.

A series of publications intended as efficiency guides for small businesses was planned. The advent of war and the inevitable increasing regulation of business in the interest of united national effort made it necessary to postpone the preparation of most of these until the time when wartime business operations become reasonably stabilized.

Wholesale Grocery Trade Study

However, a study of efficient operating methods in the wholesale grocery trade, near publication when the war began, was issued; and, according to reports from users, has been helpful to many wholesalers in the grocery business and in other fields. Another publication on simplified retail accounting was completed. It will be issued by the Senate Small Business Committee early in fiscal 1943.

The Bureau has been active in analyzing and reporting the experience of British wholesalers and retailers under war conditions for the guidance of both Government and business here as the impact of war increases. Much work has been done for the war agencies in making the information and experience within the Bureau effective in planning war measures affecting the distributive trades.

Group Action for Self-Help Stimulated

The work of the Bureau in stimulating group activities to help solve the problems of small business today has taken two major directions—community action for self help and wartime business clinics.

Small Town Manual Requested by 60,000

Early in the year, the Bureau prepared the "Small Town Manual for Community Action" as a guide in war work and on the economic front. Test cities were selected for the surveys outlined in the manual in order to perfect the manual through practical use. It was proposed to carry on these tests to the end of the fiscal year. However, news of the manual was broadcast by persons who had seen copies. Such a demand arose that the Bureau was compelled to prepare and issue a new edition, revised in the light of such experience as had been reported.

Approximately 8,000 copies had been issued and requests for over 60,000 more were on hand before the end of the fiscal year. Five towns had reported enthusiastically on results obtained from the original manual and a number of others had plans well under way. From all indications, although it is left to the individual community to develop the aggressive leadership necessary to improve its future, a large number of communities will be working out their individual salvation before the end of the calendar year. If the communities improve their economic welfare, it is highly probable that businesses in the communities will be aided.

Service clubs, fraternal organizations, commercial associations, public utilities, business firms, newspaper associations, and farm and labor organizations are actively promoting the use of the manual. The Bureau is cooperating with the individual communities asking for assistance in undertaking the surveys as much as possible through the assistance of the field offices of the Department of Commerce and from Washington.

Local Wartime Business Clinics

With the rising tempo of the war production effort, the Bureau received an increasing number of requests for help from individual businessmen perplexed by their problems. Working in close cooperation with the business service of the Office of Education, a clinical approach to such problems was developed. After carefully testing this approach through holding "Wartime Business Clinics" in a number of communities, the Bureau prepared and published "Procedures for Conducting Local Wartime Business Clinics."

This publication outlines a program for self-help by local groups of businessmen, in cooperation with the Office of Education, the Office of Price Administration, the War Production Board, and the Office of Defense Transportation, on common problems. By the end of the fiscal year, 17,000 copies had been distributed, and a second edition was in preparation. Several hundred clinics, attended by more than 75,000 businessmen, had been held, and scores more had already been scheduled for the early part of the next fiscal year.

Cooperation With Collegiate Schools of Business and Departments of Economics

Cooperation with collegiate schools of business and departments of economics has been extended more widely than heretofore. In September 1941 the Bureau, with the assistance of a number of Government agencies, compiled, published, and distributed "Sug-

gested Research Topics in the Fields of Business and Economics." This contained 196 topics on which further research was desired by these Federal agencies.

Further investigation indicated that there was a real need for a compilation of business-research studies just completed or under way in institutions of higher learning. The study was made and "Business Research Projects, 1941," listing 898 research projects, was published in December 1941. Approximately 3,000 copies were distributed in the interest of eliminating extensive duplication of research effort.

At the request of the National Conference of State University Schools of Business, in cooperation with its members and the Office of Education, the Bureau compiled and issued a report on "War Courses Offered by University Schools of Business and Departments of Economics." The first edition, which was quickly exhausted, proved so helpful that a supplement is now being prepared.

Field Service

In the fiscal year 1941-42 the Department of Commerce Field Service experienced a considerably expanded use of its facilities by other agencies of the Government. The Board of Economic Warfare officially designated the Department of Commerce field offices as its field agency and allocated a sum of money to provide additional help where needed. This utilization of existing facilities was undertaken to avoid duplication of effort and to provide uniform direction of the Board's activities and those of the Department of Commerce in each community. This form of cooperation has been similarly extended to other Government agencies. Certain specific tasks and duties have been undertaken by the Field Service at the request of the War Production Board, the Office of Price Administration, and the Department of State, as well as by other agencies. Various offices work closely with the Military Intelligence Department, the Office of Naval Intelligence, the Office of Censorship, and the Federal Bureau of Investigation. All facilities are placed at their disposal and are used constantly by these agencies.

As a result of the unification of certain field services of the Department in the last fiscal year, the offices of the Department of Commerce have undertaken the follow-up of questionnaires on two surveys on scarce materials and warehouse space in the United States, under the supervision of the Bureau of the Census acting for the War Production Board. The field offices were charged with obtaining responses from delinquent firms and individuals. As a result, the Bureau of the Census obtained a very high percentage of returns at extremely low cost. Over 24,000 firms were reached by telephone and personal calls.

Data Supplied for Bombing Objectives

In cooperation with the Board of Economic Warfare, the offices located and interviewed hundreds of individuals and officials of firms who were able to supply valuable information concerning the location of possible bombing objectives.

At the request of the Board of Economic Warfare, the offices also developed considerable economic and commercial information required by the Board from sources supplied by the Office of Censorship from

intercepted radiograms, letters, and cables exchanged by American business firms and foreign correspondents.

The offices have worked with the Interdepartmental Committee on the Proclaimed List and the Division of World Trade Intelligence of the Department of State, in keeping businessmen advised of undesirable consignees in friendly countries. In cooperation with the Office of Exports, the offices have also investigated many alleged violations of the Export Control Act.

Foreign Trade Major Study

Approximately 65 percent of the work in the field during the past year, even with the enlarged staff, was for the Board of Economic Warfare or other Government agencies concerned with foreign-trade matters.

The offices undertake to make all regulations concerning foreign trade so clear to the American businessman that misunderstandings will be avoided—misunderstandings which not only hamper the efficient operation of his business but might eventually lead to charges of violation of the many regulations.

Another important feature of the work of the offices has been the interviewing of returned travelers from all parts of the world on economic and commercial matters. To facilitate this work, the Department had an official stationed at Miami, Fla., to meet incoming planes and to interview returned travelers assigned to him by the Office of Naval Intelligence.

Close Cooperation Brings Success

Much of the success with the "Small Town Manual" and the "Wartime Business Clinics" in the field has resulted from the cooperation between the 12 regional managers, the 18 district managers, and their staffs of commercial agents, working in close relation with the regional business consultants.

The Department of Commerce closed the District Office in Honolulu, by agreement with the Army and Navy authorities there and the Honolulu Chamber of Commerce, and returned the personnel of that office to continental United States. This was made necessary by the abnormal trade conditions existing after Pearl Harbor. The office in San Juan, P. R., is being maintained in cooperation with the War Shipping Administration.

Publications

The year was slated to be the first complete year of Bureau publications under the reorganization program completed in fiscal year 1941. Publications were grouped under three headings—economic, industrial, and international. Under each group were three classifications—periodicals, reference service, and special publications.

However, on December 8, 1941, by the order of the Under Secretary of Commerce, the paid reference services were suspended for the duration. All publication of import and export statistics other than those already in work was stopped, and the proposed list of special publications was trimmed to those most helpful to the war program.

The dissemination of information to the public was concentrated in the three periodicals of the Bureau: Survey of Current Business,

Domestic Commerce, and Foreign Commerce Weekly, and a limited list of special publications, in addition to those mentioned previously in this report.

Periodical Subscriptions Increased

Many of the published services which were suspended were proving extremely popular with the public, and their subscription lists were constantly growing. Because of the elimination of services particularly important to special business groups, an increased number of subscriptions to the remaining periodicals was received. Although no promotional efforts have been made on the periodicals since the war began, there has been a steady increase in subscriptions and an increased demand from other Government agencies who use the publications in their work. In addition, the periodicals are used to obtain needed commercial publications on an exchange basis and, through book reviews, to obtain valuable additions to the Department library. Approximately 900 business and professional journals, and a total of 1,005 books on business, economic, and international subjects, were acquired.

Editorial programs have been designed to provide information helpful to individuals and firms caught in the perplexities of the war program. Broad dissemination of Bureau material has been achieved through quotations from Bureau publications in newspapers and trade publications.

In addition to special publications previously mentioned, the Bureau produced two widely used works: "Modern Ship Stowage," an authoritative publication on methods and problems of stowing cargoes, has been purchased in considerable numbers for use in making up ship loads and as a text for men being trained for the merchant marine; "How to Sell the Government for Civilian Needs" has been distributed widely to business to supplement the publications on selling to the Army and to the Navy, published by the two armed services.

Appropriations

Salaries and expenses, Bureau of Foreign and Domestic Commerce	$1,403,230.00
Field office service, Bureau of Foreign and Domestic Commerce	424,395.00
Working fund, Commerce, Foreign and Domestic Commerce (Board of Economic Warfare, National Defense)	368,750.00
Emergency Relief, Commerce, Administrative Expenses (transfer from W. P. A.)	18,596.00
Total	2,214,971.00

Personnel

Type of employment	Employees on payroll June 30, 1942		
	District of Columbia	Field	Total
Permanent	600	135	735
Temporary	13	1	14
Indefinite (war service)	220	17	237
Total	833	153	986

Patent Office

RECEIPTS AND EXPENDITURES

Substantial decreases in the number of applications for patents and trade-marks and concurrent reductions in the totals of such grants and registrations resulted in a considerable decline in the earnings of the Patent Office in the fiscal year ended June 30, 1942. Net receipts for the 12 months were $3,917,833.69, or $471,113.90 less than in the equivalent period of 1940–41. Expenditures in the fiscal year 1942 were $4,726,304.28, or $808,470.59 in excess of income.

Again in 1942, as in the preceding year, the number of applications filed by foreigners diminished notably. Other conditions attributable to the war curtailed the filing of applications by American citizens and in turn lessened the number of patents issued. Applications for patents in 1942, including those for plants and designs, numbered 53,551, as against 65,356 in 1941. In the 12 months closing with June 30, 1942, there were 12,103 applications for the registration of trade-marks, compared with 14,302 in the preceding year. Applications for design patents numbered 5,568 in 1942, contrasted with 8,462 in 1941. Including those covering designs, plants, and reissues, the total of patents granted in 1942 numbered 45,926. This was 2,523 fewer than in 1941. Prints and labels were formerly registered by the Patent Office, but this function was transferred in 1940 to the Copyright Office.

In 1942, for the first time since 1800, even in periods of war, the Patent Office was removed from Washington. By Executive order the transfer from Washington to Richmond, Va., began on January 31 and was completed on February 21, 1942. Of the total of 1,428 employees, 1,088 were allocated to Richmond. All of the examining divisions except that concerned with trade-marks, and the major part of the equipment and records, including the files pertaining to pending applications, are now in the Richmond branch.

At the end of the fiscal year, 133 former employees of the Patent Office were serving in the armed forces. The number of employees transferred from the Office to war activities was 79.

PATENT OFFICE WAR DIVISION

The Commissioner of Patents was authorized by an act of Congress (Public, No. 700) approved July 1, 1940, to order an invention revealed in an application for patent to be kept secret and to withhold the grant of a patent whenever disclosure of the invention might be detrimental to the public safety or defense. Public, No. 700 was amended by Public, No. 239, Seventy-seventh Congress, approved

August 21, 1941, to empower the Commissioner of Patents to control by means of a licensing system the foreign filing of applications covering inventions made in the United States. By authority of this act he created, under date of September 24, 1941, a new division of the Patent Office to be known as the Licensing Division. An important purpose of the amendatory act, Public, No. 239, was to supplement the control of information of war value by Public, No. 700. Under the latter act, before its amendment, an application could be filed in a foreign patent office for an invention made in the United States before filing in the United States Patent Office, or without filing in this country at all, in either case defeating the purpose of holding in secrecy inventions of value for public safety and defense. That the act, Public, No. 239, has been effective for its purpose is attested by the fact that of over 50,000 petitions for license filed in about 9 months ending June 30, 1942, only 51 related to subject matters which were not disclosed in corresponding United States applications.

The Patent Office Defense Committee became the Patent Office War Committee by Commissioner's order of April 8, 1942, and under date of June 5, 1942, the Patent Office War Committee and the Patent Office Licensing Division were consolidated as one division under the title, Patent Office War Division. This Division has been retained in Washington for collaboration with advisory agencies in selecting cases to be placed under secrecy orders. The advisory agencies include the War and Navy Departments, represented by the Army and Navy Patent Advisory Board, the War Production Board, the Office of Scientific Research and Development, and the Office of the Petroleum Coordinator for War. In order to carry on the work of selection of cases for secrecy which primarily devolves upon the examining divisions of the Patent Office, now located in Richmond, Va., the following members act as a Richmond War Committee: David Ringle, Vernon I. Richard, Mark Taylor, and Winfred M. Adams.

During 2 years of operation of Public, No. 700, more than 200,000 applications have been considered for the discovery of subject matter of war value and 12,182 of these were submitted to the advisory agencies. Upon the recommendation of these agencies, 1,969 secrecy orders were issued. In order to provide for proper use and development in the United States and for cooperation with our Allies in the war, 1,141 permits modifying secrecy orders to allow disclosure to responsible persons and filing in the patent offices of the Allies of the United States have been issued. During the 2-year period 235 secrecy orders have been rescinded.

Public, No. 609, Seventy-seventh Congress, approved June 16, 1942, provides that Public, No. 700, Seventy-sixth Congress, and Public, No. 239, Seventy-seventh Congress, shall remain in force during the time the United States is at war.

CONDITION OF THE WORK

Applications pending on June 30, 1942, numbered 95,265, or 9,692 less than the total on June 30, 1941. Cases disposed of during the fiscal year 1942 were 59,763, as against 62,281 in 1940–41. Cases awaiting action were 46,240, compared with 42,106 on June 30, 1941.

The decrease in the number of cases disposed of and increase in the number awaiting action reflect the confusion and interruption of the examining work due to the transfer of the examining corps from Washington, D. C., to Richmond, Va.

The work of four examining divisions was within 3 months of current at the end of the year. Of the remaining divisions, eight were between 3 and 4 months in arrears; eleven divisions were behind 4 and 5 months; fourteen were between 5 and 6 months in arrears; twelve divisions were behind 6 and 7 months; and the remaining fifteen were between 7 and 8 months in arrears.

CLASSIFICATION OF PATENTS

Four classes, including patents covering ammunition and explosives, were revised in the course of the fiscal year. In addition, 136 subclasses, comprising 5,783 original patents and 5,837 cross-references, were abolished, and 182 new subclasses, comprising 4,590 original patents and 5,521 cross-references, were established. By reason of reduction of the examining personnel, the work of revising on 8 classes, embracing approximately 58,000 original patents, had to be abandoned. In the course of the year 7 members of the examining corps transferred to other agencies or entered the military service, and none was replaced. There was a decrease also in the number of the clerical personnel.

On March 23, 1942, the work of classifying foreign patents was assigned to this division. From that date to June 30, 1942, a total of 39,259 foreign patents were sent to the appropriate examining divisions. Approximately 33,000 foreign patents were mounted and returned to the various examining divisions.

Written decisions as to division were made in respect to 2,626 applications. Disposition was made of 179 cases without written decisions. In all, 677 written decisions were submitted as to assignment of applications for examination in instances in which two or more examiners questioned the propriety of the allocation; and 2,200 oral decisions satisfactory to the examiners were given. Interviews numbering 6,776 were accorded to examiners and other employes of the Office regarding matters of classification, division, and field of search. There were accorded to attorneys and others not identified with the Office interviews on similar subjects.

SPECIAL CASES

During the last fiscal year, 210 petitions were received from applicants seeking to have their applications examined out of turn in accordance with the practice of granting such special status when there is a prospect that the issuance of a patent will result in investment of capital and employment of labor in the manufacture of the inventions covered or would otherwise be of public benefit. The total of such petitions was 65 less than was received in 1941. Of the petitions filed in 1942, 74 were granted, 36 receiving this favorable consideration in the interest of prospective manufacture necessitating original or additional use of capital and labor.

PATENT OFFICE ADVISORY COMMITTEE

The Patent Office Advisory Committee continued to meet at regular intervals during 1941–42.

Proposals for suggested amendments to patent laws, internal procedure, and the Rules of Practice in the Patent Office received continuing consideration and study. Recommendations for changes in rules and suggestions for amendments to the patent laws with a view to aiding the war effort were forwarded from time to time to the Secretary of Commerce through the Commissioner of Patents.

The Committee has endeavored through its recommendations and suggestions to keep the Patent Office practice in step with the changes necessitated by the war effort and to suggest ways in which the patent system as a whole can aid more effectively the Nation during the present period.

The Committee continued its cooperation with the Commissioner of Patents and the other officials and, when requested, furnished material for other Government agencies.

The members of the Committee are: George Ramsey, New York, N. Y., chairman; John J. Darby, Washington, D. C.; John A. Dienner, Chicago, Ill.; Franklin E. Hardy, Pittsburgh, Pa.; Delos G. Haynes, St. Louis, Mo.; Herman Lind, Cleveland, Ohio; Robert Lund, St. Louis, Mo.; John D. Myers, Philadelphia, Pa.; Fin Sparre, Wilmington, Del.; Milton Tibbetts, Detroit, Mich.; Charles E. Townsend, San Francisco, Calif.; and W. W. Wheeler, Hartford, Conn.

LEGISLATION

In addition to Public, No. 239, approved August 21, 1941, and Public, No. 609, approved June 16, 1942, which are discussed in connection with the Patent Office War Division, Congress also enacted Public, No. 221, which was approved August 18, 1941. This law amended section 4898 of the Revised Statutes (U. S. Code, title 35, section 47) to provide for the recording of assignments of patent applications in the same manner as assignments of patents are recorded in the Patent Office.

NATIONAL PATENT PLANNING COMMISSION

An event of impressive import to the Office and to the whole patent system was the President's creation of the National Patent Planning Commission by his Executive Order No. 8977, on December 12, 1941. By this directive, the "Commission is authorized, in conjunction with the Department of Commerce, to conduct a comprehensive survey and study of the American patent system, and consider whether the system now provides the maximum service in stimulating the inventive genius of our people in evolving inventions and in furthering their prompt utilization for the public good; whether our patent system should perform a more active function in inventive development; whether there are obstructions in our existing system of patent laws, and if so, how they can be eliminated; to what extent the Government should go in stimulating inventive effort in normal times; and what methods and plans might be developed to promote inventions and discoveries which will increase commerce, provide employment, and

fully utilize expanded defense industrial facilities during normal times."

The order further provides that "The Commissioner of Patents and his office will assist the Commission, which is also authorized to call upon other offices and agencies of the Government for such aid and information as may be deemed necessary for its work." The Commissioner was chosen as executive secretary of the Commission. Members of the Commission are Dr. Charles F. Kettering, Chairman; Hon. Chester C. Davis; Dr. Francis P. Gaines; Hon. Edward F. McGrady; and Mr. Owen D. Young.

STATISTICS

Following is presented the usual statistical information regarding the activities of the Patent Office.

Applications received during the fiscal year ended June 30, 1942 [1]

With fees:		
Applications for patents for inventions	47,710	
Applications for patents for designs	5,568	
Applications for reissue of patents	273	
		53,551
Applications for registration of trade-marks		[2] 12,103
Total, with fees		65,654
Without fees:		
Applications for inventions (act March 3, 1883)	759	
Applications for reissue (act March 3, 1883)	2	
Applications for reissue (rule 170)	3	
Total, without fees		764
Grand total		66,418

[1] Including applications in which fees were refunded and transferred.
[2] Includes 3,106 applications for renewal of trade-mark registrations.

Applications for patents for inventions with fees

Year ended June 30—		Year ended June 30—	
1933	59,408	1938	66,050
1934	56,095	1939	66,166
1935	56,832	1940	61,425
1936	59,809	1941	56,578
1937	63,772	1942	47,710

Applications for patents, including reissues, designs, trade-marks, labels and prints, with fees [1]

Year ended June 30—		Year ended June 30—	
1933	79,469	1938	92,018
1934	79,367	1939	91,163
1935	81,000	1940	87,059
1936	85,102	1941	[1] 79,658
1937	89,980	1942	[1] 65,654

[1] Labels and prints not included after July 1, 1940; transferred to Register of Copyrights.

Patent applications awaiting action

June 30—		June 30—	
1933	49,050	1938	45,723
1934	39,226	1939	42,215
1935	31,920	1940	44,902
1936	33,540	1941	42,112
1937	38,121	1942	46,239

Patents withheld and patents expired

	1941	1942
Letters patent withheld for nonpayment of final fees	3,260	3,107
Applications allowed awaiting payment of final fees	16,730	18,183
Patents expired	45,218	46,464
Applications in which issue of patent has been deferred under sec. 4885 R. S.	747	801
Applications in process of issue	3,520	3,008

Patents granted and trade-marks, labels and prints registered [1]

	1938	1939	1940	1941	1942
Letters patent	36,672	41,908	41,708	41,335	40,613
Plant patents	28	52	73	71	52
Design patents	5,142	5,154	5,779	6,695	4,980
Reissue patents	343	359	364	348	281
Trade-marks	10,529	10,591	10,254	9,439	7,763
Labels	1,806	1,770	1,856	----------	----------
Prints	609	545	614	----------	----------
Total	55,129	60,379	60,648	57,888	53,689

[1] Labels and prints not included after July 1, 1940; transferred to Register of Copyrights.

Statement of receipts and earnings for the fiscal year ended June 30, 1942

Unearned balance at close of business June 30, 1941	$220,466.10	
Collections during fiscal year ended June 30, 1942	3,716,658.97	
Total	3,937,125.07	
Refundments	19,291.38	
Net collections		$3,917,833.69
Earnings:		
Inventions, first fees	$1,428,330.00	
Extra claims	24,182.00	
Reissues	8,040.00	
Designs	57,520.00	
Design extensions	26,470.00	
Trade-marks	178,485.00	
Oppositions	7,950.00	
Recording articles of incorporation	638.00	
International trade-mark search	15.00	
Total		1,731,630.00
Final fees	$1,209,930.00	
Extra claims	13,459.00	
Disclaimers	1,660.00	
Total		1,225,049.00
Appeals	$65,145.00	
Revivals	5,410.00	
Total		70,555.00
Printed copies, etc	$348,572.55	
Photoprints	7,654.10	
Photostats	50,967.65	
Manuscripts	86,496.55	
Certified printed copies	4,717.60	
Total		498,408.45
Registration of attorneys		770.00
Court costs refundments		2,240.92

Statement of receipts and earnings for the fiscal year ended June 30, 1942—Con.

Earnings:		
Drawings		$14,664.20
Assignments		134,710.50
Total earnings		3,678,028.07
Unearned balance June 30, 1942		239,805.62
Net receipts		3,917,833.69
Expenditures, fiscal year ended June 30, 1942		
Salaries		$3,623,820.94
Photolithographing:		
Current Issue, black and white	$42,521.13	
Current Issue, color	9,412.00	
Reproduction, black and white	102,654.58	
Photographic printing	11,490.14	
Photostat supplies	19,059.86	
Total		185,137.71
Miscellaneous expenses		59,440.39
Printing and binding:		
Specifications	$688,116.19	
Official Gazette	90,308.32	
Indexes	11,230.44	
Total		789,654.95
Miscellaneous		67,000.00
Travel expenses: Public use, etc		1,250.29
Total		4,726,304.28
Receipts and expenditures		
Receipts from all sources		$3,917,833.69
Expenditures		4,726,304.28
Deficit		808,470.59
Receipts from sale of Official Gazette and other publications (Superintendent of Documents)		74,535.85

Comparative statement

June 30—	Receipts [1]	Expenditures	Deficit	Surplus
1933	$4,423,563.18	$4,588,585.02	$165,021.84	
1934	4,383,468.11	3,876,785.01		$506,683.10
1935	4,264,874.67	4,153,591.21		111,283.46
1936	4,368,099.17	4,446,463.69	78,364.52	
1937	4,565,501.69	4,492,273.47		73,228.22
1938	4,551,298.87	4,476,913.25		74,385.62
1939	4,742,617.26	4,615,505.11		127,112.15
1940	4,563,916.32	4,663,539.42	99,623.10	
1941	4,369,608.07	4,743,990.88	374,382.81	
1942	3,917,833.69	4,726,304.28	808,470.59	

[1] Does not include the amount received by the Superintendent of Documents for the Official Gazette and other publications.

Comparative statement of expenditures under separate appropriations

Appropriation	1941	1942
Salaries	$3,625,559.74	$3,623,820.94
Photolithographing	211,600.17	185,137.71
Printing and binding	789,897.01	789,654.95
Miscellaneous printing and binding	49,000.00	67,000.00
Miscellaneous expenses	67,550.91	59,440.39
Travel expenses	383.05	1,250.29
Total	4,743,990.88	4,726,304.28

Litigated cases

Patent:			
Interferences declared			791
Interferences disposed of before final hearing			794
Interferences disposed of after final hearing			206
Interferences heard			213
Interferences awaiting decision			58
Trade-mark:			
Interferences declared			69
Oppositions instituted			777
Cancelations instituted			149
Interferences disposed of before final hearing			722
Interferences disposed of after final hearing			421
Interferences heard			399
Interferences awaiting decision			23
Before the Board of Appeals:			
Appeals in ex parte cases		4, 167	
Appeals in interference cases:			
Priorities	28		
Motions	3		
		31	
			4, 198
Ex parte appeals decided		4, 356	
Appeals in interference cases decided:			
Priorities	55		
Motions	9		
		64	
			4, 420
Ex parte cases awaiting action		2, 395	
Interference cases awaiting action:			
Priorities	10		
Motions	5		
		15	
			2, 410
Oldest ex parte case awaiting action		March 11,	1942
Oldest interference case awaiting action		June 5,	1942
To the Commissioner:			
Appeals in trade-mark interferences	11		
Appeals in trade-mark oppositions	125		
Appeals in trade-mark cancelations	10		
Appeals in ex parte trade-mark cases	43		
Interlocutory appeals	5		
		194	
Petitions to Commissioner:			
Ex parte	865		
Inter partes	81		
To make special	210		
To revive	383		
Renewed petitions to revive	82		
Delayed final fee	194		
Renewed petitions for delayed final fee	68		
Under rule 78	5, 903		
		7, 786	
			7, 980
Cases disposed of by Commissioner:			
Appeals in trade-mark interferences	9		
Appeals in trade-mark oppositions	95		
Appeals in trade-mark cancelations	7		
Appeals in ex parte trade-marks	33		
Interlocutory appeals	5		
		149	

Litigated cases—Continued

Cases disposed of by Commissioner—Continued			
Petitions disposed of:			
Ex parte		865	
Inter partes		81	
To make special		210	
To revive		383	
Renewed petition to revive		82	
Delayed payment of final fee		194	
Renewed petition for delayed final fee		68	
Under rule 78		5, 903	
		7, 786	
			7, 935

Cases in the District Court of the United States for the District of Columbia

Cases pending July 1, 1941		117
Cases filed July 1, 1941–June 30, 1942		125
Total		242
Cases disposed of:		
Patent Office affirmed	35	
Patent Office affirmed only in part	2	
Patent Office reversed	6	
Dismissed for want of prosecution	11	
Dismissed by stipulation	37	
Dismissed on motion of Commissioner	2	
Total disposed of		93
Total pending on June 30, 1942		149

Cases in the United States Court of Appeals for the District of Columbia

Cases pending on July 1, 1941		26
Appeals taken from July 1, 1941–June 30, 1942		21
Total		47
Cases disposed of:		
Patent Office affirmed	16	
Patent Office reversed or affirmed only in part	4	
Dismissed on agreement of counsel	2	
Total disposed of		22
Total pending on June 30, 1942		25

Cases in the United States Court of Customs and Patent Appeals

Number of notices of appeals:		
In ex parte cases (including 4 trade-marks)	118	
In inter partes cases (patents)	61	
Ex parte design application	2	
In trade-mark oppositions	16	
In trade-mark cancelations	4	
Total		201
Number of cases pending on July 1, 1941		85
Number of cases docketed in court July 1, 1941–June 30, 1942		166
Rehearings granted		2
Total		253

Cases in the United States Court of Customs and Patent Appeals—Continued

Cases disposed of:		
Inter partes cases:		
Patent Office affirmed or appeal dismissed	46	
Patent Office reversed or affirmed only in part	11	
Ex parte cases:		
Patent Office affirmed or appeal dismissed	50	
Patent Office reversed or affirmed only in part	18	
		125
Number of cases pending June 30, 1942		128

OTHER DETAILS OF BUSINESS FOR THE FISCAL YEAR

As to the volume of business, the Office received during the year 53,551 applications for patents, reissues, and designs; 8,997 trade-mark applications and 3,106 applications for renewal of trade-mark registrations; 147,583 amendments to patent applications, 9,695 amendments to design applications, and 13,470 amendments to trade-mark applications.

The number of letters constituting the miscellaneous correspondence received and indexed was 386,687. In addition 26,944 letters were returned with information.

The number of printed copies of patents sold was 3,407,088; 1,007,897 copies of patents were shipped to foreign governments and 842,045 copies were furnished public libraries. The total number of copies of patents furnished was 6,019,107, including those for Office use and for other Departments.

The Office received for record 40,356 deeds of assignment.

The Drafting Division made 256 drawings for inventors and corrected 5,303 drawings on request of inventors; in addition 1,908 drawings were corrected for which no charge was made, 53,688 sheets of drawings were inspected, and 7,472 letters answered.

Typewritten copies of 4,252,300 words were furnished at 10 cents per hundred words. The Office certified to 13,572 manuscript copies, and furnished 4,446 miscellaneous certified copies. The Office also furnished 391,507 photostatic copies of manuscript pages; 29,164 photographic copies and 242,703 photostatic copies of publications and foreign patents for sale; 18,121 photostat-manuscript pages were furnished for departments and the Patent Office without charge; 118 certified manuscript copies were furnished for departments without charge; 12,265 photostatic copies were furnished for other departments; 25,493 photostatic and 16,670 photographic copies for use of the Patent Office; 10,314 photostats were furnished through the photoprint section for sale; 432 photostats for Office use; 62,850 copies of assignments, including 147 secret assignments to Division D; 359 disclaimers to Division B; 4,986 photostats of grants to certificate desk; in all, 769,030 photostatic and 35,834 photographic copies were furnished.

National Bureau of Standards

GENERAL ACTIVITIES

During the fiscal year 1942 the members of the Bureau's scientific and technical staff devoted a large part of their time to confidential problems connected with the prosecution of the war. The following report deals with activities outside of this category.

Finances, plant, and personnel.—The Bureau's appropriation for 1942 was $2,968,000. In addition, $398,941 was made available in deficiency items. This total of $3,366,941 included $230,000 for the construction of a new station for broadcasting standard frequency signals, $600,000 for building and equipping a new materials-testing laboratory, and $280,000 for constructing a service building and for the addition of one story to the main radio laboratory. The sum of $24,000 was allotted for travel, and $40,900 for printing and binding, from the funds of the Department of Commerce.

On February 9, 1942, ground was broken for the materials-testing laboratory located at the southwest corner of the 12.5-acre tract acquired last year. In spite of unusual concrete work and delays inseparable from war conditions, reasonable progress has been made. The construction of the new radio transmitting station at Beltsville, Md., was started on April 16; the walls are up and the antenna system is about half completed. A new Bureau telephone exchange (dial system) was placed in service.

On March 10, the Secretary of War, acting through the Provost Marshal for the District of Columbia, ordered Van Ness Street, between Connecticut Avenue and Reno Road, closed to the public. This action, which had been advocated for more than a year by the Bureau, together with the completion of a modern fence around the property, has considerably simplified the problem of guarding the plant.

The regular staff, including temporary employees, at the close of the year numbered 1,709, an increase of 505 as compared with June 30, 1941. This is the largest number of persons ever employed at the Bureau. Fifty-two research associates, representing 15 national engineering societies and trade associations, are working in the Bureau's laboratories on problems of mutual interest to the Government and industry.

Testing.—The fee value of tests and calibrations (mainly tests of supplies purchased by the Government) shows the unusual increase of 33 percent as compared with last year.

Publications.[1]—Printed publications in the Bureau's own series

[1] On the following pages a letter and a number in parentheses identify the series and number of Bureau publications. RP refers to a research paper from the Journal of Research of the National Bureau of Standards; C, Circular; BMS, Building Materials and Structures; H, Handbook; R, Simplified Practice Recommendation; CS, Commercial Standard; LC, Letter Circular (mimeographed); TNB, Technical News Bulletin; M, Miscellaneous.

492615—43——9

numbered 162, and 93 articles by members of the staff appeared in scientific and technical journals and books. Thirty-eight mimeographed letter circulars were prepared and distributed on request. Five more mathematical tables have been printed in the series which the Bureau is sponsoring, making 12 that are now available. The number of copies sold was 2,686, for which $4,812.20 was received.

Visiting committee.—The present membership of this committee is: Gano Dunn, chairman of the J. G. White Engineering Corporation; Dr. Frank B. Jewett, president of the Bell Telephone Laboratories; Dr. Karl T. Compton, president of the Massachusetts Institute of Technology; Dr. William B. Coolidge, director of the research laboratory of the General Electric Co.; and Dr. Vannevar Bush, director of the Office of Scientific Research and Development. A meeting was held in Washington on May 7.

Award of "E" pennant.—On February 21, the United States Navy Department presented the Navy "E" pennant to the Bureau in recognition of its excellent record in handling problems submitted by the Bureau of Ordnance. The presentation took place during a simple but impressive ceremony, attended by the Secretary of Commerce, the Commandant of the Washington Navy Yard, and members of the Bureau's staff. Later the Bureau was notified that it had been awarded an "All Navy E", covering work for the entire Department (TNB299).

National Conference on Weights and Measures.—A poll of the heads of State weights and measures organizations showed a 2-to-1 sentiment against holding a meeting this year. This result was placed before the executive committee of the Conference, and by formal vote it was decided to accept the judgment of the State officials. The Conference is continuing to function through its committees, and the secretary is making every effort to keep the membership informed of current developments in the field of weights and measures administration.

Conference of public-utility engineers.—The twentieth conference was held in Washington on May 22 and 23, under the chairmanship of Frederick E. Mindt, rate engineer of the Public Service Commission of New Hampshire. Thirty-six engineers from 23 States, the District of Columbia, and the Province of Quebec were present. The Federal Government was represented by 10 engineers from 4 regulatory commissions, 2 officials of the War Production Board, and 5 members of the Bureau's staff. Eleven papers were presented and discussed (TNB303).

Screw-thread standards.—The Interdepartmental Screw Thread Committee continued its close cooperation with manufacturers and users of threaded products. A new and enlarged edition of "Screw-Thread Standards for Federal Services" (H28) was published and 20,000 copies have been sold. This contains dimensional specifications and tolerances; classification of screw-thread fits; dimensions for screw heads, bolt heads, nuts, wrench openings, tap drills, and gages; and information on threading and gaging practice as applied to interchangeable manufacture.

Federal specifications.—The Director served as chairman of the Federal Specifications Executive Committee, under the auspices of which 1,459 specifications have been prepared for the use of the executive departments and establishments of the Government. The

Bureau's part of the work required cooperation with 70 other agencies of the Federal Government. It has representation on 63 of the 69 technical committees of the FSEC, holds chairmanship of 35 of these committees, vice chairmanship of 8, and secretaryship of 4. It has been active in the preparation of Emergency Alternate Federal Specifications of which more than 473 have thus far been issued.

American Standards Association.—The Bureau is sponsor or cosponsor of 16 projects under the procedure of the American Standards Association, including those relating to 4 safety codes and 1 building code. In addition, 11 of its commercial standards and 2 of its simplified practice recommendations have been approved by the Association. One hundred fifty-nine representatives of the Bureau serve on 103 technical (sectional) committees; it holds chairmanship of 8 of these committees, vice chairmanship of 2, and secretaryship of 5. It is also represented on the following coordinating agencies of the Association: Board of Directors; Standards Council; Electrical Standards Committee; Mechanical Standards Committee; Advisory Committee on Ultimate Consumer Goods; Safety Code Correlating Committee; and Building Code Correlating Committee. All of the code requirements formulated under the auspices of the Bureau have been accepted as a basis for the development of safety, building, and plumbing codes under the American Standards Association procedure. Two members of the Association's staff are located at the Bureau to facilitate the cooperative work of the two organizations.

American Society for Testing Materials.—The Bureau has 326 representations on technical committees and subcommittees of the ASTM, a national technical society devoted to the promotion of the knowledge of engineering and the standardization of specifications and methods of testing. The Bureau holds chairmanship of 33 of the ASTM committees, vice chairmanship of 4, and secretaryship of 13. Dr. G. E. F. Lundell of the Bureau staff served as president of the ASTM during the past year.

ELECTRICITY

High-voltage laboratory.—Elaborate control and safety circuits for the sets of high-voltage equipment have been installed in the new building. Acceptance tests on the set of 3 transformers, which in cascade give 1,050,000 volts at 60 cycles per second, were completed. The motor-generator set which supplies these transformers was found to have a nearly perfect sinusoidal wave form. The 2,000,000-volt surge generator for supplying electrical surges similar to those which occur in lightning has been put in operation and has proved very useful. The old equipment for testing insulating materials up to 60,000 volts has been moved into the new building, thus releasing the old and much smaller high-voltage laboratory for other work.

Radio.—Knowledge of radio transmission in polar regions was advanced by an Arctic expedition in 1941, directed and financed by Miss Louise A. Boyd. Two members of the Bureau's staff accompanied the expedition which went west of Greenland to latitude 78°. Ionospheric, magnetic, radio intensity, aurora, and ultraviolet measurements were made (TNB296).

Many diathermy generators were tested in cooperation with the

Federal Communications Commission, American Medical Association, and equipment manufacturers. As a result, several manufacturers produced satisfactory generators having extremely high constancy of frequency. This goes far toward solving the problem of diathermy interference with radio communication.

The electric hygrometer for the radio sonde was further improved by the use of a new active film material; it may now be subjected to very high humidities without harmful effects. The range of indication obtainable with a single hygrometer unit was extended. The instrument was adapted to numerous applications, including the study of humidities at high altitudes.

Some improvements were made in the standard frequency broadcast service despite the fact that the apparatus has been housed in temporary quarters since the fire of November 6, 1940. New transmitters and a new building have now been designed, and construction is under way. The coverage of the broadcast was increased by the inauguration of continuous service on a second radio carrier frequency; the frequency 5,000 kilocycles per second in general covers the shorter distances, and 15,000 the longer distances. The broadcast includes also the standard of musical pitch (440 cycles per second) and standard time intervals. The latter are so synchronized with the basic time service of the United States Naval Observatory as to mark accurately the hour and successive 5-minute periods.

Standards of electromotive force.—The substitution of deuterium oxide ("heavy water") for normal water in saturated cells affords a possibility of obtaining a type of cell suitable for use as a reference standard for the international volt. The work previously done on this project has been extended to include concentrations up to 98 mole percent of deuterium oxide. The electromotive force of cells containing heavy water is lower than that of ordinary cells in proportion to the amount of deuterium oxide present. Cells containing the higher percentages are fully as reproducible and constant in electromotive force as the older type of cell. In some respects they may be superior. A detailed report on such cells has been published (RP1435).

Standardization of dry cells and batteries.—Frequent revision of the American Standard Specifications for dry cells is necessary to take account of changes in industrial practice. Under the procedure of the American Standards Association, the Bureau is sponsor for such revisions, which are made by a committee including manufacturers and users of batteries. A revised specification covering new types and new uses for batteries, as well as some increase in the requirements for performance of cells, was approved and issued during the year as American Standard C18–1941 (C435).

WEIGHTS AND MEASURES

Increased testing demands.—In certain sections of the Division the demands for testing and certifying measuring equipment have very greatly increased. This applies particularly to glass volumetric apparatus, hydrometers, sieves, engineering and geodetic tapes, haemacytometer chambers and cover glasses, and gage blocks. The testing and certification of precision gage blocks, which serve as master standards in the production and inspection of war materials, air-

planes, tanks, trucks, guns, and ammunition, is of the most urgent military importance. Unfortunately, the demand for these blocks has been such as to encourage their production by firms without adequate experience or equipment. The testing of large numbers of seriously defective and inaccurate blocks has placed an added burden on the Bureau, without a proportionate increase in the number of satisfactory blocks made available for use.

Test of master gages.—The number of gages measured and certified has increased, and a considerable change has taken place in the proportion of various types submitted for test. The checking of inspection gages for munitions has been done at 13 district gage laboratories, the aresenals, and other agencies under Government control. In general, the Bureau's work on munition gages has been limited to measurements of master gages for these agencies and for gage manufacturers. A large proportion of the master gages submitted has consisted of precision gage blocks, gage-block accessories, thread-measuring wires, and gage and tool makers' measuring rolls. Approximately 13,000 gage blocks, or 4 times the number in the previous year, were measured and certified. Priority has been given to ordnance work, but gages for oil country tubular goods, penetration needles, polariscope tubes, etc., have been measured and reported without serious delay.

Intercomparison of length standards.—Air-conditioning equipment and fluorescent lighting have been installed in the comparator room, the ceiling has been insulated, and other changes made so that it is now possible to maintain a temperature of 20° C in the comparator. Under these improved conditions several series of intercomparisons of length standards have been carried out. The fundamental series was an intercomparison of the Bureau's laboratory standard meters, United States Prototype Meter No. 27 having been included in the group. The results of these measurements indicate, first, that minor inconsistencies found in some previous calibrations have been caused by slight temperature fluctuations, and, secondly, that the Bureau now has a sound basis for its length measurements. Intercomparisons of meter and decimeter bars, graduated in the Optics Division, have furnished valuable data for these studies.

Graduation of precision circles.—Six stainless steel circles, 4 inches in diameter, were graduated for a manufacturer of precision instruments. These circles are to be used in theodolites for the Engineer Corps of the Army. The Bureau's testing equipment was modified so that these circles, and even smaller ones, can now be checked using the same procedure as for larger circles. These six circles were found to be of the same high degree of accuracy as those graduated at this Bureau for first-order theodolites of the United States Coast and Geodetic Survey and other organizations. In recent months, experiments have been made in graduating precision circles on materials that might be more suitable than stainless steel for use in Army theodolites.

Railway track scales.—The Bureau's three railway track scale testing equipments tested 18 of the 19 master railway track scales in the United States, 1,033 commercial track scales, and 2 special locomotive wheel-load scales. Sixteen test-weight cars were weighted in the field and 50 were standardized on the master scale at Clearing. The tests of commercial railway track scales were made in 35 States; 79 percent of these scales was found to be accurate, an increase of 1.4

percent as compared with last year, and the mean of the maximum percentage errors was 0.18 percent, as compared with the basic tolerance of 0.20 percent and last year's figure of 0.19 percent. Substantially the same number of railroad-owned and industry-owned commercial railroad scales were tested (510 and 523, respectively), but the level of accuracy of the railroad-owned scales was considerably higher than that of the industry-owned scales.

Cooperation with the States.—In order to assist in the coordination of weights and measures regulatory work carried on by the States and their local subdivisions, the Bureau has participated in conferences in several States. Efforts have been made to strengthen weights and measures statutes and organizations where the need for this exists.

A resurvey of wagon and motortruck scale conditions was made in the State of Georgia; this was followed by a series of tests of vehicle scales installed in military and naval establishments in the region traversed by the Bureau's testing unit on its return to Washington.

Dental research and testing.—Cooperation with the American Dental Association was continued on a somewhat reduced scale because of the loss of one research associate to industry and the calling of another to active duty as an officer in the United States Navy. Researches on corrosion of dental alloys were completed and an important discovery, relative to damage that may be done to an amalgam alloy if it is mixed in the palm rather than in a mortar or other clean mixing device, was confirmed and explained (TNB295). The moisture and salt contamination from the palm may cause excessive expansion of the restoration.

A satisfactory substitute was found for the tinfoil ordinarily used as a separating medium in the curing of dental resins. An alginate film was produced which protects the resins as effectively as does tinfoil (TNB304).

Dental materials were tested for compliance with Federal and other specifications. Although much improvement in dental materials is shown, failure to meet the specifications under which these materials are purchased is still not uncommon.

The printing of a circular entitled "Physical Properties of Dental Materials" (C433) has made available to the public the results of the Bureau's cooperative researches over a period of some 20 years.

HEAT AND POWER

Thermometry.—Two thousand four hundred sixty-six laboratory thermometers, 3 electrical thermometers, 3 industrial thermometers, and 9 hygrometers were tested for the public and for Government departments. Thirty-two percent of the total number of instruments tested was for Government departments, representing 29 percent of the total fee value. In the same period 117,263 clinical thermometers were tested for the public and Government departments, with testing for the Government totaling 84 percent of the test items, representing 93 percent of the total fee value.

Cooperation with the American Society for Testing Materials resulted in unifying ASTM and NBS thermometer specifications as nearly as possible, so that ASTM specified thermometers will meet the Bureau's requirements for certification.

Standards of ultraviolet radiation.—The radiation from tungsten-filament lamps with quartz windows has been compared with that from a black body at the freezing temperature of iridium (4450° F.) from a wave length of 0.7 *mu* (red light) to 0.23 *mu* in the ultraviolet. As a result of these determinations, working standards of spectral radiant energy in this range of wave lengths are now available.

Precision temperature measurements.—The development of new technique in resistance thermometry and in the measurement and control of pressure has made possible a precision of 0.0001° C. and an accuracy of a few ten-thousandths of a degree in measurement of the boiling point of water (steam point). Similarly, new technique has permitted measurement of the ice point and the triple point of water to an even higher accuracy. It is suggested that for precision temperature measurements the ice point be replaced by the triple point of water. Apparatus and procedure for conveniently attaining high accuracy at the triple point have been developed.

Heat transfer.—Testing equipment in operation included the air-filter apparatus, the shielded hot-box heat-transfer apparatus, the radiator and convector test room, the heating laboratory, the test bungalow, and the floor-heat-loss structure. Approximately 30 percent of the work since December has been done at the request of the armed services and something over 50 percent of the work now on hand was received from them.

In heating equipment, attention has been directed away from oil-burning devices and those in the luxury class, toward simpler (usually coal-burning) devices. The desire of the Government to save metal has been reflected in the attitude of manufacturers and the nature of the equipment they are submitting. Reduction of weight and substitutes for metal are receiving much attention.

Several air filters for motor vehicles operating under dusty conditions were tested.

A number of test reports on building materials was published (BMS74 and BMS78), and a paper on chimneys was presented before the American Society of Heating and Ventilating Engineers. The work on heat losses through floors is nearly completed and a paper on the subject is in preparation.

Thermal properties of gases.—The correlation and compilation of the thermal properties of hydrogen were completed and a similar project for nitrogen has been started. In connection with this project a study was made of the effect of high pressures on the viscosity and thermal conductivity of gases. The data for hydrogen are being prepared for publication.

Artificial rubber.—Measurements of the thermodynamic properties of an artificial rubber and of basic materials from which it is made were undertaken to provide physical data needed for the development of an efficient manufacturing process. A report on the subject will be published.

Absolute viscosity of water.—Experiments performed during the early part of the present fiscal year resulted in the completion of one phase of the investigation on the absolute viscosity of water, and a report is being prepared for publication.

Fire-retarding treatments.—A considerable volume of development work and testing was done on fire-retarding treatments, resulting

from the greatly increased use of textiles for military purposes, of textiles and paper as blackout materials, and of wood and other combustible materials as substitutes for metal and asbestos. This included, for the textiles, the effect of weathering, indoor exposure, laundering, and dry-cleaning.

Precision of motor-fuel testing.—The third triennial analysis to determine the precision of motor-fuel testing was completed in May 1942. This analysis was based on 6,925 knock ratings on 183 fuels and on nearly 3,000 sets of inspection data on 109 of these fuels. Since 1939 the precision of knock rating has continued to improve, the standard deviation for the CFR research method as well as the ASTM motor method now being less than one-half an octane unit (TNB304). The precision of other fuel inspection tests also was evaluated.

Calibration of carburetor jets.—A Government patent has been granted on an instrument recently developed for flow-testing the fuel-metering devices used in aircraft-engine carburetors. This orifice comparator, which employs air as the calibrating medium, gives accurate results rapidly and eliminates the fire hazard inherent in methods hitherto used.

Conservation of petroleum.—Nearly 100 proposals for saving gasoline or other petroleum products were handled for the Office of the Petroleum Coordinator. Engine or car tests were made in 12 cases which included naphthalene fuel dopes, air bleeds or squirrel cages in the intake manifold, a speed governor that operates a valve in the fuel line, a vacuum gage calibrated to read miles per gallon, and various attachments to the exhaust line.

Vapor lock in airplane fuel systems.—Through experimental investigations at the Bureau and coordination of the activities of the industry, progress has been made on various phases of the complex problem of vapor lock in airplane fuel systems. Much of the fundamental information has been obtained and a basic understanding of the problem has been reached. The optimum fuel-line size has been determined. This represents a compromise between line-pressure drop and possible obstruction of the fuel line by vapor at low speed of flow.

OPTICS

Microcopying films for archival storage.—Under authority of the Elliot bill (Public, No. 788, 76th Cong.), standards of quality of photographic films suitable for permanent record purposes have been set up and are in force. As part of the specification, manufacturers are submitting sample films to the Bureau for test. Random check tests are made from time to time on films supplied to users. This plan practically eliminates the use of unsatisfactory films for this purpose, and assures stability and permanence of microcopies of documents for archival and other use.

Spectrographic analysis.—The development of methods for the rapid quantitative analysis of strategic war materials received special attention. A method for the spark spectrographic analysis of commercial tin was published (RP1451) and several methods for the analysis of other materials were established. A project was initiated, in cooperation with the steel industry, for the preparation and distribution of 45 solid-rod spectrographic standards which are urgently

needed for calibrating spectrographic procedures used by industrial and by Army and Navy testing laboratories. In connection with this program, the analysis of steel was studied to determine optimum conditions of spark excitation, photography, and photometry. Analyses—mostly on war materials, and including tests for Army and Navy agencies—involved 30,191 qualitative and quantitative determinations, approximately double the figure for the previous year.

Atomic constants.—Atomic constants of chromium, columbium, molybdenum, antimony, thulium, and tantalum were determined, using new observational material derived from high-dispersion spectrograms and Zeeman-effect observations at the Bureau and at the Massachusetts Institute of Technology. Many new energy levels have been established for these elements, including those giving the ultimate rays of singly ionized tantalum atoms. Results for antimony have been published (RP1464); and similar data for other elements are available upon request.

Color measurement.—An "artificial eye for color measurement," consisting of a photocell and three selected spectral filters, has been developed at the Bureau. This equipment and suggested methods for using it to study uniformity and other color characteristics of paints, textiles, and other materials are described in a new circular (C429).

Aircraft and airport lighting.—In cooperation with the Bureau of Aeronautics, Navy Department, preparations have been made for inspecting glass and plastic ware used in the red and green running lights of aircraft, as well as the signal lights which assist in formation flying, and those used in landing on an aircraft carrier. Three different types of color comparators have been designed and built to test globes and prismatic covers.

The exigencies of the war have been reflected in the aviation lighting work for the Civil Aeronautics Administration. Type approval tests on the products of manufacturers who had not previously produced aviation lighting equipment have been required with unusual frequency. The Bureau has collaborated on specifications for the joint use of the Civil Aeronautics Administration and the armed forces, especially in the development of the specification for colors of aeronautical lights and lighting equipment.

Blackout lighting and materials.—In cooperation with the Engineer Board at Fort Belvoir, specifications have been prepared covering blackout lighting for streets, automobiles, and building interiors. For the Office of Civilian Defense, measurements were made of the light transmission of blackout materials and of the brightness-decay curves of phosphorescent substances.

Examination of crystalline quartz.—The Metals Reserve Company requested the Bureau to expand its facilities for the examination of quartz crystals, used in constructing radio oscillators. Accordingly, plans are now being prepared to care for a greatly increased volume of work. Quartz is examined for optical twinning, using a test which depends on interference fringes. Owing to more exacting requirements for the quality of crystals, it was found necessary to add a test for slight imperfections known as needles. Although this test considerably increases the total time necessary to complete the examination of a given crystal, the present rate of examination exceeds 75,000 pounds of crystals per month.

Standard of spectral transmission for the ultraviolet.—Lack of stability and other reasons make glass filters unsuitable for use as spectrophotometric standards in the ultraviolet. Various workers have studied aqueous solutions of potassium chromate for this purpose but the published results are somewhat divergent. Accordingly, the Bureau has measured the transmission of potassium chromate solutions prepared in different manners and kept in various containers, and standard data over a wide range of wave lengths have been obtained for the solutions which have proved stable.

Measuring specular gloss.—Reflection and gloss methods for measuring specular reflection have been improved. Measurements of low-gloss are being used for evaluating camouflage materials, and specular reflectance measurements at the upper end of the scale are employed for evaluating searchlight reflectors.

Abbe-type refractometers.—For several years this Bureau has been using refractometers of the Abbe type for measuring index and dispersion of optical glass and liquids, the results being checked from time to time against more precise measurements made on a spectrometer; refractometers have likewise been calibrated for the Government and the public. A publication on the subject is in press.

Large-scale testing of airplane camera lenses.—The large-scale testing of airplane camera lenses has continued, and as a byproduct, two publications have been prepared. One (RP1216) discusses the variations in the focal length and other properties of an airplane camera lens to be expected in lenses commercially produced; the second (in press) deals particularly with lenses of the extreme wide-angle type and the factors that govern the evenness of the illumination over the field.

Ultraviolet solar and sky radiation intensities.—A photoelectric recording apparatus was mounted on the mainmast of the schooner *Morrissey*, during the 1941 cruise of the Louise A. Boyd Arctic expedition. This gave a continuous record in absolute value of the intensity of the biologically effective ultraviolet radiation, from the sun and the entire sky, incident on a horizontal plane, under various meteorological conditions in high latitudes. This information is of much interest to the medical profession.

Ruling of line standards.—Using the wave length of the standard red radiation of cadmium as a unit of length (R=6438.4696A), meter line standards were produced in the interferential ruling machine that agree with the meter as defined by the Bureau's platinum standards to 0.2 micron (1 part in 5,000,000). Also, smaller scales were made with rulings 1, 2, 3, 5, and 10 microns apart to determine the resolving power of microscopes, and the size of colloidal particles.

Materials for jewel bearings.—Claims were made that the quality of low-grade diamonds for industrial purposes could be increased by thermal and chemical treatment. Measurements showed that no improvement in quality had resulted. At the request of the Army and Navy Munitions Board, micro-indentation tests were applied to synthetic sapphires and other materials to determine their suitability for urgently needed jewel bearings.

Knoop indenter.—Through cooperation with the manufacturers, the Knoop indenter, developed at the Bureau and successfully used for several years, was incorporated in a commercial micro-indentation tester.

X-ray equipment.—The 1,400,000-volt X-ray installation has been completed and has proved of great value in securing information needed for the design of protective equipment in various navy yards where 1,000,000-volt radiographic inspection equipment is in use. In order to speed the purchase of X-ray equipment by the War Department and safeguard the quality of apparatus delivered under emergency conditions, a program of X-ray equipment testing and inspection has been undertaken.

Radioactivity.—There were 1,422 radioactive preparations containing approximately 19,723 milligrams of radium tested; 17 air samples were received for test of radon content; 75 radioactive standards were distributed; 221 check measurements on radium preparations returned after use by hospitals were made for the National Institute of Health; and 6 miscellaneous tests were conducted. Tests involving a total of 1,480 measurements extending over a period of 6 months on 35 samples of luminous material of different grades, to determine the break-down curves, were completed and reports on initial brightness and brightness after 180 days were issued to the manufacturer.

CHEMISTRY

Standard samples.—Six new standard analyzed samples were made available: A molybdenum-tungsten high-speed steel, a high-sulfur stainless steel, a wrought aluminum alloy, a solder (35Sn—65Pb), and microanalytical standards of benzoic acid and acetanalide. Six renewal samples were prepared. The Bureau now issues standard samples of 126 different kinds, used for checking methods of chemical analysis in industrial and scientific laboratories, and as standards for physical measurements (C398 and supplement). Approximately 18,500 individual samples were sold, an increase of 50 percent over the previous year.

Active acidity (pH) standards.—The test and control of active acidity in industry, in science, and in problems relating to the public health will be facilitated by the use of 17 pH standards covering the range 2.5 to 11.5, which are described in a pending article, and proposed for calibration of pH meters. Precision pH standards, and corrections for salt errors, for measurements to within ± 0.001 pH unit are being developed. Spectrophotometric measurements of ionization constants, pH values, and salt errors of indicators have been made. Special indicators have been used provisionally for determining relative acid strength in about 20 organic liquids, including lubricating oils and dry-cleaning solvents. Dielectric properties and conductivities of solvents, pH standards, and indicators are being measured.

New thermometric fixed point.—Observations of the freezing behavior of benzoic acid showed that with proper precautions the freezing temperature of the acid can be consistently reproduced to within 0.001° C.; it can, therefore, be used as a fixed point in the calibration of thermocouples and platinum-resistance thermometers. This temperature (122.37° C.) offers certain advantages in convenience and precision over the boiling point of water because it is independent of changes in barometric pressure.

Methods of analysis.—A paper (RP1456) covering determinations of holmium, erbium, thulium, and ytterbium was published to supple-

ment the paper (RP1395) on the spectrophotometric determination of praseodymium, neodymium, and samarium which was described a year ago.

The work reported last year on the attack of refractory platiniferous materials with hydrochloric acid and chlorine in sealed vessels at high temperatures was extended to other materials, including a number of minerals and synthetic materials which are difficult to prepare for analysis. The method proved especially useful for tin ores, chromite materials, and high-alumina refractories. Improved measurements of the high pressures developed in the apparatus made it possible to provide better protection against loss of samples by bursting of the glass tubes.

In cooperation with Committee D–3 of the American Society for Testing Materials, approximately 30 laboratories have analyzed gas mixtures in order to compare the methods employed. The work has proved very useful in ascertaining sources of error in this class of analytical work.

The Bureau also cooperated with the ASTM in preparing standard methods for the chemical analysis of aluminum and light aluminum alloys, magnesium and magnesium alloys, pig lead, nickel-chromium electrical-heating alloys, slab zinc, admiralty metal, and free-turning yellow brass.

Other analytical problems investigated include the separation of lead from the platinum metals, separation of irridium from rhodium, analysis of rhodium-plating solutions, determination of minute amounts of gold on small specimens of gold-plated articles, and determination of volatile impurities in organic and other readily fusible substances.

Gases.—As part of the work of Committee D–3 of the ASTM, a study of the accuracy, reproducibility, sensitivity, and operating characteristics of all well-known industrial and laboratory apparatus for the determination of the specific gravity of gases has been completed; reports of the investigation have been drawn up and distributed.

Hydrocarbons in petroleum.—In cooperation with the American Petroleum Institute the isolation and identification of hydrocarbons in petroleum were continued with the following results: Two new hydrocarbons (4-methylnonane at 166° C. and an unidentified bicyclic naphthene at 147° C.) were isolated; the boiling points at 20 pressures from 50 to 800 mm Hg of 14 pure hydrocarbons and of the freezing points of 7 pure hydrocarbons were determined; a high precision refractometer was assembled; methods were developed for the analytical determination of toluene and other aromatic hydrocarbons by absorption, and for the quantitative separation and recovery of aromatic hydrocarbons by absorption. The latter method is being used in the analysis of the major components of the gasoline fraction of representative crude petroleums.

Electroplating.—The shortage of certain metals has compelled the electroplating industry to make many substitutions for both the base metals and the coatings. Among the applications of plating being studied for the Government are tableware, mess trays, guns, cartridge cases, projectiles, surgical instruments, aircraft parts, reflectors, plumbing fixtures, and hardware.

A research just completed shows that iron deposits may be sub-

stituted for all the nickel and part of the copper normally used on printing plates, thus conserving these strategic metals.

Over 200 "Magne-gages" were calibrated, chiefly for measuring the thickness of plated coatings on munitions.

MECHANICS AND SOUND

Air-raid alarms.—The acoustic properties of various air-raid alarms, including sirens, steam and compressed-air whistles, and loudspeakers have been determined. Included in the program, which was conducted in cooperation with the Office of Civilian Defense, were measurements of acoustic output at distances up to 2 miles, frequency analyses of the noise, air or steam consumption, and determinations of the transmission of tones of various frequencies under different atmospheric conditions. The Bureau advised municipalities on the proper location of alarm devices and has emphasized the desirability of utilizing existing facilities such as factory whistles and compressed-air supplies at filling stations. The information at hand has been made available as a letter circular (LC706).

Perforated cover plates for steel columns.—The established practice in the design of compression members of bridge trusses has been to construct such members of a box type cross section, and the custom of designers, until recently, has been to use lattice bracing or battens on one of the four sides to facilitate interior inspection and painting. Latticing and battening for such members have been used merely to brace the member and not to resist either moment or thrust. Designers are making a progressively wider use of perforated cover plates in the place of latticing or battening, but opinions have differed concerning the proper value to be assigned in such construction in carrying thrust and as regards its effective rigidity.

The committee on technical research of the American Institute of Steel Construction has cooperated with the National Bureau of Standards in outlining a series of tests and furnishing full-scale specimens to determine the strength, stress distribution, concentration of stress, and rigidity of steel perforated cover plates for variations in perforation shape, size, spacing, and width-to-thickness of plate. Two reports have been published (RP1473 and RP1474). The results show that the perforated cover plates contribute to the rigidity and to the strength of the columns. Their use, when designed on a rational basis from the results of the tests, will result in a marked saving of steel as compared with the use of latticing and battening.

Hydraulics.—Many special model tests have been made, and an extensive annotated bibliography covering one important subject is being prepared for the Navy Department. Experiments with models of weirs and spillways used to obtain records of stream discharge have been conducted for the Forest Service and the Geological Survey. Tests have been made of sprinkler heads for the Federal Housing Administration, and of plumbing fixtures for the War Department, the Veterans' Administration, and the Public Buildings Administration.

Acoustics.—In many Federal buildings it is necessary to reduce reverberation by putting sound-absorbing materials on the walls. During the past year the Bureau made studies of 14 structures belonging to different Government agencies. Sound absorption measurements were made on 41 large samples and 21 small samples of sound-

absorbing materials, and transmission measurements were made on 8 panels representing different types of building construction.

Twenty-four microphones and sound-level meters were calibrated. These will be used in absolute measurement of sound levels—a matter of fundamental importance in acoustics. The section has also calibrated 7 audiometers, and has studied 16 mm. sound-on-film equipment. The data on 16 mm. projectors have been made available to the public in a Bureau circular (C439).

Constant of gravitation.—The experimental work and calculations on the constant of gravitation have been completed and the paper is in press (RP1480). The final value is $G=6.673\pm.003\times10^{-8}$ (cgs units).

Engineering instruments and appliances.—Some 1,456 instruments were calibrated, principally for the engineering bureaus of the Government and for the Bureau of Internal Revenue. Approximately 100 mechanical appliances, including fire extinguishers, building and heating equipment, mail meters, elevator safety interlocks, and miscellaneous engineering and office appliances were investigated to determine their eligibility for approval under Government regulations or were tested as samples in connection with Government purchases.

Aircraft instruments.—An experimental investigation of the limiting useful deflections of corrugated metal diaphragms was completed and a report prepared in cooperation with the National Advisory Committee for Aeronautics.

Among the investigations of aircraft instruments made for the Bureau of Aeronautics, Navy Department, were ones looking to improvements in flight test instruments, oxygen apparatus for aircraft personnel, and methods of measuring carbon-monoxide concentration. Methods and apparatus for testing a number of aircraft instruments were developed.

A large number of mercurial altitude barometers and high grade aneroid barometers were tested for use by the Army, Navy, and Weather Bureau. The facilities for this testing were greatly improved; a constant temperature room is now available.

Aerodynamics.—Fundamental air-flow studies near surfaces were continued in cooperation with the National Advisory Committee for Aeronautics. Much attention was given to research on military ordnance devices for the Bureau of Ordnance, Navy Department, and for the National Defense Research Committee.

ORGANIC AND FIBROUS MATERIALS

Rubber.—Research over a period of years on the constants and properties of rubber has enabled the Bureau to furnish a considerable amount of information needed in the present emergency. Precise measurements made on isoprene when it was a laboratory curiosity are being put to practical use now that it is employed in synthetic rubber. Studies of the behavior of rubber at low temperatures have assumed a new importance because the rubber in military equipment must function properly both in the cold of the Arctic and at very high altitudes.

The two distinct types of change which take place in natural rubber with change in temperature already have been observed in synthetic rubbers. Several synthetic rubbers crystallize and all of them undergo transitions of the second order which are associated with the brittle point. Both transitions were investigated by making precise meas-

urements of the temperature-volume relation by means of dilatometers or an interforometer. The lower the temperature at which freezing took place, the lower the melting range of crystalline rubber, whether natural or synthetic. This observation was employed to explain the supposed *beta* anomaly of Ruheman and Simon (TNB302).

A previous study on the thermodynamic relation between isoprene and natural rubber laid the basis for studies now in progress on the thermodynamic relation between monomers such as butadiene and styrene on the one hand, and the synthetic rubbers on the other. Determinations of heat capacity and entropy have been made on one synthetic rubber, Hycar O. R. (RP1487), and measurements on butadiene are in process.

The frictional properties of rubber were the subject of an extensive laboratory study (RP1463). Rubber was found to differ from other materials, as regards frictional behavior, only in degree and not in kind.

Electrical measurements were made on the system, rubber calcium carbonate, as presenting a simple case of a heterogeneous dielectric (RP1457). General relations were found between the dielectric constant and the composition which held both with Vistanex, a synthetic rubberlike material, and with natural rubber.

Tires of different sizes and types made largely from Buna S have been found to meet the performance required in specifications for natural rubber tires. Tires of passenger car sizes made wholly from Buna S or other synthetic rubbers have been found satisfactory for emergency use. Temperatures developed in synthetic rubber tires have been measured because synthetic rubber is known to generate more heat on flexing than natural rubber.

Widespread interest in the national rubber situation brought numerous requests for tests to determine the merit of new plans for producing or synthesizing rubber. A general procedure for evaluation was formulated on the basis of examining and independently repeating the proposed process (TNB299).

Wool.—Wool is of particular value in those branches of the textile industry that manufacture wearing apparel, blankets, carpets, and felts—commodities which are important because of their warmth or their elasticity; that is, their ability to regain their original lengths or shapes after they have been distorted. Actually, this elasticity is primarily responsible for the warmth of a wool fabric, in that it allows the fabric to maintain a porous structure. The small air spaces in such a structure impart to the fabric most of its insulating properties. The basis of the elasticity of wool has been extensively studied by research associates of the Textile Foundation stationed at the Bureau (RP1486).

Although the disulfide cross links contribute much to the important mechanical properties of the wool fiber, they are also the source of some of the main disadvantages of wool. For example, the ease with which wool is degraded by alkalies during laundering, or is attacked by moths, is related to the presence of these links in the molecular structure. These faults can be diminished considerably by a new process developed through the work of the Textile Foundation associateship (RP1405). The process is based on the observation that the disulfide links are the first point of attack by alkalies and by the digestive juices of moths. By transforming the relatively un-

stable disulfide links to more stable bis-thioether links, modified wools have been developed that are decidedly more stable toward many chemical and biological agents.

METALLURGY

Aircraft metals.—Examination of parts of planes and engines in which the character of the metal was suspected of having a bearing on service failures has occupied a great deal of time. The study of the deterioration of metals under service conditions, either by corrosive influences or by fatigue stressing, has continued. The extent to which long-continued marine exposure affects the strength and fatigue resisting properties is receiving special attention, an important phase of this work being the evaluation of coatings and other surface treatments in minimizing such deterioration. Stress-corrosion studies have been carried out on the industrially important types of the wrought aluminum alloys as a means of evaluating the relative merits of forged and extruded fittings. Substitutes for critical metals, such as the 18–8 stainless steel used for airplane fire walls and cowling, have been given laboratory and practical fire tests in an experimental airplane engine set-up, and some of these materials have been approved for military planes. Elimination of residual stress in streamline wrought tie-rods has been discussed in a research paper (RP1477). The study of the elastic properties has been extended to include torsional properties, and the range of materials has been broadened to take in the heat-treated light alloys in addition to stainless steels and other alloys which owe their high strength to cold working (RP1459).

Corrosion.—At the request of the War Department a member of the staff spent several weeks in the Canal Zone studying corrosion of parts of the canal locks. Service tests of ferrous piping materials used in commercial plumbing are in progress. In addition to special set-ups permitting continuous flow of domestic city water through pipes, samples have been installed in the service lines at the Bureau and at the Capitol Power Plant. Metallographic examination of specimens used in previous corrosion-fatigue studies has given useful information on causes of failure (RP1366). The broad program of the American Society for Testing Materials on atmospheric corrosion of the commercial nonferrous sheet metals has been terminated, and the resulting information is ample justification for the Bureau's participation.

Ferrous metals.—Welding characteristics of steel are being studied in cooperation with the Navy Department, the T-bend test as an indication of weldability having been used with increasing satisfaction (RP1444). With the assistance of commercial research laboratories, the characteristic properties of the high-purity iron (99.99+ percent) prepared in the Division of Metallurgy have been determined (RP1472); the iron has been used as the basic material in studying the microstructural changes accompanying the heat treatment of steel (RP1403).

The elastic properties of alloy cast iron of three typical compositions have been measured in transverse loading tests and compared with the corresponding properties of plain cast iron (RP1447). The results do

not justify the superiority claimed for alloy cast iron under all conditions.

In an investigation of bright annealing of steel, a method has been found for eliminating the oxide film on iron when heated in vacuo (RP1468). In cooperation with the Bureau of Engraving and Printing, the effect of various metallurgical surface treatments on steel engraving plates has been determined (RP1484).

Some success has been attained in overcoming the marked decrease in toughness of steel with lowered temperature (RP1410). The low-temperature toughness has been increased by heat treatment which gives a more suitable grain size.

Nonferrous metals.—The scarcity of tin has prompted a study of low-tin solders. The use of lead-silver solder, approximately 2.5 percent silver, is entirely practicable on copper as has been shown by the work on soldered pipe fittings (BMS83). The reason for the undesirable lowering of bond strength in tin-soldered joints on copper has been demonstrated by microstructural studies to be the result of a brittle alloy layer formed by diffusion between the copper and tin when both are maintained at a relatively high temperature (RP1465). Hence the reason for a maximum temperature limit for soldered joints in service. Among the factors which must be considered in the choice of nonferrous metals for high-temperature service are the rate of oxidation and, for members under load, the rate of creep. The rate of oxidation has been determined for a considerable number of nonferrous metals (RP1470) and the creep rate for copper-nickel alloy (RP1462).

An investigation of the influence on the cast metal (red brass) of the enveloping furnace atmosphere shows that, of the industrial gases thus far studied, hydrogen has by far the most detrimental effect. The vacuum fusion technique, used so successfully for ferrous metals, has been found applicable for determining oxygen in copper, but not for most other nonferrous alloys. Promising results have been obtained, however, with another method in which melting with aluminum converts all oxides to alumina.

CLAY AND SILICATE PRODUCTS

Optical glass, glazes, and enamels.—All available facilities for the manufacture of optical glass have been used to supply the needs of the Army, Navy, and Maritime Commission. Assistance has been given to commercial glass companies that are starting production of optical glass for the military services. Encouraging results have been obtained in the production of lens blanks directly from the molten glass. A dark field immersion apparatus for rapid index-of-refraction measurements has been developed and is being used for control work.

A study of the effect of repeated freezing and thawing on zinc-flash and glazed bricks showed that porosities, air permeabilities, and saturation coefficients of the bricks were increased with increase in the number of freezing and thawing cycles.

Tests on 4 different clays fired at various temperatures to determine the resistance to freezing and thawing of specimens made of deaired clay as compared with non-deaired specimens indicate that deairing

decreases the resistance to freezing and thawing, while increase in firing temperature increases the resistance.

A report on the investigation of "Low-Cost Glazes for Structural Clay Products" was published (C436).

Porcelain-enameled metals.—The strategic scarcity of aluminum and stainless alloys has led to the adoption of porcelain-enameled iron for several articles required in the military services. Specifications for canteens for the Army and Marine Corps, and mess plates for the Maritime Commission are based upon tests made at the Bureau. An article was published (RP1476) describing the mechanism of weathering of porcelain enamels, an accelerated test therefor, and the type of enamel most resistant to weathering. Tests for warpage of enamelled articles and for gouging-resistance of enamels, which were developed at the Bureau in cooperation with the Porcelain Enamel Institute, have been adopted as standards by that organization.

Ceramic whiteware and refractories.—An electrically heated laboratory furnace has been developed, using a special oxide resistor, in which specimens can be heated under oxidizing conditions. Results of tests in the temperature range from 1600° C. to 2000° C. have been partially reported, together with a description of the furnace (RP1443).

Most of the phase relations of the $PbO-Al_2O_3-SiO_2$ system, within the $PbO.Al_2O_3-PbO.SiO_2-PbO$ area, have been determined. In the study of the glass phase in heated clay materials, no evidence has thus far been found for reactions to form a glassy band in mixtures of extremely fine-grained quartz, feldspar, and kaolin.

A dust-free plant for crushing and grinding reclaimed pot shell and separating it into three different sizes was constructed and placed in operation.

An investigation of the thermal spalling resistance by the panel method of high-heat and superduty types of fire-clay brick showed that in most cases the spalling loss varied directly with the gas pressure maintained within the furnace during reheating, and was much greater when the bricks were tested in header construction than when tested in stretcher construction.

Cement, concrete, and lime.—The electron microscope, recently purchased has been used to correlate the working properties of clays with their submicroscopic particle shape and size. The results of a joint investigation with the Department of Agriculture on the identification of some clay minerals is in press.

A paper was published on the relationship between the garnet-hydrogarnet series and the sulfate resistance of portland cements (RP1411). Certain compounds believed to be constituents of hydrated portland cements were synthesized. Evidence was obtained of the existence of analogous compounds in which calcium sulfate and hydroxide are replaced by calcium silicate.

Since the composition of the aqueous phases plays an important part in the setting, hardening, and durability of concrete, the solutions resulting from the reactions of the mixing water with portland cement clinkers were studied, using 12 clinkers and 8 admixtures.

A paper was published showing how different soluble salts affect the times of set of portland cement clinker pastes and the temperature rises during the first 24 hours. Tests of portland-pozzolan cements

showed that they compare favorably with standard portland cement concrete.

Since abnormal expansion of concrete resulting from chemical action between certain cements and aggregates has been noted in various sections of the country, materials from different localities are being studied in the hope of developing test methods which may be used to eliminate undesirable aggregates. Using the petrographic and metallographic microscopes, the aggregate constituents causing some severe concrete disintegration in the central States have been discovered. It is now likewise well established that a small amount of opal—a hydrated silica—in an aggregate, is potentially deleterious, and may lead to disintegration of the concrete when a cement containing a relatively large amount of free alkali is used.

Aggregates having low bulk specific gravities because of high porosity, may prove deleterious when the concrete is subjected to frequent freezing and thawing, and those having relatively low coefficients of thermal expansion may cause unduly high stresses in concrete, leading to disintegration.

A study of the increased frost resistance of concrete to which minute quantities of aerating agents have been added, showed the optimum percentage of aerating agent to vary considerably for different cements. Laboratories throughout the country are cooperating in the establishment of a standard procedure for freezing and thawing tests.

The Portland Cement Association Fellowship has continued its work on the alkali systems of portland cement. One paper (RP1421) reporting K_2O compounds of portland cement has been published. One of these is a newly discovered compound consisting of K_2O, CaO, and SiO_2; the other is K_2SO_4, which has been observed in many commercial clinkers. Other matters receiving attention are: The structure of clinker and cement paste; accelerated tests for the evaluation of cements; thermodynamic properties of the material; and the spectroscopic determination of the alkali and other minor metallic elements of cement.

Mortar specimens prepared from either high calcium or completely hydrated dolomitic hydrated limes have shown practically no expansion when stored in the damp or outdoors.

Cement reference laboratory.—This laboratory, a cooperative project of the Bureau and the American Society for Testing Materials, continued its seventh inspection tour among cement laboratories; 281 laboratories asked to be included in the tour. The Public Roads Administration continued to make use of the reference laboratory's reports, and gave substantial financial assistance. The verification of compression testing machines was continued; 92 machines were tested and information was collected about 53 others. This work has increased the interest of laboratories in the performance and maintenance of their machines. Data on the autoclave test for cement were gathered from 150 laboratories to assist in answering questions concerning procedure and equipment.

Branch laboratories.—More than 18,000,000 barrels of portland cement were tested for the Federal Government by the Bureau and its branch laboratories at Allentown, Pa.; Denver, Colo.; Permanente,

San Francisco, and Riverside, Calif.; and Seattle, Wash. This is an increase of 80 percent over the previous year.

Masonry and reinforced concrete.—The completeness of the bond between mortars and bricks was found to increase with a decrease in the rate of absorption (suction) of the brick at the time of laying, and with increases in the water retentivity, and flow of the mortar. The strength of the bond was highest with bricks of low or moderate suction or with high absorptive ones that had been wetted, and under practical laying conditions, the bond strength increased with increases in the strength, water-retentivity, and flow of the mortar.

Data on the structural behavior of reinforced concrete have been furnished in response to many requests from designers of wartime structures.

Building stone and aggregate.—Studies of the physical properties of 77 marbles produced in 12 States and used for terrazzo aggregates have been completed and a report has been prepared for publication.

One hundred eleven samples of concrete aggregate have been tested for thermal expansion by the interferometer method between temperatures of $-25°$ and $-60°$ C. Most of the thermal coefficients obtained were between 4 and 10 $\times$ 10^{-6}. The cherts, as a class, gave the highest coefficients, and feldspars the lowest. The expansion for many samples is not uniform.

The chemical changes that take place when slate shingles fade are being studied in the hope of developing a reliable laboratory test. The present method used to grade slates into fading and unfading types is not satisfactory.

SIMPLIFIED PRACTICE

Cooperation with national war agencies.—The plan of collaboration between the Division of Simplified Practice and national defense agencies, begun in 1941, was amplified as "simplification" assumed first place on the agenda for meetings of industry groups with the Office of Production Management and the Office of Price Administration and Civilian Supply. Insofar as practicable, members of the staff participated in these meetings and pointed out opportunities for eliminating unnecessary varieties of manufactured products. When the War Production Board was formed, the chief of the Division assisted for 3 months in the organization of a simplification branch in the newly created Bureau of Industrial Conservation. Members of the Division's staff have served as advisers to the Board on problems involving simplification and have helped to formulate orders.

Limitation, conservation, and other orders.—A number of existing simplified practice recommendations are identified in orders of the War Production Board and Office of Price Administration; in other cases, the complete recommendation is incorporated in the order. For example, maximum price schedule for iron and steel scrap recognizes R58–36 which contains a classification of scrap; limitation order 139, schedule 1, simplification of dental excavating burs, incorporates R195–42 which eliminates 76 percent of the standard numbers of that product; and schedules I and II to limitation order L–42, plumbing and heating simplification, incorporate R183–42, R184–42, and R185–42.

Valves and pipe fittings.—R183–42, which reduced the number of

pressure ratings of brass or bronze valves from 11 to 5, or 55 percent, and R184–42, which eliminated 75 percent of the former number of pressure ratings of iron-body valves, will have the combined effect of saving more than 1,000,000 pounds of copper-base alloy. R185–42 made possible the elimination of 5,599 varieties of pipe fittings, or 65.4 percent.

New, revised, and reaffirmed recommendations.—Twelve new simplified practice recommendations were promulgated, bringing the effective list to 193. Seventeen existing recommendations were surveyed to discover possibilities for further reductions in variety. In consequence, more than a dozen were revised, and the remainder reaffirmed, pending the development of certain limitations, conservation, and price orders by the War Production Board and the Office of Price Administration.

Foreign interest in simplification.—The heavy demand for copies of effective simplified practice recommendations, on the part of war agencies, industry, and institutions abroad, has continued. Requests were received from Australia, Canada, England, New Zealand, and South America. A standardization body in Brazil secured, through the State Department, a complete set of simplified practice recommendations.

Following the example of the Australian Standards Association, the Wartime Prices and Trade Board of the Dominion of Canada set up its own "Division of Simplified Practice." The Board is now issuing "Administrators' Orders on Simplification and Conservation," and has specifically requested the Bureau to assist in informing Canadian industries concerning the results and benefits of simplification.

TRADE STANDARDS

Commercial standards printed and promulgated.—Twenty-five commercial standards, including 10 new standards for domestic use, 3 for export, 5 revisions, and 7 supplements, were promulgated and issued in mimeographed form. Standards subsequently issued in printed form covered: Hardwood dimension lumber (exports); diamond core drill fittings; moisture regains of cotton yarns; calking lead; lead pipe; lead traps and bends; portable electric drills; driving and passing lamps for vehicles; artists' oil paints; gas floor furnaces; enameled steel utensils; oil-burning space heaters; mechanical draft oil burners; and crawler mounted, revolving power shovels, lifting cranes, dragline and clamshell excavators (export classifications) (Spanish edition).

Porcelain-enameled utensils.—Housewives have found it difficult, if not impossible, in purchasing enameled utensils to distinguish between good enamels and those which readily chip, scratch, mark, or dissolve. With the cooperation of manufacturers, distributors, users, and the University of Illinois, a commercial standard was established and promulgated in printed form for multiple-coated, porcelain-enameled steel utensils. The standard is identified as CS100–42, effective for new production from September 30, 1942. The standard provides, for the benefit of all concerned, a means for distinguishing between satisfactory and unsatisfactory utensils on the basis of definite performance requirements and methods of test for impact resistance, solubility of enamel, acid resistance, capacity, resistance to thermal shock, and other criteria which control the quality of enameled utensils

for cooking, household, food storage, and hospital use. The standard incorporates the wording of a sticker or other label for use by the seller to guarantee conformance to the standard.

Conferences.—Thirty-nine conferences were held with representative groups of consumers, distributors, producers, and testing laboratories in the development and establishment of a wide range of commercial standards, of which there are 139 active projects. Written acceptances of 29 of these as their standards of practice in buying and selling were filed by responsible officers of 4,346 companies and organizations.

Standards for exports.—To aid American manufacturers in the maintenance and expansion of markets for quality products during the post-war period, and to help coordinate the efforts of industry and Government to meet foreign competition, several industries have been aided jointly by the National Bureau of Standards and the Bureau of Foreign and Domestic Commerce in the voluntary establishment of commercial standards (printed in appropriate foreign languages) covering commodities for export. Eleven such projects, initiated or carried forward during the year, established standards for the following commodities: Diamond core drill fittings; liquid hypochlorite disinfectant, deodorant, and germicide; pine-oil disinfectant; phenolic disinfectant (emulsifying type); phenolic disinfectant (soluble type); household insecticide (liquid spray type); hardwood dimension lumber; sanitary cast-iron enameled ware; interchangeable ground-glass joints, stopcocks, and stoppers; revolving power shovels, lifting cranes, and excavators; and diesel and fuel-oil engines.

Diesel engines.—There has been endless misunderstanding and confusion between sellers and buyers of diesel engines, especially in export trade, with reference to the kind of equipment and number of accessories to be furnished, the basis for horsepower ratings, methods of test, and data to be supplied.

A commercial standard entitled "Diesel and Fuel-Oil Engines (Export Classifications)," CS102E–42, was established in cooperation with the leading manufacturers and promulgated as effective for new production from October 30, 1942. It covers standard nomenclature and definitions for slow- and medium-speed stationary and marine diesel engines; for small-, medium- and high-speed stationary, marine, and portable diesel and fuel-oil engines; standard bases for horsepower ratings, altitude corrections, fuel guaranties, standard equipment, engine and accessory data, and includes the standard wording for a plate or label on the engine by which the manufacturer certifies compliance with the standard.

CODES AND SPECIFICATIONS

Protection of Federal buildings.—The heads of the sections on building codes, safety codes, and building practices devoted a large amount of time to the preparation of an "Air Raid Protection Code for Federal Buildings." The chief of the building codes section was elected chairman of a committee representing 10 interested Federal departments and establishments, organized by the Public Buildings Administration under an Executive order to study the physical characteristics of existing Government structures and to recommend measures for safeguarding them against enemy action. Surveys were made of the more important Federal buildings in Washington, and the code, sub-

sequently drawn up, is being used as the basis for protective measures applied to Federal buildings throughout the country.

Building codes.—In addition to its work on air-raid protection the building codes section has been called upon to cooperate and in some cases to take the lead in the development of a number of codes having special application to problems created by the war. The Bureau's "Plumbing Manual" which became available last year (BMS66) has been made the basis for emergency plumbing standards mandatory on Federal Government departments and is estimated to have saved thousands of tons of critical metals. In cooperation with representatives of Federal housing agencies a publication entitled "Recommended Building Code Requirements for New Dwelling Construction with Special Reference to War Housing" has been completed (BMS88). This is expected to play a considerable part in conserving essential materials.

Safety codes.—Many requests were received from tax-supported agencies both Federal and local for advice on special problems relating to safety especially in connection with electrical installations and elevators.

Building practices.—All publications in the Building Materials and Structures series, 11 of which were issued this year are edited (including preparation of drawings) and cleared through the section on building practices. In addition the section has served in a consulting and supervisory capacity in connection with the design and erection of new buildings for the Bureau, and the alteration of several existing structures. Plans and specifications have also been prepared for construction work scheduled for the coming year.

Services to governmental agencies, other consumers, and producers.—The total number of lists of sources of supply of commodities guaranteed to comply with the requirements of Federal specifications and commercial standards was increased from 860 to 887. The number of Federal specifications now totals 1,459, and in addition, 473 emergency alternate Federal specifications have been issued by the interdepartmental committee charged with this work. All willing-to-certify sources of supply were kept currently informed of the release of revisions in and emergency alternates for Federal specifications in which they had expressed interest. Only through this work have the manufacturers throughout the country been kept posted on changes being made in Federal specifications in recognition of the wartime scarcity of certain materials. Large numbers of willing-to-certify manufacturers have written to the Bureau endorsing the certification plan because it has aided them in their war effort and in their contacts with governmental purchasing agencies.

Numerous sources, both governmental and nongovernmental, engaged in war work have notified the Bureau of their effective utilization of two recent publications: "Standardization Activities of National Technical and Trade Organizations" (M169) and "Directory of Commercial Testing and College Research Laboratories" (M171).

BUILDING MATERIALS AND STRUCTURES

Structural properties of house constructions.—Including tests previously reported, information has now been secured on the structural properties of 96 constructions intended for low-cost housing. The

data on concrete, masonry, steel, and wood thus made available are assisting architects and builders in selecting suitable constructions of the lowest cost for a particular building. Preliminary reports on the structural requirements for houses, and the performance of 6 wood-frame floors (12 feet square) having 6 different depths of joist have been prepared for the Federal housing agencies. Structural properties of a proposed plywood construction for barracks and other Army post buildings were determined for the Quartermaster Corps, War Department, and measurements of resistance to transverse wind loads were made on a partition construction proposed for use in Washington defense dormitories.

Masonry and concrete walls.—Results of water-permeability tests and of outdoor weathering on walls built of masonry units are described in two publications (BMS76 and BMS82). In permeability tests of walls faced with stucco and gunite, all specimens showed a high resistance to moisture penetration; differences in the kinds of facing and of backing, and in the methods of construction and of curing had no practical effect on permeability. Measurements of resistance to axial stress (tension or compression) of metal ties embedded at the ends in brick masonry, showed that mortar strength affected the strength of the specimens; those built of a weak mortar with the ordinary round steel ties failed at the mortar joints. Some tests were made of the structural properties of porous concrete walls in which coarse aggregate of a uniform size but no fine aggregate was used. The compressive and transverse strengths of the walls were dependent upon the quantity of cement per unit volume of concrete and were not greatly affected by the size of the aggregate.

Paints for exterior masonry.—In order to observe the physical properties and weathering characteristics of representative masonry paints, 75 test walls of porous masonry (common brick, cinder block, and new and weathered asbestos-cement shingles), 5 miniature brick houses (4 by 4 by 4 feet), and 12 miniature concrete swimming pools have been added to the 193 test walls and the small house built and painted in 1940. A report of the observations during the 2-year period is being prepared.

Roofing materials.—A report was issued covering a field study of roofing materials in the South Central States (BMS84). The reports available include all the States east of the Rocky Mountains (BMS6, BMS29, BMS75). Plans made for a fifth survey in the remaining 11 Western States were abandoned because of war conditions. It is hoped that this work may be completed at some future time and that a general discussion may be prepared correlating the durability in service of different types of roofing materials with the prevailing climatic conditions in all sections of the country.

At the request of the Office of the Chief of Engineers, War Department, inspections of roofings were made at 9 Army cantonments from Pennsylvania to Florida, and recommendations covering the maintenance, repair, and reroofing of the various types of roofing materials were drawn up.

Surface treatment of metal.—Outdoor exposure tests of surface protection of metal are being continued. Most of the steel panels (galvanized and ungalvanized) having aluminum-in-varnish or lampblack-in-oil top coats are still in good condition after 4 years exposure. Top coats of iron oxide in oil are also giving good service. No new

tests have been started, and a report will be prepared as soon as break-downs show definite degrees of performance.

Fiber building boards.—The field of usefulness of fiber insulating boards as finish material for interior walls was extended by the development of improved methods of application. This relatively new type of building material had been found in a previous investigation to have excellent qualities (BMS50).

Floor coverings.—A laboratory performance test of floor coverings installed in various ways was made as the fourth of a series of such tests (BMS34, BMS43, BMS68, BMS80). The test panels were subjected to 48,000 passages of a platform truck, equipped with a steel-tired wheel and a rubber-tired wheel, and a "walking wheel" shod with wooden blocks which were covered with leather during the first half of the test and with abrasive cloth during the second half.

Plumbing.—The experimental work in plumbing, outlined as a part of the research program on building materials and structures and in progress during the past 4 years, has been completed. One report, "Water-distributing systems for buildings" (BMS79), was published. Earlier reports on the program include: Backflow prevention in over-rim water supplies (BMS28), Methods of estimating loads in plumbing systems (BMS65), and a Plumbing Manual (BMS66). Two other reports, now in preparation, will complete the series.

The published reports and pertinent data abstracted from the unpublished reports are being utilized by technical committees of the American Standards Association in formulating recommended standards for plumbing materials and plumbing construction. Data supplied from the same sources have been used by the War Production Board in drawing up emergency standards for plumbing on which the quantities of critical materials allotted for plumbing construction are based.

Fire-resistance classifications of building constructions.—A project on fire-resistance classifications, initiated under the Central Housing Committee on Research, Design, and Construction, was completed and the report prepared for publication (BMS92). With four basic building types defined, height, area, and other building-code restrictions are outlined in relation to them. The results of surveys of combustible contents of buildings are presented as a basis for fire-resistance requirements, together with available fire-resistance ratings of building constructions.

Building materials specifications.—Technical committees on hardware, pipe, and plumbing fixtures of the Federal Specifications Executive Committee, under the Bureau's leadership, prepared emergency alternate specifications authorizing acceptance of certain less scarce or noncritical substitute materials under existing Federal specifications and eliminating items considered nonessential for the emergency. Emergency alternate specifications were prepared for 20 Federal specifications.

The emergency specifications for builders' hardware include four appendices in the form of recommended hardware requirements for the principal classes of emergency building construction. They are intended to serve as a guide for the selection of hardware items and finishes that will effect a maximum saving in scarce materials with minimum impairment in serviceability and appearance.

GENERAL FINANCIAL STATEMENT, 1942

The amounts and objects of each appropriation for the fiscal year, together with disbursements, liabilities, and balance for each appropriation, are shown in the following table:

Disbursements, liabilities, etc., 1942, 1941, and 1940 appropriations

Appropriations	Total appropriations	Disbursements	Liabilities	Balance
Operation and administration	[1] $381,291.93	$294,396.86	$57,401.07	$29,494.00
Testing, inspection, and information	[2] 1,289,695.00	1,095,708.21	177,795.79	16,191.00
Research and development	[3] 779,941.63	720,958.68	57,441.95	1,541.00
Standards for commerce	[4] 143,109.25	137,702.15	3,010.10	2,397.00
Enlarging optical glass plant building [5]	24,979.26	23,947.52		[6] 1,031.74
Station for broadcasting standard frequencies [5]	230,000.00	36,594.12	165,610.32	[6] 27,795.56
Investigation of building materials—1940–41 [5]	14,290.85	14,056.88		233.97
Electrical building and equipment [5]	63,061.77	58,505.83	4,513.99	[6] 41.95
Materials testing laboratory and equipment [7]	60,000.00		940.00	[6] 59,060.00
Appropriations transferred from other departments:				
Salaries and expenses, Weather Bureau	6,000.00	5,735.02	130.85	134.13
Salaries and expenses, Bureau of Engraving and Printing	11,300.00	10,995.61	24.00	280.39
Distinctive paper for United States securities	2,000.00	1,937.73	25.90	36.37
Maintenance, Bureau of Ships	24,800.00	23,513.11	1,129.96	156.93
Aviation, Navy	[8] 282,392.88	230,120.97	26,341.40	[9] 25,930.51
Technical development, CAA	32,046.96	30,534.65	1,491.66	20.65
Incidental expenses of Army	26,000.00	23,801.62	917.43	1,280.95
Air Corps, Army	8,500.00	7,730.47	634.25	135.28
Administrative expenses, Home Owners' Loan Corporation	[10] 50,016.07	45,587.78	4,034.50	393.79
Administrative expenses, U. S. Housing Authority	[11] 50,009.65	41,171.25	8,252.99	585.41
Administrative expenses, Federal Housing Authority	[12] 50,068.90	43,841.62	4,993.21	1,234.07
Advisory Committee for Aeronautics	[13] 100,003.00	98,687.26	1,202.45	113.29
Development of landing areas for national defense, CAA	4,000.00	2,430.03	1,473.92	96.05
Establishment of air navigation facilities, CAA	5,000.00	4,211.13	772.44	16.43
Maintenance, National Cancer Institute	2,000.00	1,740.76	188.26	70.98
Ordnance service and supplies, Army	36,000.00	26,012.06	9,898.32	89.62
Ordnance service and supplies, Army 1942–43	50,000.00	12.94	734.30	[6] 49,252.76
Ordnance and ordnance stores, Navy	10,000.00	9,923.41	28.15	48.44
Medical and hospital department, Army	5,500.00	1,805.41	3,454.33	240.26
Emergency fund for the President, national defense allotment to Commerce, 1942–43	150,000.00	17.10	46.55	149,936.35
Appropriations transferred from other departments under the provision of the Legislative Act approved June 30, 1932:				
Working funds	3,591,336.86	1,574,036.55	243,792.94	[6] 1,773,507.37
Total, 1942	7,483,344.01	4,565,716.73	776,281.03	2,141,346.25
Total, 1941	4,178,889.20	3,748,793.18	85,861.79	344,234.23
Total, 1940	3,209,458.00	3,199,979.42	3,351.96	6,126.62

[1] Includes transfers from other departments, reimbursements received and pending, and/or appropriation adjustments as follows: $146.93.

[2] Includes transfers from other departments, reimbursements received and pending, and/or appropriation adjustments as follows: $330,000.

[3] Includes transfers from other departments, reimbursements received and pending, and/or appropriation adjustments as follows: $5,046.63.

[4] Includes transfers from other departments, reimbursements received and pending, and/or appropriation adjustments as follows: $1,903.25.

[5] Available in 1942.

[6] Available in 1943.

[7] Does not include $540,000 transferred to Treasury Department, Procurement Division, Public Buildings.

[8] Includes transfers from other departments, reimbursements received and pending, and/or appropriation adjustments as follows: $42.88.

[9] Returned to Navy Department $23,500.

[10] Includes transfers from other departments, reimbursements received and pending, and/or appropriation adjustments as follows: $16.07.

[11] Includes transfers from other departments, reimbursements received and pending, and/or appropriation adjustments as follows: $9.65.

[12] Includes transfers from other departments, reimbursements received and pending, and/or appropriation adjustments as follows: $68.90.

[13] Includes transfers from other departments, reimbursements received and pending, and/or appropriation adjustments as follows: $3.

Weather Bureau

Since the Weather Bureau, like other war agencies, is engaged in many activities classified as secret, much of the information that would normally be submitted in its annual report must be withheld until after the war. Only certain general features of the year's work can be given. During the first 5 months of the fiscal year meteorological organization and preparations under the national defense program were carried forward rapidly. Following declaration of war the Bureau's facilities were quickly converted to wartime service and the plans prepared through the work of the Defense Meteorological Committee were placed in effect.

On December 26, Executive Order No. 8991 was issued providing for coordination of meteorological facilities in the prosecution of the war. As the national meteorological organization of this country, the Weather Bureau is responsible for basic synoptic observations and for general weather reports and services for all national interests, especially for aeronautics, agriculture, and commerce. The basic synoptic reports carry the data for current weather maps for all purposes, military as well as civil. Besides its authority and responsibility for the basic meteorological and climatological services of the country, the Bureau is charged with fundamental research and investigations in these sciences. In order to furnish special military weather information and interpret local conditions in active theaters of war, the Army and Navy have their own meteorological units operating with their field forces. Thus, while essential coordination and continuity of basic meteorological functions are provided through the Weather Bureau, the military need for flexibility and unity of command is satisfied through the supplementary meteorological units of the Army and Navy integrated with the armed forces in the field and at sea.

In wartime, military meteorological units are increased in number and many meteorologists must be recruited from civilian life. To assist in providing meteorologists for the armed forces, the Weather Bureau had released 279 employees by July 1, 1942—70 as officers and 209 as enlisted men. Release of men for military duty continues as rapidly as replacements can be trained for positions essential in the basic wartime service. Meteorologists not eligible for military service, including newly trained women graduates, are being taken into the civilian service to carry on essential meteorological work. The Bureau assisted in organizing comprehensive meteorological training for civilian and military students. Graduate meteorologists from the Weather Bureau were loaned to serve as instructors; curricula were planned in conference with Army, Navy, and university representatives; and the Bureau has facilitated meteorological training in other ways.

In war, the influence of weather on military tactics is comparable to that of the terrain on which a battle is fought—a factor that cannot be controlled but one that must be known in advance so plans can be made to suit. Clouds, fog, and rain determine whether aircraft pilots can see their targets, whether warships can find the enemy, or tanks and artillery can move swiftly, and how the several specialized arms of the fighting forces must be timed and coordinated to attain the objective quickly.

The war has increased emphasis upon the necessity for extending the time-range of weather forecasts. This problem has challenged scientists and amateurs for hundreds of years, and the various attempts at its solution have been numerous. Public interest in it is attested by the continued popularity of many forms of climatological "forecasts" and other experimental prognostications, which even Benjamin Franklin published in "Poor Richard's Almanac"—not because he thought them reliable but because his readers liked them so well that he found it difficult to discontinue them. Some progress in this field is being made but it falls far short of the needs. The reason is obvious. Weather is one of the most complex of natural phenomena. Unlike the movements of the planets, the weather does not behave according to precise laws so far known to physicists, mathematicians, or meteorologists. It is generally believed that there must be more exact knowledge of the general circulation of the atmosphere before the meteorologist can give in more detail the information of weather, past, present, and future, needed in the modern world. Recent extension of meteorological observations into the upper air and over new regions of the globe is an important step toward comprehension of atmospheric processes. Although handicapped by incomplete data, imperfect techniques, and shortage of technicians, progress in meteorological science in the last decade has been considerable and expansion in applied meteorology in recent years has been rapid considering the handicaps. Growth has been orderly and sound; too rapid expansion with its dangers of disorganization and waste have been avoided.

It is pertinent to emphasize also that while the present pressure for improvements in weather forecasting, particularly in the long-range forecasting field, is mainly military, the need is by no means limited to war purposes. The enormous benefits to be derived from real progress in this field justify whatever scientific effort can be made toward a solution. The need for long-range forecasts is not the only problem with which meteorology is confronted. Modern technological progress, particularly in aeronautics, calls for parallel improvements and expansion in meteorology far beyond the present technical capacity to supply it. In air transport and many other fields, successful operations are more or less dependent upon atmospheric conditions, and improvements in meteorological service are necessary to efficiency in operations. The horizon for applications of weather science has been extended greatly, and entirely new uses and values have appeared for applied meteorology. The Weather Bureau's program of modernization during the last decade has been designed to advance the science and enable the synoptic meteorologist to match technological developments in other fields.

SERVICE ACTIVITIES

The activities of the Bureau, now adapted to current war needs, include service to a long list of war industries as well as special observations, new and enlarged forecast services and studies, and reports for the military branches. Besides the primary job of organizing civil meteorological activities for war purposes, some of the general features of the Bureau's work during the last year are summarized under the following headings:

1. Assistance in the coordination of meteorological stations through consolidation of offices and establishment of weather centrals where applicable. The Weather Bureau has been able to assist in many ways in the planning and organizing of interrelated meteorological services for war purposes.

2. Decentralization of the general administration of the Weather Bureau into seven field regions to provide closer contact with and supervision of Weather Bureau service throughout the country. Extension of the program for all regular observing stations throughout the country, including hydrologic and climatological substations. The installation of new hydrologic stations in accordance with the long-term plan has been slowed down temporarily by the war.

3. Collaboration with the military services and the Office of Censorship in the administration of wartime security measures involving restrictions in the dissemination of meteorological information and related matters. The handling of meteorological information under these restrictions entails planning and multiplies the Bureau's daily work in synoptic meteorology.

4. Expanded in-service training program for meteorologists to provide higher professional standards in all groups, including observers as well as regular professional personnel. Conducted in-service training in observational procedures and indoctrination in fundamentals of air navigation for airways weather forecasters.

5. Organization of a central weather analysis unit ("AMAFA") at Washington to provide comprehensive analyses of the current synoptic situation for prompt dissemination in the United States and collaborating countries as an aid to high standards in weather maps and to facilitate the work of weather forecasting. (See *Aviation Weather Service*, below.)

6. Encouragement in the extension of synoptic services and other meteorological developments in neighboring countries in which the United States is interested. Assistance has been given in meteorological training courses for Latin American meteorologists. Where legally authorized and desirable, aid has been given in establishing meteorological facilities and scheduling reports of benefit in this country. Aeronautical expansion has, more than ever, made applied meteorology an international cooperative undertaking.

7. Preparation of many technical reports covering special meteorological projects and research investigations.

REGIONAL MANAGEMENT OF FIELD SERVICE

The rapid development of the national weather service during the last decade has been due primarily to two influences—the phenomenal expansion in aeronautics and the modern 3-dimensional or air-mass concept in meteorology. These influences are to some extent interdependent. Aviation needs comprehensive reports and forecasts of weather with particular reference to conditions of the upper air; modern technique in the air-mass method of forecasting depends much upon observations of the atmosphere at higher levels. Aviation's influence on meteorological practice has been of far-reaching value to many activities besides aviation, particularly to agriculture, engineering (hydroelectric, heating, etc.) marketing (fuels and perishables), and transportation. Better weather service in these fields has been long needed. It has always been true, and still is, that the public demand for weather service far exceeds the capacity of the Bureau's facilities. The pressing needs of aviation have helped greatly in bringing about modern extensions of the service.

These developments have been accompanied by increases in the number of observing stations and forecast centers and have necessitated two important administrative adjustments within the Bureau. The first of these, accomplished last year, reorganized the directive functions in Washington to coordinate all related service functions and facilitate administration; the second, accomplished this year, decentralizes field-service management and places it largely in seven regional offices. The regional divisions of the Weather Bureau are made in a manner to coordinate the numerous and varied field services. Regional offices are located at La Guardia Field, N. Y. (Region No. 1); Atlanta, Ga. (Region No. 2); Chicago, Ill. (Region No. 3); Fort Worth, Tex. (Region No. 4); Kansas City, Mo. (Region No. 5); San Francisco, Calif. (Region No. 6); and Seattle, Wash. (Region No. 7). An eighth region is to be established in Alaska.

Broadly speaking, the functions of the regional offices are to manage the field activities of the Weather Bureau under the general direction of the central office in Washington. The regional directors give special attention to supervision and inspection of field offices for the purpose of solving local problems, encouraging the best use of available facilities, and ascertaining that the highest standards of accuracy are applied in observations, reports, and records, and the best technical practices maintained in all phases of meteorological and climatological work. As a result of closer relation to field activities and enlarged responsibility, the regional organization has already proved its efficiency in meeting unprecedented weather-service demands of the war program. These advantages will continue into future peacetime activities and are consistent with efficient and progressive administration.

CONTINUING REGULAR SERVICES

National censorship of weather information, which limits public issues to (*a*) special warnings, and (*b*) forecasts in generalized terms over 26-hour periods, has made it necessary to adopt new distribution practices for getting essential meteorological information to war industries. This requires the use of direct and individual service

to public utilities, manufacturers of war material, State and municipal authorities, transportation companies, and others engaged in the war effort. In the interest of over-all war effort, the military authorities have approved a clearance system to permit the general broadcast of warnings of severe conditions, such as cold waves, hurricanes, severe local storms, and heavy snows. The issue of operating forecasts containing meteorological information that might be useful to the enemy have been displaced in many places by specific operating advices for construction contractors, farmers, growers, shippers of perishables, etc.

The work of the general weather service has been reviewed in previous annual reports and it need not be repeated here. The importance of comprehensive hemispheral weather reports, including adequate sampling of the upper air by pilot balloons and radiosondes, has already been stressed as the probable key to adequate understanding of atmospheric processes and more rapid progress in applied meteorology. Synoptic meteorology is an international science and frequent exchange of reports of observations and air-mass analyses between countries that are meteorologically interdependent is essential to the operation of general weather service of the kind that is needed by aeronautics, agriculture, commerce, and industry.

AVIATION WEATHER SERVICE

In the 5 months preceding Pearl Harbor three major plans were developed for improvement of service to peacetime aviation. Under these plans (1) terminal forecasts issued every 6 hours were to be increased in number and issued in more specific terms for use by pilots and air-carrier operations personnel; (2) facsimile reproduction of weather maps would have made copies of the latest maps promptly available; and (3) cross-sectional atmospheric diagrams indicating expected weather conditions along specified routes would have been issued with the latest weather map. For security and operational reasons, these projects were suspended in December.

Under the security requirements requested by the military services, necessary readjustments were made in the methods of providing essential weather information for flying operations. Basically, these arrangements include personal identification of aviation personnel applying for such information on the ground, and the radio transmission in code of data necessary for landing or other operational uses by aircraft in flight.

An important step in providing weather service to aviation, both military and civil, was taken in the establishment at Washington of a central analysis unit during March. This is the partial realization of a long-planned method for placing the daily weather analysis, after preparation by a staff of experts, promptly in the hands of local meteorological offices throughout the country. Facsimile reproduction, a part of the plan, is expected to be adopted eventually. While the immediate objective of this central analysis unit is to serve aviation, its benefits extend incidentally to all forms of weather-forecasting services; it represents in fact a milestone in establishing modern meteorological practice at the hundreds of airport stations throughout the country and promotes high standards and proficiency in weather-map analysis. It makes available to all airports in the United States (by means of direct transmittal over the "C" teletype circuits) compre-

hensive analyses of current surface and upper-air weather reports. In addition to relieving overburdened field staffs of a large amount of map plotting, these transmitted analyses will answer the need for uniform presentation of weather data upon which current forecasts are based, with direct benefits of speed and coordination in interpretation and the assurance of better forecasts for all purposes.

FRUIT FROST WARNING SERVICE

Wartime restrictions in the use of radio have necessitated the establishment of telephone relay channels in cooperation with county agricultural agents, growers' organizations, and others, to distribute the protective warnings of this service. Omitting detailed description of weather conditions, these warnings are now issued in the form of advices specifying the kinds of protection needed and measures for its accomplishment. During the year the effectiveness of this branch of the service was again demonstrated in the value of citrus fruit crops saved from destruction through the use of its forecasts. The saving is estimated by citrus interests at several millions of dollars this year.

HURRICANE-WARNING SERVICE

This service in the past has depended largely upon ship reports from coastal, Gulf, and Caribbean waters. In face of the handicap of wartime radio silence, arrangements have been devised for collecting essential hurricane information by other means, and the service, long a vital economic and social safeguard in the southern coastal areas, is expected to be an important safeguard for wartime shipping, manufacturing, and military activities in the Gulf, Caribbean, and adjacent areas. Estimated value of this special service for the year, in terms of property saved through safety measures based on hurricane warnings, is more than $15,000,000, exclusive of shipping.

FIRE-WEATHER WARNING SERVICE

Improvements in the Fire-Weather Warning Service during the year include the coordination of all such work in the Western States under the direction of a fire-weather coordinator at San Francisco. New fire-weather districts have been organized under Kansas City's direction in Missouri, Illinois, and Iowa, under Chicago in southern Indiana, under New Orleans in northern Louisiana and southern Arkansas, under Denver in the Black Hills and in Colorado, and under Philadelphia in New Jersey and Pennsylvania—all in cooperation with the respective State forestry agencies, and with almost no additional expense to the Federal Government except for telegraphing reports and forecasts. Existing services were also improved by better forecasting techniques and addition of mobile equipment at Boise, Portland, Mount Shasta, and Missoula; and a special service was inaugurated to assist the Grazing Service of the Department of the Interior in the fire protection of extensive grazing areas.

To provide detailed data for improvement of forecasts and extensions of the fire-weather service to new areas, a WPA project was instituted at San Francisco for the summarization of all past fire-weather records.

As with other services operated by the Weather Bureau, it has been necessary under wartime security restrictions to devise special methods

and to utilize new channels for the distribution and exchange of fire-weather reports and forecasts.

RIVER AND FLOOD SERVICE

This service, already covering most of the navigable rivers, organized new districts at Lake Charles, La., and Austin, Tex., and instituted closer and more systematic engineering collaboration under a specialist hydrologic engineer assigned to each of the seven regional offices. Serious floods occurred during the year in the Trinity, Kansas, Arkansas, Missouri, and Sacramento Rivers, and in smaller streams in eastern Pennsylvania, Michigan, and Wisconsin. Previous high-water records in all of these areas were broken and considerable damage resulted from flooding. Warnings were of added value this year in safeguarding property and personnel in military establishments and in plants and factories engaged in the production of war materials. The Nation-wide value of property saved through the aid of Weather Bureau flood warnings was estimated at more than $7,500,000.

A special report on this service, presenting a review of progress since 1891 and a master plan for future improvements, was submitted to the Secretary early in the fiscal year.

Hydrometeorological Section

This section continued its development of techniques for estimating maximum possible precipitation and quantities of run-off for the flood-control programs of the Departments of War and Agriculture. A noteworthy project this year was the report "Maximum Possible Precipitation Over the Sacramento Basin of California," which is being reproduced by the Waterways Experiment Station of the U. S. Engineer Corps at Vicksburg, Miss. In addition, much of the basic work on a hydrometeorological report for the Panama Canal Third Locks was completed, and work was started on a similar report for the Pecos River basin in Texas and New Mexico.

Storm studies of the U. S. Engineer Corps were reviewed throughout the year and are filed in the section along with reviews of mass curves, basic data, and discussions. Progress was made also in the storm-classification program; studies were begun on thunderstorms as an important flood-producing storm type; and five brief reports on basin-storms were made for the Flood Control Advisory Committee of the Department of Agriculture.

HURRICANE TRAINING CLASS

A class for training students from Latin American Republics bordering the Caribbean was organized at New Orleans in the latter part of February in collaboration with the Department of State and continued through June with schedule for adjournment at the end of July after a 10-day visit to the central office at Washington. The students were instructed in the general principles of meteorology, with particular stress on tropical conditions, including hurricanes and synoptic work.

The program was notably successful, not only from the professional standpoint but also in cultivating United States-Latin American understanding in meteorology. This exchange of professional views and extension of meteorological training is important in the development of meteorological service in the Latin American countries, a worth-

while program in air transportation and other Western Hemisphere interests.

Some of the adjustments to wartime weather service are indicated in the foregoing. It is pertinent to include in this report an expression of the Weather Bureau's appreciation for the invaluable cooperation of the military services, of other agencies with which the Weather Bureau has worked, and of the public generally. The Bureau's services are unusually inclusive in their contacts, touching the interests and operations of nearly all classes of people. In many instances curtailments have been necessary in services that have operated for public benefit for half a century. The elimination of references to weather from radio broadcasts, and to a large extent also from the press, has caused an inconvenience of national scope. Restrictions on the teletype distributions of reports have handicapped aviation training schools and other operations. Chambers of commerce, brokerage agencies, and railroads have been requested to discontinue the publication and posting of weather information for advertising purposes. Many of these public services, such as weather information by radio broadcast, had been built up by the Bureau after years of effort. Their curtailment was accepted as a necessary wartime security measure and their restoration is planned immediately upon return of peace. The cooperation of the American press, the radio networks, and the Office of Censorship, has aided greatly in these necessary measures to safeguard national security and give maximum cooperation in the war effort.

The organization of the field service as of June 30, 1942, and the funds available for the Bureau's operations for the fiscal year were as follows:

Field stations

First-order stations (commissioned personnel)		296
General forecasting centers	14	
Airway forecasting centers	22	
Regional offices	8	
River district centers	76	
Climatological section centers	43	
Marine service activities in 16 port offices.		
Checking units for hydrologic data (3 located at regional offices)		7
Special stations (meteorological, hurricane, frost and fruit)		55
Airway stations (105 in Alaska)		235
Cooperative airway stations (15 in Alaska)		90
Off-airway stations (20 in Alaska)		140
CAA cooperative airway stations (14 in Alaska)		275
Storm-warning display stations		307
Weather and crop reporting stations—1,700 unpaid		2, 085
River, rainfall (for river work), snowfall, winter sports, evaporation, and special reporting stations—496 unpaid		1, 778
Hydrologic stations—1,333 unpaid		2, 025
Climatological stations (non-crop reporting)—unpaid		4, 260

Funds available to the Weather Bureau, fiscal year 1942

Regular appropriations, "Salaries and expenses"	$7, 984, 730
Allotments to the Weather Bureau by the Secretary of Commerce	139, 000
Funds advanced or transferred from other Government agencies	471, 326
Emergency Relief funds	73, 576
Grand total	8, 668, 632

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