W 79.1: 928

ANNUAL REPORT OF THE GOVERNOR OF THE PANAMA CANAL, 1928

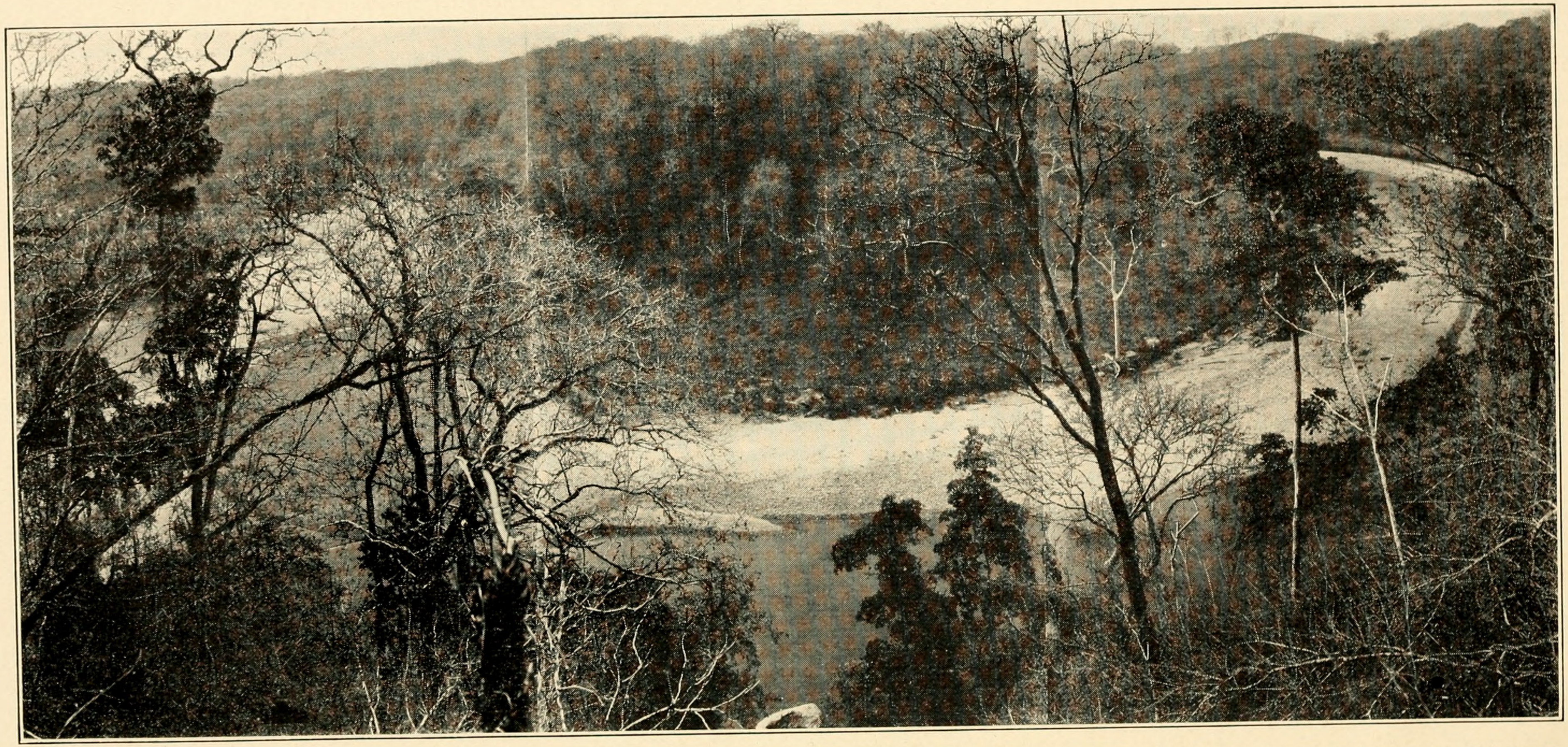
386
P187

UNIVERSITY
OF FLORIDA
LIBRARY

Digitized by the Internet Archive
in 2010 with funding from
University of Florida, George A. Smathers Libraries with support from Lyrasis and the Sloan Foundation

http://www.archive.org/details/annualreportofgo1928cana

FRONTISPIECE



CHAGRES RIVER AT ALHAJUELA, NEAR SITE OF PROPOSED DAM TO SECURE ADDITIONAL STORAGE OF WATER. CENTER OF PICTURE IS ALONG AXIS OF PROBABLE SITE

ANNUAL REPORT

OF THE

GOVERNOR OF THE PANAMA CANAL

FOR THE

FISCAL YEAR
ENDED JUNE 30

1928

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1928

386
P187

ADDITIONAL COPIES

OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
U. S. GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT

20 CENTS PER COPY

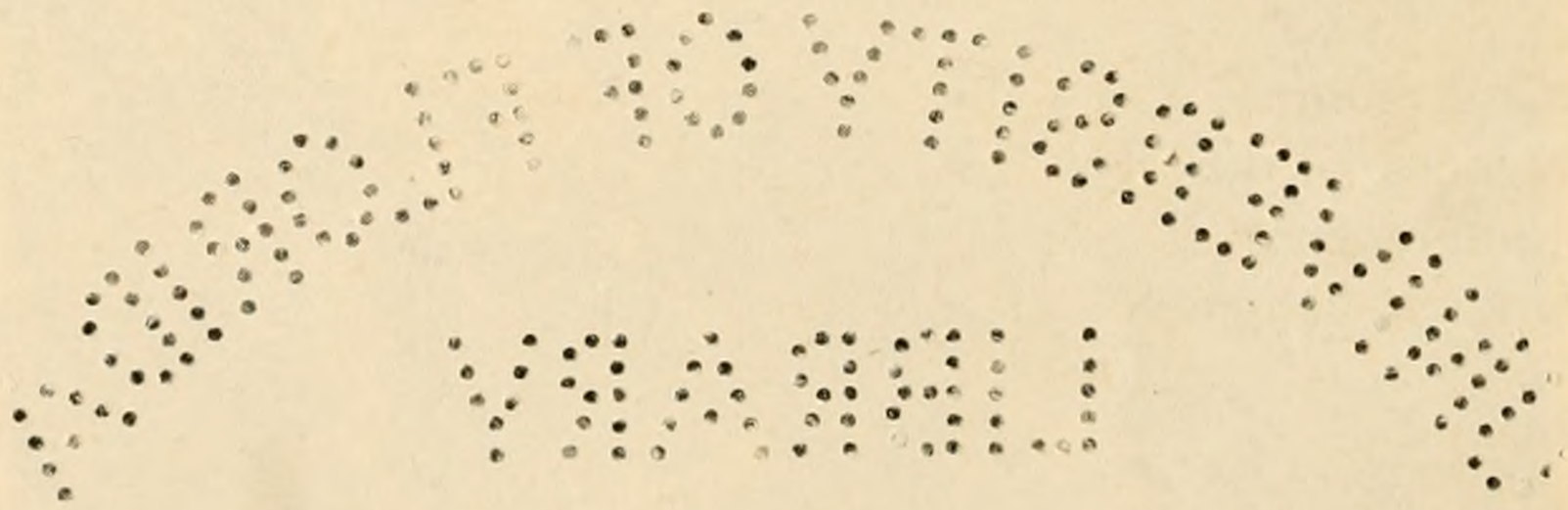


TABLE OF CONTENTS

	Page
Introduction	1
Operation and maintenance of the canal	3
Business operations	3
Administration—Government	4
Net revenue of the canal and its auxiliaries	4
Services rendered by the canal to shipping	6
SECTION I.—CANAL OPERATION AND TRADE VIA PANAMA	
Traffic in 1928	7
Proportion of tanker traffic	9
Tanker cargoes	11
Nationality of vessels	11
Commercial traffic through the canal during the fiscal year 1928 by nationality of vessels	13
Vessels entitled to free transit and launches of less than 20 tons net measurement	13
Trade routes and cargo	14
Comparative cargo statistics for past four fiscal years by principal trade routes through canal	15
Principal commodities	16
Commodity movement—	
Atlantic to Pacific	16
Pacific to Atlantic	17
Classification of vessels	17
Details of the trade	18
Dual measurement system	18
Hours of operation	19
Lockages and lock maintenance	21
Lockages	21
Hours of operation	21
Overhaul	22
Equipment	22
Power for canal operation	22
Water supply	23
Dry season	25
Additional storage at Alhajuela	25
Seismology	26
Maintenance of channel and improvement projects	26
Improvement project No. 1	26
Improvement project No. 2	27
Improvement project No. 9	27
Equipment	28
Ferry service	28
Slides	28
Aids to navigation	29
Accidents	29
Salvage operations	30
Rules and regulations	31

67171

Section II.—Business Operations

	Page
Mechanical and marine work	32
Marine work	33
Other work	33
Dry docks	34
Plant	34
Financial	35
Coal	35
Fuel oil, Diesel oil, gasoline, kerosene	36
Ship chandlery and other supplies—storehouse operations	37
Native lumber operations	37
Harbor terminals	38
Commissaries	38
Sales	39
Purchases	40
Manufacturing plants	40
Hotels and restaurants	41
Building construction	42
Animal and motor transportation	42
Panama Canal Press	42
Panama Railroad	43
Telephones and telegraphs	43
Land and buildings	44
Panama Railroad Co. lands and leases	44
Agricultural lands in Canal Zone	44
Alhajuela Basin	45
Plant introduction gardens and experimental station	45
Quarters for employees	46
Clubhouses	47
Farm industries	47
Operation with Panama Railroad Co.'s funds	48
Panama Railroad Steamship Line	48
Canal Zone for orders	48

Section III.—Government

Population	50
Public health	50
Malaria	50
Canal Zone	51
Panama City	51
Colon	52
Canal hospitals	52
Quarantine and immigration services	53
Municipal engineering	54
Water supply	54
Sewers	54
Roads, streets, and sidewalks, Canal Zone	54
Cities of Panama and Colon	54
Army and Navy	55
Repairs to Dock 15	55
Water purification plants and testing laboratory	55
Bridge across Miraflores Spillway	55

Page

Public order 56
Office of the district attorney 57
District court 57
Marshal 57
Magistrates' courts 58
Balboa 58
Cristobal 58
Fire protection 58
Public school system 59
White schools 59
Colored schools 60
Postal system 60
Customs 62
Shipping commissioner—seamen 63
Prohibited aliens 63
Administration of estates 63
Licenses and taxes 64
Immigration visas 64
Relations with Panama 64

SECTION IV.—ADMINISTRATION

Changes in organization and personnel 65
Force employed 65
Wage adjustments:
Gold employees 67
Alien employees on silver roll 68
Complaints board 69
Recruiting and turnover of force 70
Gold employees 70
Silver employees 71
Public amusements and recreation 71
Purchases and sales in the United States 72

SECTION V.—FINANCIAL AND STATISTICAL STATEMENTS

For list of tables see page 73

LIST OF ILLUSTRATIONS

Frontispiece. Chagres River at Alhajuela, near site of proposed dam to secure additional storage of water. Center of picture is along axis of probable site.
Graph of operating uses of Gatun Lake water supply. (Page 24.)
Plate 1. Administration building at Cristobal.
2. Dredging division activities: View of dump area in swamp reclamation near Corozal.
3. New buildings at Corozal Hospital for the insane.
4. The *Chagres*, one of two Diesel electric tugs built at Balboa shops, Canal Zone.
5. Wholesale warehouse of commissary division, Mount Hope.
6. Railway and highway bridge at Miraflores Locks, over discharge channel of Miraflores Lake Spillway.
7. Improvement project No. 2—widening Gaillard Cut. View looking west from Station I east bank, showing dredge working on south shoulder.
8. Graph of principal commodities shipped through Panama Canal, fiscal year 1928.
9. Graph of origin and destination of Pacific bound cargo, 1928.
10. Graph of origin and destination of Atlantic bound cargo, 1928.
11. Graph of tonnage of cargo passing through the Panama Canal, by fiscal years.
12. Graph of percentage of cargo carried by ships of United States and foreign registry.
13. Graph of number of commercial vessels transiting Panama Canal, by fiscal years.
14. Graph of tolls collected, by fiscal years.

APPENDIXES NOT PRINTED

Reports of Heads of Departments and Divisions

Reports for the fiscal year 1928 have been made as follows and may be consulted at the Washington office of the Panama Canal or at the office of the governor, Balboa Heights, Canal Zone:

Engineer of maintenance—
- Assistant engineer of maintenance, report of.
- Pacific locks, report of superintendent.
- Atlantic locks, report of superintendent.
- Electrical division, report of electrical engineer.
- Municipal engineering division, report of municipal engineer.
- Dredging division, report of superintendent.
- Office engineer, report of.
- Meteorology and hydrography; surveys; report of chief of surveys.
- Gatun Dam and backfills, report of general foreman.

Marine division, report of superintendent.

Mechanical division, report of superintendent.

Supply department, report of chief quartermaster.

Executive department—
- Division of civil affairs, report of chief of division.
- Police and fire division, report of chief of division.
- Division of schools, report of superintendent of schools.
- Bureau of clubs and playgrounds, report of general secretary.

District attorney, report of.

Accounting department, report of the auditor.

Land agent, the Panama Canal and Panama Railroad Co., report of.

Purchasing department, report of the general purchasing officer and chief of Washington office.

ANNUAL REPORT

OF THE

GOVERNOR OF THE PANAMA CANAL

BALBOA HEIGHTS, CANAL ZONE,
August 27, 1928.

The SECRETARY OF WAR,
Washington, D. C.

SIR: Herewith is report of the Governor of the Panama Canal for the fiscal year ended June 30, 1928.

In forwarding this my final report I wish to express my grateful appreciation of the splendid support you have given me in the administration of the canal. It has been a pleasure and a privilege to serve under you.

I also wish to bear witness to the intelligence, loyalty, and industry of the personnel composing the canal and Panama Railroad forces. It is an honor to have led such a body of men and women, and their unselfish devotion to duty has made possible the successful operation of these large governmental enterprises.

Very respectfully,

M. L. WALKER, *Governor.*

INTRODUCTION

The traffic through the Panama Canal in the fiscal year just closed was greater than in any preceding fiscal or calendar year. This statement, made last year, is repeated for this, Traffic in the fiscal year 1928 was greater than that in the fiscal year 1927 by 18 per cent in number of commercial transits, 12 per cent in net tonnage, 11 per cent in tolls and 7 per cent in cargo carried.

This considerably greater canal business, which may be expressed roughly by saying that the canal has handled seven ships where six were handled the year before, has been conducted with an increase in force of approximately 1 man to every 25 previously employed. The growth in traffic led to an extension during the past year of the hours of operation and to increases in divers elements of business connected with the operation of the canal.

The growth of traffic has brought to the front considerations of the possibility of its exceeding the capacity of the canal, with the corollary

of considering ways by which the capacity may be increased. Present traffic is considered to be between 45 and 50 per cent of that which the canal can handle, as constructed at present. The first move to provide for future increases and to assure sufficient depth of water in the cut and over the upper sills of the locks has been begun in the development of a supplementary water supply. A résumé of the essentials of this project is presented in a section devoted to additional storage at Alhajuela. It is believed that this, with the eventual construction of a third flight of locks, paralleling the present twin flights will increase the present capacity of the canal by about 70 per cent.

The total net revenue from combined Panama Canal and Panama Railroad operations in the fiscal year was $20,621,314.82, the best showing for any year to date. The increasing revenues have been made the occasion for proposals that the tolls be reduced, either on all traffic or on special classes of vessels. Policy in this respect is for determination by Congress. It is pertinent, however, for the administration of the canal to point out that heavy expenditures are yet due to be made for additions and replacements in the plant, for the adequate quartering of employees, for suitable retirement of employees grown old or disabled in this exacting service; that tolls at Panama are lower (by approximately a third at present) than the tolls at Suez; that reductions will benefit foreign vessels in foreign trade as well as United States vessels in domestic trade; that the intercoastal lines are competing severely with the railroads, and a lowering of tolls may cripple the internal transportation system of the United States while reducing the Government's revenue, with offsetting benefits accruing only to limited special interests.

Through the past year the canal force has maintained its high standards of expeditious service, not only in the actual transiting of ships but in all of the supplementary services to shipping which are conducted at the canal. The maintenance of adequate channel and smoothly working locks go hand in hand as primary factors, and these are linked with many only slightly lesser interests, the various business activities and the governmental or municipal administration for the canal and Canal Zone.

Under business activities are grouped such enterprises as the storehouses and retail establishments for purveying foodstuffs and supplies, oil and coaling plants, dry docks and shops for repair and manufacturing, operation of the Panama Railroad and its shops on the Isthmus, piers and wharves for the handling of cargo and passengers, operation of the Panama Railroad Steamship Line, operation of quarters for the canal force and their families and the conducting of other enterprises which in the usual community are under private management. Under governmental administration some of

the principal items are public schools, sanitation and medical and hospital service, police and fire protection, customs service, quarantine and immigration, and some provision for recreation in a population which includes approximately 8,000 civilian Americans, 9,000 Americans in military and naval stations, and 20,000 aliens, mostly West Indians.

Responsibility for the administration of the Panama Canal is centered in the governor, by the provisions of the Panama Canal act. In the existing organization the governor has distributed the work among nine major departments and divisions, the heads of which are responsible to him.

OPERATION AND MAINTENANCE OF THE CANAL

The maintenance of the passage for vessels between the oceans is the fundamental business of the canal. The fiscal year 1928 was another in which no delays of consequence occurred to traffic. Vessels were handled both in transit and at the terminals with a promptness which operators have learned to expect and demand. During the year a total of 6,959 seagoing vessels passed through the canal, an average of 19 per day. Of these vessels, 2,442, or a little over one-third, made use of the terminal ports in discharging or loading passengers or cargo.

One of the permanent problems of the canal is the avoidance of accidents of the sort inherent in traffic through restricted channels; such as groundings due to faulty operation of steering gear, often at time of sheers which result from currents in close waters; striking against the lock walls or piers and wharves, collisions with other vessels, etc. During the fiscal year 1928 a total of 99 accidents occurred as compared with 60 during the preceding year; those in which the estimated damage was $1,000 or more numbered 14 as compared with 15 during 1927.

The deepening of the Pacific sea-level section and Balboa inner harbor, the removal of material brought into the canal by small slides, and the general maintenance of channel and locks were carried on through the year without interference with traffic.

BUSINESS OPERATIONS

Certain business enterprises necessary for the conduct of the work and for the convenience of shipping were carried on by the canal organization during the past year as before. The Panama Canal must have its own controlled sea communication with the United States. The employees must be housed, provided with the necessities and comforts of life, and the Americans must have means for transportation to and from the United States on leaves of absence to be spent in

the Temperate Zone. Repair facilities, bunkering stations, chandlery, and other essential supplies, are required by shipping. For purposes of transshipment there are wharves and piers. These activities are carried on by either the Panama Canal or the Panama Railroad Co., the latter being in all essentials a department of the canal organization.

The value of these services under centralized control has been shown by experience. They assure to shipping adequate facilities at reasonable prices under a management devoted primarily to the efficient handling of vessels; and they make much easier the maintenance of an adequate and contented force which can be depended on for the effective operation of the canal. With reference to national defense, they place under the direct control of the Government certain plants and stores of supplies essential to the use of the canal terminals as naval bases and to the husbanding of resources in case of siege. It is notable that in the face of the general opposition to the Government's engaging in business activities, the wisdom of this arrangement at the canal is recognized practically universally.

ADMINISTRATION—GOVERNMENT

Such functions of government as public health; quarantine; immigration service; customs; post offices; schools; police and fire protection; construction and maintenance of roads, streets, water supply, and sewers; hydrographic and meteorological observations; steamboat inspection; aids to navigation, etc., are all embraced in the single organization of the Panama Canal under the direct control of the governor. Here again the concentration under one control has simplified the operations of the canal by coordinating any and all of these activities to the main function of prompt and reliable handling of vessels. The arrangement results also in economies of administration, since under this control it is possible to place under one organization or even under one individual, duties which in a less centralized administration would be the function of two or more administrative units. This centralization has probably had more to do than any other factor with the continued efficiency of canal operations.

NET REVENUE OF THE CANAL AND ITS AUXILIARIES

The net income from tolls and other miscellaneous receipts known as "transit revenues" was $18,224,844.86 for the fiscal year 1928, as compared with $15,611,093.80 in 1927, $15,151,668.06 in 1926, $13,465,924.72 in 1925, and $16,307,948.50 in 1924.

The net profits on auxiliary business operations conducted directly by the Panama Canal, of which the most important are the mechanical shops, material storehouses, and fuel-oil plants, totaled $736,719.43, as

compared with $876,536.80 in 1927, $841,310.29 in 1926, $765,916.85 in 1925, and $901,624.12 in 1924. The net profits of operations conducted by the Panama Railroad Co., exclusive of the Panama Railroad Steamship Line but including commissaries, docks, coaling plants, and cattle industry, were $1,659,750.53, as compared with $1,644,189.37 in 1927, $1,347,887.33 in 1926, $1,525,910.13 in 1925, and $1,044,887.04 in 1924. The total net revenue of the year from all sources, exclusive of the Panama Railroad Steamship Line, was $20,621,314.82, as compared with $18,131,819.97 in 1927, $17,340,-865.68 in 1926, $15,757,751.70 for 1925, and $18,254,459.66 in 1924.

The above is condensed in tabular form for the past three years as follows:

	1926	1927	1928
Net transit revenue	$15, 151, 668. 06	$15, 611, 093. 80	$18, 224, 844. 86
Net revenue on Panama Canal business operations	841, 310. 29	876, 536. 80	736, 719. 43
Total net revenue, Panama Canal	15, 992, 978. 35	16, 487, 630. 60	18, 961, 564. 29
Net revenue on Panama Railroad business operations	1, 347, 887. 33	1, 644, 189. 37	1, 659, 750. 53
Combined net revenue	17, 340, 865. 68	18, 131, 819. 97	20, 621, 314. 82

The canal, opened to traffic on August 15, 1914, was blocked by slides at various times during the first few years, and with the relatively light traffic of the first nine years did not return a net revenue commensurate with its cost. Beginning with the fiscal year 1923 there was a distinct advance; the combined net revenue of the canal and Panama Railroad for that year was $12,063,880.74, as compared with $3,079,531.91 during the preceding year. The following year 1924, showed a further increase of something over $6,000,000 to be followed in 1925 with a decrease of approximately two and one-half millions as compared with 1924 figures. Since 1925 the net revenue for each year has been higher than for the year preceding, and the figure of $20,621,314.82 for the fiscal year 1928 represents the maximum yearly net revenue to date.

Investment in the canal is partly commercial, partly for national defense. Arbitrarily the figure of $275,000,000 has been adopted as representing the investment in a commercial sense (exclusive of the Panama Railroad Co.) and approximately $115,000,000, including the $40,000,000 paid to the French, has been charged off as expenditure for national defense. The annual interest on $275,000,000 at 3 per cent, the rate on most of the Panama Canal bonds, would be $8,250,000; at 4 per cent it would be $11,000,000 at 5 per cent, $13,-750,000. However, no interest charge is taken into account, although there is a fixed annual charge of $350,000 for amortization of canal fixed property having a life of 100 years and $640,000 covering depreciation at 2 per cent per annum on property having a life of less than

100 years, which together with interest at 3 per cent per year will provide for amortization of the investment or replacement of all items at the end of 100 years. In addition, the expenses include a further charge of approximately $750,000 per year for depreciation of canal equipment and plants. To June 30, 1928, the operating expenses for the canal proper amounted to approximately $104,000,000 and the revenues to over $196,000,000, of which $193,018,936.71 was for tolls alone. In addition, the operating expenses of certain auxiliary business units amounted to over $159,500,000 more, against business revenues of $166,000,000. The excess of total earnings over total expenses at the beginning of the fiscal year 1929 stood at $98,915,439.82.

In the above, as stated previously, there is no consideration of interest charge on the investment. At 3 per cent on $275,000,000 it would have amounted to $115,500,000 for the 14-year period of canal operation at simple interest and if compounded would be considerably more. Against this the operating earnings, aggregated to date, leave a deficit.

SERVICES RENDERED BY THE CANAL TO SHIPPING

The main items in the business of the canal and its adjuncts in the past year, covering principal services to shipping, are expressed numerically in the following table, with comparison with the two years immediately preceding:

	1926	1927	1928
Transits of the canal by ships paying tolls	5, 197	5, 475	6, 456
Free transits	552	597	503
Calls at canal ports by ships not transiting canal	963	1, 061	1, 123
Cargo handled at ports (tons)	1, 089, 244	1, 150, 807	1, 300, 119
Coal, sales and issues (tons)	347, 619	372, 461	340, 774
Coal—number of ships served other than vessels operated by the Panama Canal	902	907	964
Fuel oil pumped (barrels)	12, 562, 146	16, 350, 399	15, 977, 648
Fuel oil—number of ships served other than vessels operated by the Panama Canal	2, 064	2, 874	2, 678
Ships repaired, other than Panama Canal equipment	836	911	1, 093
Ships dry-docked, other than Panama Canal equipment	109	120	131
Provisions sold to ships (commissary sales)	$1, 174, 478. 46	$1, 308, 520. 02	$1, 429, 647. 35
Chandlery sold to ships (storehouse sales)	$109, 590. 58	$134, 106. 36	$149, 055. 47

SECTION I

CANAL OPERATION AND TRADE VIA PANAMA

TRAFFIC IN 1928

Exceeding the previous record of traffic made in the fiscal year 1927, the traffic through the Panama Canal in the fiscal year ended June 30, 1928, was greater than that in any preceding fiscal or calendar year.

Six thousand four hundred and fifty-six commercial vessels made the transit during 1928 as compared with 5,475 during the preceding fiscal year. The average number of commercial transits per day was 17.63 during 1928 as compared with 15 for 1927. Transits of naval and other public vessels of the United States, public vessels of the Republics of Panama and Colombia, and vessels transiting solely for repairs, none of which paid tolls, numbered 503 during 1928 as compared with 597 during 1927. Combining the two, there were 6,959 transits of seagoing vessels during 1928 as compared with 6,072 in 1927. The daily averages were 19 and 16.6, respectively. The increase in total transits in 1928 with respect to the year before was over 14 per cent.

The net tonnage of the 6,456 commercial transits in 1928 was 29,458,634 tons, Panama Canal measurement. Tolls levied amounted to $26,944,499.77, and cargo carried through the canal aggregated 29,630,709 tons.

The majority of the leading trade routes through the canal showed increases of traffic during the year. There was a slight decrease, however, in the United States intercoastal trade. This was caused principally by light shipments of mineral oils during the last six months of the year. Slight decreases occurred also in the trade between the United States and the Australasian area, and in that between the west coast of Canada and the Atlantic coast of the United States.

Mineral oil continued to be the largest item of cargo through the canal, although there was a decrease of over a million and one-half tons as compared with the previous year. Other important items of cargo such as wheat, lumber, and nitrates showed heavy increases over the previous year.

Traffic figures for each fiscal year since the canal was opened to navigation are shown in the table below:

	Number of transits	Panama Canal net tonnage	Tolls	Tons of cargo
Fiscal year ending June 30—				
1915 [1]	1,075	3,792,572	$4,367,550.19	4,888,454
1916 [2]	758	2,396,162	2,408,089.62	3,094,114
1917	1,803	5,798,557	5,627,463,05	7,058,563
1918	2,069	6,574,073	6,438,853.15	7,532,031
1919	2,024	6,124,990	6,172,828.59	6,916,621
1920	2,478	8,546,044	8,513,933.15	9,374,499
1921	2,892	11,415,876	11,276,889.91	11,599,214
1922	2,736	11,417,459	11,197,832.41	10,884,910
1923	3,967	18,605,786	17,508,414.85	19,567,875
1924	5,230	26,148,878	24,290,963.54	26,994,710
1925	4,673	22,855,151	21,400,523.51	23,958,836
1926	5,197	24,774,591	22,931,055.98	26,037,448
1927	5,475	26,227,815	24,228,830.11	27,748,215
1928	6,456	29,458,634	26,944,499.77	29,630,709
Total	46,833	204,136,588	193,307,727.83	215,286,199

[1] Canal opened to traffic Aug. 15, 1914.
[2] Canal closed to traffic approximately 7 months of fiscal year by slides.

The commercial traffic, while showing an increase of 981 vessels over the fiscal year 1927, was fairly uniform throughout the year. By months, the number of transits ranged between 481 in June and 589 in December, a difference of 108 vessels and of 2.97 in daily average transits. The monthly average of transits for the year was 538 and compared with 456 for the previous year, an increase of 82, or 18 per cent. Monthly transits and tolls, with daily averages, for commercial vessels only, were as follows:

Month	Total for month		Daily averages	
	Transits	Tolls	Transits	Tolls
1927				
July	509	$2,215,515.99	16.42	$71,358.56
August	543	2,274,040.55	17.52	73,356.15
September	540	2,294,432.34	18.00	76,481.08
October	567	2,380,115.97	18.29	76,777.95
November	559	2,369,267.99	18.63	78,975.60
December	589	2,398,459.75	19.00	77,369.67
1928				
January	540	2,212,752.50	17.42	71,379.20
February	547	2,253,755.37	18.86	77,715.70
March	542	2,223,370.57	17.48	71,271.63
April	531	2,187,607.82	17.70	72,914.55
May	508	2,118,969.83	16.38	68,353.86
June	481	2,016,211.09	16.03	67,206.43
Total	6,456	26,944,499.77	17.63	73,618.85

Comparison by months with traffic in the preceding fiscal year is shown as follows:

Month	Number of vessels		Panama Canal net tonnage		Tons of cargo		Tolls	
	1926–7	1927–8	1926–7	1927–8	1926–7	1927–8	1926–7	1927–8
July	456	509	2, 154, 821	2, 406, 955	2, 185, 527	2, 450, 468	$1, 980, 719. 67	2, 215, 515. 99
August	464	543	2, 230, 905	2, 513, 614	2, 321, 697	2, 429, 947	2, 055, 041. 91	2, 274, 040. 55
September	446	540	2, 186, 804	2, 532, 942	2, 239, 547	2, 397, 753	2, 019, 626. 42	2, 294, 432. 34
October	445	567	2, 124, 519	2, 585, 752	2, 374, 711	2, 717, 646	1, 989, 213. 93	2, 380, 115. 97
November	428	559	2, 032, 488	2, 591, 717	2, 272, 449	2, 488, 882	1, 889, 001. 11	2, 369, 267. 99
December	458	589	2, 135, 002	2, 616, 728	2, 310, 270	2, 573, 828	1, 996, 036. 72	2, 398, 459. 75
January	443	540	2, 121, 631	2, 422, 770	2, 241, 765	2, 372, 061	1, 984, 760. 71	2, 212, 752. 50
February	449	547	2, 201, 328	2, 460, 111	2, 230, 107	2, 660, 425	1, 994, 860. 82	2, 253, 755. 37
March	496	542	2, 413, 999	2, 441, 077	2, 533, 525	2, 428, 662	2, 217, 913. 20	2, 223, 370. 57
April	464	531	2, 224, 500	2, 384, 491	2, 429, 807	2, 473, 884	2, 065, 206. 92	2, 187, 607. 82
May	471	508	2, 248, 892	2, 274, 612	2, 379, 713	2, 497, 588	2, 066, 070. 73	2, 118, 969. 83
June	455	481	2, 152, 926	2, 227, 865	2, 229, 097	2, 139, 565	1, 970, 377. 97	2, 016, 211. 09
Total	5, 475	6, 456	26, 227, 815	29, 458, 634	27, 748, 215	29, 630, 709	24, 228, 830. 11	26, 944, 499. 77

PROPORTION OF TANKER TRAFFIC

On account of increased output from oil fields which have their access to the sea on the Atlantic coast of the Americas, tanker traffic through the canal declined considerably during the fiscal year 1928. It shows a decrease of about 15 per cent when compared with that of 1927. Tanker transits totaled 1,121 as compared with 1,324 during 1927, a decrease of 203. Tank ships comprised 17.3 per cent of the total commercial transits during the year, made up 21.2 per cent of the Panama Canal net tonnage, paid 20.1 per cent of the total tolls collected, and carried 19.7 per cent of the cargo which passed through the canal.

During previous fiscal years increases or decreases in traffic have been due largely to fluctuations in tanker traffic. The heavy increase in 1928, however, over the preceding year is due entirely to general traffic. Transits of tank ships during 1928 decreased 203 as compared with 1927 while transits of vessels engaged in general traffic increased 1,184, making a net increase of 981 in commercial transits. In Panama Canal net tonnage the tank ships decreased 1,380,143 tons while general cargo vessels increased 4,610,962, tons, a net increase for all of 3,230,819 tons. Tolls collected from tank ships decreased $1,222,369.74 while tolls collected from general cargo carriers increased $3,938,039.40, making the net increase $2,715,669.66.

Omitting transits of public vessels of the United States and other vessels exempt from the payment of tolls, the number of ocean-going vessels transiting the canal daily averaged 17.6 throughout the year. Of this number tank ships averaged three transits daily, the balance of 14.6 being made up of general cargo carriers, passenger ships, warships of foreign nations, etc.

In the tables below the commercial traffic has been segregated to show the proportion of tanker transits, tonnage, and tolls as compared with corresponding figures embracing all other classes of traffic. The figures are for the fiscal years 1923 to 1928, inclusive, covering the era of the growth and decline of tanker traffic:

Proportion of tank ships to total traffic

Year	Total commercial transits			Average daily transits		
	Tankers	General	Total	Tankers	General	Total
1923	913	3,054	3,967	2.5	8.3	10.8
1924	1,704	3,526	5,230	4.6	9.6	14.2
1925	1,079	3,594	4,673	2.9	9.8	12.8
1926	1,090	4,107	5,197	3.0	11.2	14.2
1927	1,324	4,151	5,475	3.6	11.4	15.0
1928:						
July	116	393	509	3.7	12.7	16.4
August	116	427	543	3.7	13.8	17.5
September	131	409	540	4.4	13.6	18.0
October	105	462	567	3.4	15.0	18.4
November	96	463	559	3.2	15.4	18.6
December	100	489	589	3.3	15.8	19.1
January	87	453	540	2.8	14.6	17.4
February	68	479	547	2.3	17.1	19.4
March	66	476	542	2.1	15.3	17.4
April	73	458	531	2.4	15.3	17.7
May	73	435	508	2.4	14.0	16.4
June	90	391	481	3.0	13.0	16.0
Total, 1928	1,121	5,335	6,456	3.0	14.6	17.6

Proportion of tanker tonnage to total tonnage

Fiscal year	Panama Canal net tonnage			Percentage of total net tonnage		
	Tankers	General	Total	Tankers	General	Total
1923	5,374,384	13,231,402	18,605,786	28.9	71.1	100
1924	10,212,047	15,936,831	26,148,878	39.1	60.9	100
1925	6,424,622	16,430,529	22,855,151	28.1	71.9	100
1926	6,324,240	18,431,351	24,774,591	25.5	74.5	100
1927	7,624,112	18,603,703	26,227,815	29.1	70.9	100
1928	6,243,969	23,214,665	29,458,634	21.2	78.8	100

Proportion of tolls from tank ships to total tolls from all vessels

Fiscal year	Tolls paid by shipping using canal			Percentage of total tolls		
	Tankers	General	Total	Tankers	General	Total
1923	$4,769,324.63	$12,738,874.94	$17,508,199.57	27.2	72.8	100
1924	9,071,835.65	15,219,127.89	24,290,963.54	37.3	62.7	100
1925	5,728,302.26	15,672,221.25	21,400,523.51	26.8	73.2	100
1926	5,626,167.93	17,304,888.05	22,931,055.98	24.4	75.6	100
1927	6,658,806.90	17,570,023.21	24,228,830.11	27.5	72.5	100
1928	5,436,437.16	21,508,062.61	26,944,499.77	20.1	79.9	100

TANKER CARGOES

Cargo carried through the canal in tank ships decreased from 7,250,579 tons in 1927 to 5,829,722 tons in 1928, or 1,420,857 tons. Of the 5,829,722 tons, 5,611,644 tons were shipped from Pacific to Atlantic ports and 218,078 tons from Atlantic to Pacific. Shipments of both Californian and Peruvian oil were considerably less during the fiscal year 1928 than during 1927. Of the aggregate shipments of mineral oils through the canal during the year 4,273,726 tons originated at the port of Los Angeles.

The foregoing figures for tanker cargoes do not comprise all mineral oil shipments passing through the canal, as considerable quantities of refined oil in cases are carried through in general cargo carriers.

NATIONALITY OF VESSELS

Twenty-three flags were represented in the commercial traffic passing through the canal during the fiscal year 1928. In number of transits vessels carrying the flag of the United States increased slightly (68), but with respect to tonnage, tolls paid, and cargo carried the United States vessels showed slight decreases. This is attributed to the decrease in transits of tankers, which are usually larger than the general cargo carriers.

Transits of British vessels showed a marked increase, from 1,351 in the fiscal year 1927 to 1,842 in 1928, a gain of 491 transits, or over 36 per cent. They comprised 28½ per cent of the transits, as compared with 24½ per cent in 1927. This was largely due to the large number of vessels of this nationality being routed through the canal for the carriage of heavy shipments of wheat from western North America to Europe.

German traffic through the canal made the greatest relative gain during the past year, increasing from 212 transits in 1927 to 316 in 1928, a gain of 104, or almost 50 per cent. German vessels took third place in number of transits in 1928, exchanging places in this respect with the Norwegian vessels, which were third in 1927 and fourth in 1928. Two of the large German companies have augmented their tonnage on lines passing through the canal, and there are prospects of handling an increasingly large number of German vessels. Norwegian vessels continue in third place with respect to net tonnage, tolls, and cargo.

As in former years, vessels of the United States and Great Britain made up the greater part of the traffic; in 1928 about 75 per cent of the total. The nationalities next in order in transits were German and Norwegian, each with slightly less that 5 per cent.

With respect to cargo carried through the canal, vessels of United States registry carried approximately 48 per cent of the total; British

vessels, 27¼ per cent; Norwegian vessels, 4¼ per cent; German vessels, 4 per cent; Swedish vessels, 2½ per cent; Dutch vessels, 2¼ per cent; and French vessels, 2 per cent. Combined, the vessels of these seven countries carried over 90 per cent of all cargo that passed through the canal during the past fiscal year.

As compared with the fiscal year 1927 cargo carried under the United States flag was less by nearly 1,000,000 tons, or 6½ per cent, while that carried under the British flag, the nearest competitor, increased by approximately 1,600,000 tons, or 25 per cent. The decrease in cargo tonnage under the United States flag is due primarily to decreased shipments of mineral oils through the canal, a great proportion of which has been in United States vessels. Shipments from the port of Los Angeles alone declined over one and a quarter million tons.

The following tabulation shows the cargo tonnage carried under the flags of the leading maritime nations contributing to canal traffic during the past five years:

Tons of cargo carried

	1924	1925	1926	1927	1928
United States	16,654,435	13,080,200	13,710,956	15,242,156	14,248,735
British	6,051,842	5,917,058	6,750,843	6,436,785	8,075,022
Norwegian	539,101	842,708	1,051,276	1,052,453	1,268,124
German	737,103	830,512	885,007	973,741	1,185,421
Japanese	935,425	946,916	667,982	1,036,785	1,041,166
Swedish	220,517	282,447	636,266	652,173	205,154
Dutch	573,929	619,017	552,741	571,700	637,178
French	407,249	481,526	398,393	530,026	600,421
Remaining combined	875,109	958,452	1,380,984	1,252,396	1,869,488
Total	26,994,710	23,958,836	26,037,448	27,748,215	29,630,709

A greater volume of cargo passed through the canal during the fiscal year 1928 than during any other calendar or fiscal year in its history. Cargo carried under each flag, with the exception of that of United States, also showed substantial increases. With respect to cargo carried in United States bottoms, if mineral oils be eliminated from the comparison, other cargo would show increases equaling that under other flags. The volume of general cargo carried in United States vessels, particularly in United States intercoastal traffic, has been increasing from year to year.

Complete statistics for all flags contributing to the 1928 traffic through the canal appear in the following table:

Commercial traffic through the Panama Canal, fiscal year 1928, by nationality of vessels

Nationality	Transits	U. S. equivalent net tonnage	Panama Canal net tonnage	Registered gross tonnage	Registered net tonnage	Tolls	Cargo (long tons)
Belgian	13	52,124	61,293	82,146	49,168	$57,407.25	67,411
British	1,842	6,853,922	8,976,960	11,087,242	6,853,880	8,738,815.68	8,075,022
Chilean	32	93,730	124,959	194,625	105,438	118,862.95	81,678
Colombian	99	34,349	39,162	56,246	35,106	41,194.42	33,909
Costa Rican	2	138	138	246	144	103.50	----------
Danish	69	222,169	285,396	339,196	217,474	271,851.95	380,240
Danzig	29	153,077	190,947	251,758	142,955	163,504.90	154,597
Dutch	137	456,701	644,390	754,684	453,650	561,044.93	637,178
Ecuadorian	1	302	307	405	308	368.40	500
Finnish	3	8,163	8,128	8,566	6,212	8,922.60	9,544
French	127	459,996	580,769	728,437	449,915	576,627.46	600,421
German	316	725,308	995,629	1,185,859	712,360	892,511.39	1,185,421
Greek	12	35,212	46,040	53,609	32,947	40,233.42	66,554
Honduran	1	1,042	991	1,636	940	1,189.20	552
Italian	118	487,651	580,721	766,559	469,077	567,807.85	498,807
Japanese	188	801,093	909,232	1,158,651	778,657	949,424.69	1,041,166
Norwegian	313	897,107	1,181,189	1,439,748	883,519	1,052,127.36	1,268,124
Panaman	138	54,682	82,650	106,998	66,346	64,370.53	65,559
Peruvian	53	87,373	140,323	205,166	111,982	107,576.65	96,175
Spanish	46	130,253	157,465	212,655	132,810	151,375.32	104,606
Swedish	111	350,265	480,006	918,263	423,677	396,908.28	705,154
United States	2,753	10,786,487	13,752,957	17,377,580	10,749,252	12,645,880.20	14,248,735
Yugoslav	53	172,652	218,982	272,599	171,872	201,390.84	309,356
Total:							
1928	6,456	22,863,896	29,458,634	37,202,874	22,847,689	26,944,499.77	29,630,709
1927	5,475	20,565,596	26,227,815	33,555,817	20,618,253	24,228,830.11	27,748,215
1926	5,197	19,452,828	24,774,591	31,672,618	19,548,881	22,931,055.98	26,037,448

VESSELS ENTITLED TO FREE TRANSIT AND LAUNCHES OF LESS THAN 20 TONS NET MEASUREMENT

Naval and other vessels owned and operated in the Government service of the United States, Panama, and Colombia, and vessels transiting the canal solely for repair at the Balboa shops, are exempt from the payment of tolls, and such vessels are not included in the transit statistics in the preceding sections. They accounted for the following additional transits in the fiscal year 1928: Public vessels of the United States, 450; public vessels of Panama, 10; public vessels of Colombia, 6; vessels transiting for repairs, 37; or a total of 503. These vessels carried a total of 232,672 tons of cargo.

If charges at commercial rates had been made against the 450 public vessels of the United States that transited the canal without payment of tolls, the revenue from tolls would have been increased by approximately $889,350.54 during the year. Tolls on the 10 Panaman and 6 Colombian Government vessels would have amounted to approximately $46,149.43.

Launches of less than 20 tons net measurement are also excluded from the statistics of commercial traffic, although they are not exempt from the payment of tolls. The number of these transiting the canal during the year was 155, and tolls aggregating $1,109.34 were collected for their passage.

TRADE ROUTES AND CARGO

As in former years, either the east or west coast of North America is the origin or destination of the larger portion of cargo passing through the canal. The proportion of traffic in which North America was either origin or destination, or both, was less in 1928, however, than in 1927.

In the Atlantic-to-Pacific traffic approximately 66 per cent of the total cargo through the canal during the year originated on the east coast of North America and about 43.5 per cent was destined to the west coast of North America. In the Pacific-to-Atlantic traffic the percentages are a little greater, as about 66 per cent of the total cargo originated on the west coast of North America and approximately 56 per cent was destined to the east coast.

Notwithstanding a decrease of some one and one-half million tons of mineral oils from the southern California fields, the volume of cargo movement between the principal trade areas served by the canal was as great or greater than during the preceding fiscal year. Two outstanding features of the cargo movement during the year are a decrease in United States intercoastal cargo of some 500,000 tons, due to the decline in mineral oil shipments and the heavy increase in nitrate shipments from the west coast of South America, which were more than double those during the preceding year. Shipments to and from the west coast of South America increased over the preceding year by nearly one and one-half million tons.

In the following table the volume of cargo tonnage moving over 10 of the principal trade routes is shown for the past four years. Approximately 84 per cent of the total cargo routed through the canal during the past year passed over these routes.

Cargo shipments through the Panama Canal during the past four fiscal years, segregated by principal trade routes

Trade routes	Tons of cargo			
	1925	1926	1927	1928
United States, intercoastal:				
Atlantic to Pacific	2,213,603	2,435,748	2,638,786	2,401,872
Pacific to Atlantic	7,282,656	7,633,856	7,921,719	7,665,520
Total	9,496,259	10,069,604	10,560,505	10,067,392
Europe to west coast Canada:				
Atlantic to Pacific	361,792	377,446	559,138	574,969
Pacific to Atlantic	1,409,277	1,681,663	1,901,702	3,093,937
Total	1,771,069	2,059,109	2,460,840	3,668,906
East coast United States to west coast South America:				
Atlantic to Pacific	377,864	423,730	412,835	377,968
Pacific to Atlantic	2,661,756	2,816,346	2,518,611	2,840,510
Total	3,039,620	3,240,076	2,931,446	3,218,478
Europe to west coast South America:				
Atlantic to Pacific	776,388	783,007	623,030	787,214
Pacific to Atlantic	1,708,626	1,612,733	1,326,573	2,118,251
Total	2,485,014	2,395,740	1,949,603	2,905,465
Europe to west coast United States:				
Atlantic to Pacific	334,761	324,540	199,105	256,404
Pacific to Atlantic	1,157,556	1,331,662	1,821,255	2,087,682
Total	1,492,317	1,656,202	2,020,360	2,344,086
East coast United States to Far East:				
Atlantic to Pacific	1,234,608	1,421,214	1,576,151	1,562,112
Pacific to Atlantic	266,269	333,834	407,313	504,163
Total	1,500,877	1,755,048	1,983,464	2,066,275
Europe to Australasia:				
Atlantic to Pacific	518,406	543,825	539,792	595,985
Pacific to Atlantic	420,356	556,871	493,425	554,678
Total	938,762	1,100,696	1,033,217	1,150,663
East coast United States to west coast Canada:				
Atlantic to Pacific	178,110	199,175	267,895	216,943
Pacific to Atlantic	501,623	651,969	658,959	514,233
Total	679,733	851,144	926,854	731,176
United States to Australasia:				
Atlantic to Pacific	663,619	727,406	795,161	580,883
Pacific to Atlantic	28,195	33,087	33,758	57,927
Total	691,814	760,493	828,919	638,810
Cristobal to west coast United States:				
Atlantic to Pacific	33,877	26,251	40,484	34,836
Pacific to Atlantic	59,372	200,129	456,811	314,217
Total	93,249	226,380	497,295	349,053
Miscellaneous routes and sailings:				
Atlantic to Pacific	705,369	774,755	930,150	920,948
Pacific to Atlantic	1,064,753	1,148,201	1,624,762	1,569,457
Total	1,770,122	1,922,956	2,555,712	2,490,405
Total traffic, all routes:				
Atlantic to Pacific	7,398,397	8,037,097	8,583,327	8,310,134
Pacific to Atlantic	16,560,439	18,000,351	19,164,888	21,320,575
Total	23,958,836	26,037,448	27,748,215	29,630,709

PRINCIPAL COMMODITIES

Complete manifests of cargo carried by vessels transiting are not required at the canal, but the masters are required to submit briefly itemized statements showing the principal items of cargo and their points of origin and destination. These statements, known as cargo declarations, are the basis of the commodity statistics. Except for commodities commonly carried in bulk, actual shipments are likely to be in excess of the aggregate tonnage reported, as smaller items which can not be segregated readily are bulked under the head of "General cargo" that should be segregated. In some cases no other report than "General cargo" is made for entire cargoes carried by vessels. Subject to errors arising from this source, the tonnage of the principal commodities shipped through the canal during the past four fiscal years has been as follows:

Commodity movement

ATLANTIC TO PACIFIC

Commodity	Fiscal year ended June 30—			
	1928	1927	1926	1925
Manufactures of iron and steel	1,855,532	1,971,964	1,525,280	1,416,135
Mineral oils	717,080	649,379	721,817	948,451
Cement	280,032	222,817	283,328	359,831
Cotton	259,225	361,241	226,092	145,604
Machinery	215,334	172,150	134,411	133,024
Sulphur	207,257	211,625	188,889	165,925
Phosphates	198,826	183,521	162,254	67,206
Railroad materials	188,561	189,858	150,993	138,740
Paper	183,263	150,722	101,493	101,827
Coal	161,610	96,772	222,288	159,231
Tin plate	143,610	194,111	202,773	145,188
Textiles	124,658	91,967	78,770	94,132
Automobiles (exclusive of accessories)	124,553	127,882	125,820	124,972
Ammonia	91,776	134,977	108,104	88,199
Coke	91,130	89,750	93,344	96,114
Slag	84,797	30,064	55,458	27,053
Asphalt	82,350	60,586	43,458	34,978
Tobacco	78,943	81,457	65,174	68,472
Coffee	69,135	54,018	39,356	32,345
Glass and glassware	61,434	53,119	44,363	24,826
Agricultural implements	60,895	52,438	38,976	40,223
Creosote	55,682	38,911	38,018	43,940
Chemicals	52,493	48,479	41,015	22,317
Automobile accessories	49,052	53,064	46,132	39,642
Sugar	44,951	282,912	158,997	91,461
Iron (metal)	40,109	60,216	47,490	51,867
All other	2,787,846	2,919,327	3,093,004	2,736,694
Total	8,310,134	8,583,327	8,037,097	7,398,397

Commodity movement—Continued

PACIFIC TO ATLANTIC

Commodity	Fiscal year ended June 30—			
	1928	1927	1926	1925
Mineral oils	5,619,076	7,143,165	5,930,716	5,989,622
Lumber	3,673,832	3,139,113	3,200,311	2,255,421
Wheat	3,035,884	1,477,376	1,187,384	1,078,844
Nitrate	2,565,572	1,174,384	1,878,050	2,155,814
Iron ore	1,400,490	1,403,737	1,334,408	1,045,383
Sugar	577,781	427,035	318,032	300,465
Copper (metal)	443,381	357,456	319,045	211,168
Canned fruit	434,424	403,270	356,609	255,688
Food products in cold storage [1]	288,952	245,520	221,068	202,781
Dried fruit	272,644	200,433	150,229	135,832
Barley	237,262	344,341	313,535	236,115
Canned fish	178,245	209,491	168,701	165,071
Wool	167,931	129,906	146,092	91,586
Coffee	132,862	113,313	104,739	81,881
Beans	127,168	73,569	54,565	101,218
Flour	112,191	90,988	64,391	82,402
Cotton	95,724	107,311	65,850	75,358
Fresh Fruit	93,457	97,969	63,495	45,376
Borax	86,933	56,091	51,951	50,428
Lead (metal)	85,953	84,077	79,734	76,343
Copra	83,143	81,685	76,223	90,125
Skins and hides	73,587	58,976	48,479	46,875
Oats	64,388	73,515	41,084	37,875
Canned vegetables	63,099	60,982	28,908	27,391
Tin (ore)	57,371	57,092	51,325	27,955
Copper (ore)	56,593	62,436	79,104	100,289
Rice	47,756	71,870	20,664	49,315
All other	1,244,876	1,419,787	1,645,659	1,543,818
Total	21,320,575	19,164,888	18,000,351	16,560,439

[1] Does not include fresh fruit.

Total cargo passing through the canal from the Atlantic to the Pacific during the year shows a decrease of 273,193 tons as compared with the fiscal year 1927. Of the 13 commodities shown in the foregoing tabulation as having a total of 100,000 tons or more through the canal during the year, manufactures of iron and steel, cotton, and tin plate show decreases as compared with 1927. Totals for the other 10 were as great or greater than during the preceding fiscal year.

The Pacific-to-Atlantic cargo movement during 1928 was larger than during the year preceding by 2,155,687 tons. Since shipments of mineral oils in this direction through the canal declined as compared with the year preceding approximately one and one-half million tons, this means an increase in other commodities of over 3,600,000 tons. Most of the major commodities through the canal from the Pacific to the Atlantic during the year show substantial increases, shipments of nitrates and wheat being more than double those during the year preceding.

CLASSIFICATION OF VESSELS

Of the 6,456 commercial vessels transiting the canal during the fiscal year, 5,477 were steamers, 890 were motor ships, 70 were motor schoon-

ers, and the remaining 19 were sailing ships, barges, etc. For the past four years the proportion of each class has been as follows:

	1925	1926	1927	1928
	Per cent	*Per cent*	*Per cent*	*Per cent*
Steamers	92.0	89.2	85.3	84.8
Motor ships	6.0	8.5	11.9	13.8
Motor schooners	1.1	1.2	1.5	1.1
Miscellaneous	.9	1.1	1.3	.3
Total	100.0	100.0	100.0	100.0

As will be noted in the above table, the number of motor ships through the canal has been increasing from year to year. The actual number of transits for the past four years has been as follows: Fiscal year 1925, 282; 1926, 443; 1927, 654; 1928, 890.

Of the 5,477 steamers transiting the canal during the past fiscal year 3,496 burned oil, 1,957 burned coal, and 24 were reported as fitted for either fuel. For the past four fiscal years the proportion of each class has been as follows:

	1925	1926	1927	1928
	Per cent	*Per cent*	*Per cent*	*Per cent*
Oil burning	69.4	66.2	70.8	63.8
Coal-burning	30.1	33.2	28.3	35.7
Either oil or coal	.5	.6	.9	.5
Total	100.0	100.0	100.0	100.0

DETAILS OF THE TRADE

Further particulars of the traffic are presented in Section V of this report in Tables Nos. 58, 59, and 60.

DUAL MEASUREMENT SYSTEM

Under the present law, tolls on commercial vessels using the canal are levied at $1.20 per net ton on laden ships and $0.72 on vessels in ballast on the basis of tonnage determined by the Panama Canal rules of measurement, with the proviso that the amount collectible shall not exceed $1.25 per net ton or be less than $0.75 per net ton as determined under the rules for registry in the United States. This requires that tonnage be determined and tolls reckoned on two bases, and as the United States rules of measurement are considered somewhat arbitrary and are subject to changes, the dual system results in confusion and annoyance. Occasionally on small vessels, such as tugs, the United States rules indicate a negative net tonnage, and such vessels make the transit without payment of tolls.

The canal administration has advocated consistently the adoption of the Panama Canal rules only as the basis of tolls, and in recent years

has suggested that if they be adopted the rates of tolls should be set at $1 per net ton for laden ships and $0.60 for ships in ballast, which would return approximately the same revenue as is collectible now. This plan has met opposition from operators of United States general cargo vessels for the reason that it would result in a slight increase in the charges against this type of vessel. For the past fiscal year the adoption of the canal plan would have increased the total tolls a little over 1 per cent; the additional collections would have been $300,973.23 as compared with the actual collection of $26,944,499.77. For all United States vessels together it would have meant an increase of $16,498.40. The following table shows the distribution of increases or decreases among the vessels of the different nations using the canal during the year:

Nationality	Tolls actually collected under present dual system	Tolls that would have been collected under proposed rates of $1 laden and 60 cents ballast on basis of Panama Canal net tonnage	Difference	
			Increase	Decrease
Belgian	$57,407.25	$53,173.00		$4,234.25
British	8,073,815.68	8,222,780.90	$148,965.22	
Chilean	118,862.95	126,748.50	7,885.55	
Colombian	41,194.42	37,990.40		3,204.02
Costa Rican	103.50	82.80		20.70
Danish	271,851.95	272,442.80	590.85	
Danzig	163,504.90	149,479.00		14,025.90
Dutch	561,044.93	631,772.40	70,727.47	
Ecuadorean	368.40	307.00		61.40
Finnish	8,922.60	7,394.00		1,528.60
French	576,627.46	581,267.10	4,639.64	
German	892,511.39	979,744.60	87,233.21	
Greek	40,233.42	41,318.00	1,084.58	
Honduran	1,189.20	991.00		198.20
Italian	567,807.85	544,398.20		23,409.65
Japanese	949,424.69	877,846.50		71,578.19
Norwegian	1,052,127.36	1,074,327.80	22,200.44	
Panaman	64,370.53	78,292.00	13,921.47	
Peruvian	107,576.65	139,663.80	32,087.15	
Spanish	151,375.32	144,393.00		6,982.32
Swedish	396,908.28	418,808.40	21,900.12	
United States	12,645,880.20	12,662,378.60	16,498.40	
Yugoslavian	201,390.84	199,873.20		1,517.64
Total	26,944,499.77	27,245,483.00	427,734.10	126,760.87
Total difference, increase of			300,973.23	

HOURS OF OPERATION

The system of dispatching vessels through the canal on a schedule was followed for several years without noteworthy change until December 15, 1927, when a modification known as the "partial-transit plan" was adopted. Under this plan some vessels begin transit late in the day of arrival and complete it the following day. Vessels for partial transit may be started each day from each end of the canal after the vessels for through transit are all under way. Those from

the Atlantic anchor in Gatun Lake for the night and those from the Pacific tie up at the upper approach wall of Pedro Miguel Locks and continue their transit the following morning. The plan has been successful. It not only enables ships arriving late to pass part way through the canal that day and make an earlier clearance the next day, but it also benefits ships arriving the following day because the ships handled by partial transit would otherwise have had the first places in the traffic of the second day.

In addition to the partial-transit system, hours of operation for through transit on day of arrival were extended somewhat. The present arrangements may be summarized:

Beginning in the morning, for vessels at the Atlantic entrance awaiting transit, the first two are dispatched so as to reach Gatun Locks at about 7.05 and 7.15 a. m., respectively. Subsequent dispatches are made at an average of about two per hour until traffic is disposed of, with the limit on late dispatches that a vessel for through transit must be able to clear Pedro Miguel Locks by 9 p. m., which means, for the average vessel, reaching Gatun Locks not later than 3.55 p. m. From the Pacific, the ship on No. 1 schedule is dispatched so as to reach Miraflores Locks at 7 a. m. Subsequent dispatches are made at approximately 30-minute intervals until traffic is disposed of, except that no vessel is dispatched for through transit unless she can reach Gatun Locks by 10 p. m., which means, for the average vessel, reaching Miraflores Locks by 5 p. m. Later vessels may be given partial transit.

The present schedules for dispatching vessels through the canal require the daily operation of the locks as follows: Gatun, 7 a. m. to 11 p. m.; Pedro Miguel, 7 a. m. to 9 p. m.; Miraflores, 6.50 a. m. to 10.30 p. m.

In October, 1927, a letter was received from one of the principal steamship lines using the canal requesting several changes in canal operations, one of which was the extension of daylight operating hours. Following the adoption of the partial-transit plan outlined above no further communications on the subject were received. It is thought that the present volume of traffic does not justify continuous operation and that it is inadvisable to adopt 24-hour or extensive night operation before such time as the volume of traffic may practically compel it. Such operation would not only involve greater expense and increase the difficulties of maintenance of locks and channel, but it is objectionable from the shipmasters' point of view on account of the hazards of navigation in restricted channels under conditions of darkness, made worse by rains and fogs. Fogs over the cut and lake usually fall before midnight and are dissipated by 8 o'clock in the morning.

LOCKAGES AND LOCK MAINTENANCE

LOCKAGES

The average number of lockages per day was 17.25 at Gatun Locks, 18.15 at Pedro Miguel, and 17.97 at Miraflores. The total number of lockages at all locks was 19,533, as compared with 16,941 during the fiscal year 1927 and 15,970 during the fiscal year 1926. The increase in the past year was 2,592, or 15.3 per cent.

HOURS OF OPERATION

At Gatun Locks during the earlier part of the year two shifts were on duty from 7 a. m. to 3 p. m. and one shift from 3 to 11 p. m. For 12 days during the year two shifts were on duty from 3 to 11 p. m on account of heavy traffic, and effective November 14, 1927, provision was made for two crews from 7 a. m. to 11 p. m. regularly. At Miraflores the hours of operation were from 6.50 a. m. to 10.30 p. m. and at Pedro Miguel from 7.30 a. m. to 9 p. m., with overlapping shifts to make possible double lockages between 9.20 a. m. and 5.20 p. m. at Miraflores and 9.30 a. m. to 5.30 p. m. at Pedro Miguel.

The December traffic of 592 commercial vessels (not including 10 small launches) and 563 lockages at Gatun Locks constituted a record month.

The passage of the United States Navy airplane carriers *Saratoga*, 875 feet long by 107 feet in breadth, and *Lexington*, 874 feet long by 107 feet in breadth, in February and March, respectively, constituted new records for size of ships through the canal. As the lock chambers are 110 feet wide, there was a clearance of but 1½ feet on each side during the lockage of these two vessels. The passage of these vessels through the locks, though of necessity slower than for smaller ships, was accomplished without special incident other than the demolishing of five lamp-posts at Gatun and one at Pedro Miguel by the bow overhang of the *Lexington* and the wrecking of a handrail as she was leaving Pedro Miguel Locks.

At Gatun Locks the total delay to 38 vessels due to minor troubles of operation was 4 hours and 16 minutes, or an average of a little less than 7 minutes per vessel.

Lockages during the year are summarized in the following table:

	Gatun		Pedro Miguel		Miraflores		Total	
	Lockages	Vessels	Lockages	Vessels	Lockages	Vessels	Lockages	Vessels
1927								
July	503	598	531	628	527	634	1,561	1,860
August	530	624	560	666	549	660	1,639	1,950
September	536	623	558	631	551	628	1,645	1,882
October	553	636	572	667	573	676	1,698	1,979
November	547	643	562	666	563	668	1,672	1,977
December	563	652	597	677	592	678	1,752	2,007
1928								
January	537	608	567	664	562	666	1,666	1,938
February	531	620	560	650	556	654	1,647	1,924
March	535	646	567	701	557	691	1,659	2,038
April	508	613	540	647	532	647	1,580	1,907
May	498	590	531	625	519	610	1,548	1,825
June	473	553	497	589	496	592	1,466	1,734
Fiscal year:								
1928	6,314	7,406	6,642	7,811	6,577	7,804	19,533	23,021
1927	5,467	6,641	5,783	6,968	5,691	6,941	16,941	20,550
1926	5,213	6,386	5,398	6,434	5,359	6,403	15,970	19,223
1925	4,644	5,485	4,977	5,703	4,859	5,689	14,480	16,877
1924	5,260	6,205	5,572	6,297	5,520	6,277	16,352	18,779

OVERHAUL

There was no general overhaul of any of the locks during this year. Gatun Locks were overhauled in 1927 and the Pacific Locks will be overhauled during the fiscal year 1929, beginning probably in January, 1929. During the closing months of the year a large number of spare parts for this work were in process of manufacture at the Balboa shops.

EQUIPMENT

The signal arrows at north and south ends at Miraflores and the south end at Pedro Miguel were replaced by new aluminum arrows mounted on steel structures near the tops of the lamp-posts and work was started at Pedro Miguel to make the change for the north arrow. The maintenance work required to keep machinery and plant in good condition was continued at all locks. One new towing locomotive, received from Balboa shops at the close of the fiscal year 1927, was completely equipped and placed in service in November, 1927, and one received on November 15, 1927, was placed in service in March, 1928.

POWER FOR CANAL OPERATION

Electric power for the operation of the canal was derived almost wholly from the hydroelectric plant at Gatun during the fiscal year 1928. The state of the water supply in Gatun Lake through the

dry season was such that it was not necessary to save water by transferring load from the hydroelectric plant to the new Diesel electric plant at Miraflores. However, the load was handled by the Miraflores plant on account of peak-load conditions and other operating requirements from time to time. At the Gatun plant there was one interruption to service caused by failure of generating equipment. No failures occurred at the Miraflores plant. All details of the Diesel electric plant were completed and final acceptance of the engines was made.

The combined generator output of the two plants averaged 4,861,-333 kilowatt-hours per month, as compared with 5,066,242 kilowatt-hours per month last year. An average of 4,484,061 kilowatt-hours per month was distributed from substations, as compared with a corresponding figure of 4,386,746 kilowatt-hours per month for the preceding year. These figures indicate a loss in transmission of 7.76 per cent as compared with a similar loss of 13.41 during 1927. The improvement is due to discontinuing the steam plant at Miraflores, at which steam was kept up for stand-by service by an electrically heated boiler. This boiler was heated by current from the hydroelectric plant and such current was charged to system losses.

There were four interruptions on the transmission line during the year, none due to insulator failure.

A substation of 3,000 kilo-volt-ampere capacity, which had been in use temporarily for the gravel-handling plant at Gamboa, was transferred to a permanent location at Summit. This equipment will supply current at proper voltage for dredging operations in the vicinity of Gaillard Cut and for lighting and power in offices, quarters, etc., at Summit.

WATER SUPPLY

Comparative data showing the inflow of water in Gatun Lake from all sources, utilization, and losses for the fiscal years 1927 and 1928 are shown in the following table:

	Per cent of total, fiscal year—		Billion cubic feet, fiscal year—	
	1927	1928	1927	1928
Run-off above Alhajuela	35.9	44.0	82.18	101.15
Yield from land area below Alhajuela	44.3	38.4	101.57	88.25
Direct rainfall on lake surface	19.8	17.6	45 47	40.31
Total	100.0	100.0	229.22	229.71
Evaporation from lake surface	8.7	9.0	20.02	20 81
Gatun Lake lockages	17.0	19.4	38.96	44.60
Hydroelectric power	19.9	19.6	45.64	44.93
Spillway waste	50.1	51.8	114 86	118.91
Leakage and municipal water	.6	.6	1.39	1.38
Increase or decrease in storage	−3.7	−.4	+8.35	−.92
Total	100.0	100.0	229.22	229.71

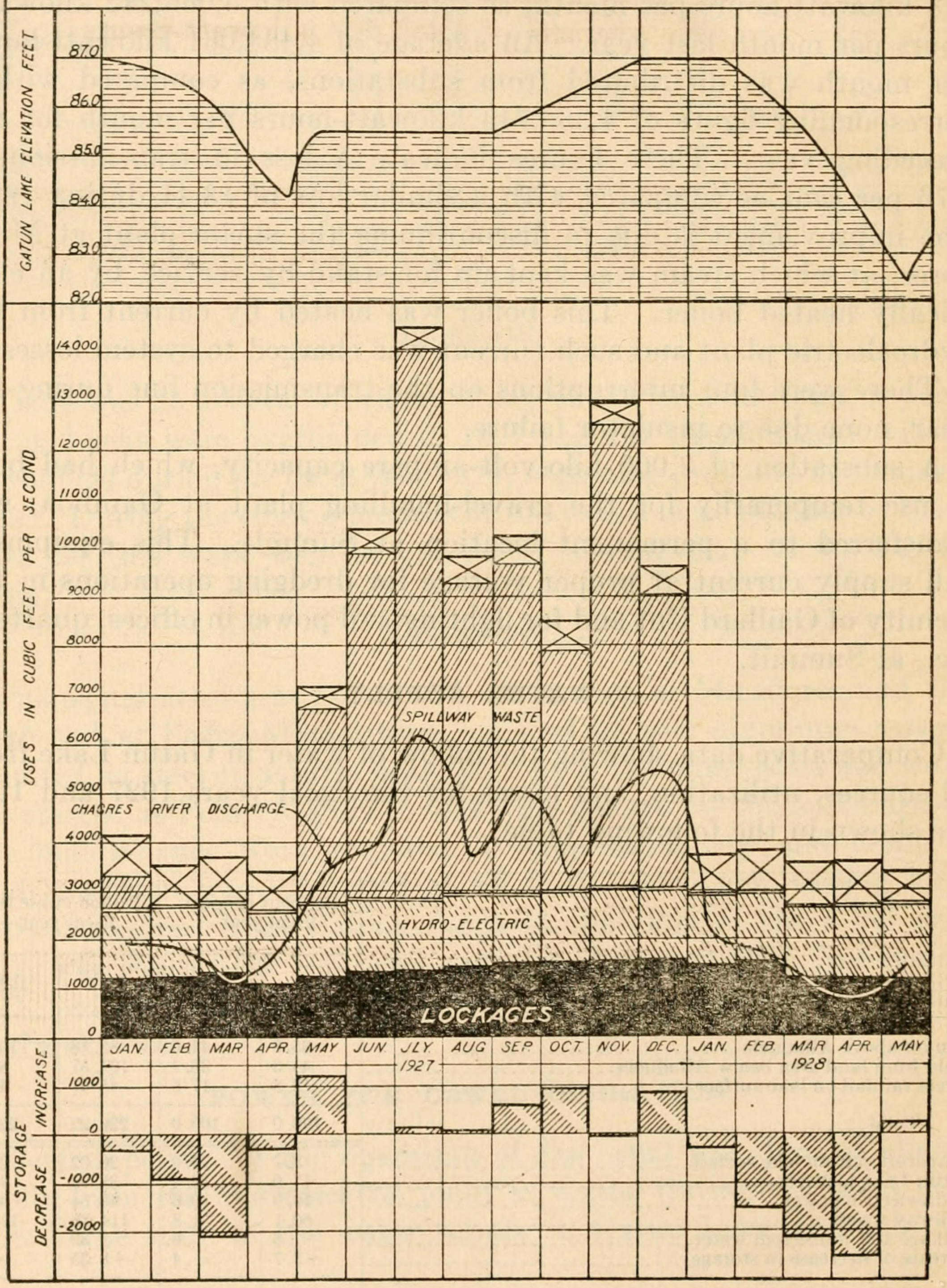
THE PANAMA CANAL
DEPARTMENT OF OPERATION AND MAINTENANCE
Section of Surveys
Balboa Heights, Canal Zone

OPERATING USES OF GATUN LAKE WATER SUPPLY

YEAR 1927 - DRY SEASON 1928

(To accompany Annual Report 1928)*

EVAPORATION
SPILLWAY
LEAKAGE and MUNICIPAL
HYDRO-ELECTRIC
LOCKAGES
STORAGE



The graph on page 24 shows the operating uses of Gatun Lake water supply for the calendar year 1927 and the first five months of 1928, covering the dry season.

DRY SEASON

From a water-supply standpoint the past dry season was slightly below the average in both duration and yeild. Gatun Lake fell from elevation 87.13 to 82.50 feet, a lowering of 4.63 feet. This involved a loss in storage of 21.2 billion cubic feet. No effort was made to save water at the Gatun hydroelectric station, and water saving at the locks was not begun until March. No cross filling or other rigorous methods were used.

ADDITIONAL STORAGE AT ALHAJUELA

Progress was made on the project for additional water storage at Alhajuela, which is the most important constructive feature in the present work of canal administration and development. Need of more water for the dry season has been recognized for years past, and the increases in traffic during the fiscal years 1923, 1924, and 1925 emphasized the need and forced the consideration of means of relief. The sums of $50,000 for the preparation of plans and $500,000 for the first year's work were included in the estimates for 1926, 1927, and 1928, but were eliminated by the Bureau of the Budget; however, $250,000 was allowed for 1929. Preparations were made during the latter part of the fiscal year 1928 for the commencement of work with the beginning of the fiscal year 1929, the first work to be toward construction of a highway to Alhajuela from the present highway near Summit, construction of telephone and power transmission lines, completion of topographical survey of the reservoir area, and the examination by diamond-drill borings of the several dam sites.

During the year various elements in the Alhajuela development were the subjects of investigation and report by a committee consisting of the municipal engineer, the electrical engineer, the office engineer, and the chief of surveys. Field work was carried on under the municipal engineer and the chief of surveys.

It is assumed that about five years will be required to complete this project, at a cost of approximately $12,000,000. The conditions which make such an addition necessary are summarized in the following, quoted from the annual report for 1927:

> During approximately eight months of the year much excess water enters the lake and has to be spilled into the sea. During the remaining four months the inflow is wholly inadequate to meet the demands for water which must be provided for the lockage of ships, the generation of electric power, and for municipal purposes, in addition to the heavy losses resulting from evaporation. The maximum height to which Gatun Lake may be filled is 87 feet plus. The minimum lake elevation permitting safe navigation through Gaillard Cut is 80 feet plus.

This gives a margin of 7 feet of storage available for drawing upon during the dry season. With the continued increase in traffic, the time is approaching when this margin will not suffice to provide safe transit through the cut for heavy-draft vessels toward the end of a dry season both extremely dry and unusually prolonged.

By the erection of a dam at Alhajuela a second basin can be created where surplus water can be stored in the rainy season to be drawn upon during the dry season to maintain the level of Gatun Lake. Recent topographical surveys show that it is feasible to build a dam about 170 feet in height, which will create a reservoir covering about 22 square miles, and provide additional storage of about 22,000,000,000 cubic feet. In addition, the reservoir would be a means of control of the Chagres River during floods in the rainy season, which are a possible menace to navigation.

SEISMOLOGY

Forty-four seismic disturbances were recorded at Balboa Heights during the fiscal year ending June 30, 1928. Of these about 34 per cent were of local origin, 27 per cent of distant origin; and 17 per cent were so slight that no estimate of the distance and epicenter could be made. No damage was reported from any of these tremors. In the preceding fiscal year the number recorded was 22.

MAINTENANCE OF CHANNEL AND IMPROVEMENT PROJECTS

Dredges were at work throughout the year on maintenance and improvement work in the Atlantic entrance, Gatun Lake, Gaillard Cut, Pacific entrance, and Cristobal and Balboa harbors and terminals. These dredges excavated 3,160,450 cubic yards of material from the canal prism, 1,732,600 cubic yards from Balboa harbor and terminal, and 201,500 cubic yards from the Atlantic harbor terminal, making a grand total of 5,094,550 cubic yards, as shown in the following table:

	Earth	Rock	Total
From the canal prism:			
Atlantic entrance	464,550	0	464,550
Gatun Lake	121,850	0	121,850
Gaillard Cut—			
Project No. 2	86,500	683,200	769,700
Project No. 9	7,650	43,500	51,150
Maintenance	107,200	478,500	585,700
Pacific entrance—			
Project No. 1	147,800	446,750	594,550
Maintenance	463,400	109,550	572,950
Total, canal prism	1,398,950	1,761,500	3,160,450
Auxiliary:			
Cristobal harbor and terminal	201,500	0	201,500
Balboa harbor and terminal—			
Project No. 1	931,650	36,100	967,750
Maintenance	764,850	0	764,850
Total, harbors and terminals	1,898,000	36,100	1,934,100
Grand total	3,296,950	1,797,600	5,094,550

Improvement project No. 1.—The work of deepening the Pacific entrance channel from Miraflores Locks to the sea buoys and Balboa inner harbor from 45 feet to a ruling depth of 50 feet, mean sea-

level datum, known as improvement project No. 1 and begun in July, 1924, was continued throughout the year as equipment was available. Work was carried on by pipe-line suction dredges *No. 83* and *No. 86*, handling the softer material, and dipper dredges *Cascadas* and *Gamboa* excavating rock and hard earth. The suction dredges excavated 855,200 cubic yards from the harbor and 128,200 cubic yards from the channel, charged to this project; and the dipper dredges excavated 112,550 cubic yards from the harbor and 466,350 cubic yards from the channel, counted as work on the improvement. In addition to this total of 1,562,300 cubic yards on the project, the dredges did considerable excavation classed as maintenance. Two drill boats were employed 11 months each during the year on this work, breaking up 362,021 cubic yards of rock and using 328,163 pounds of dynamite. The total excavation to the end of the fiscal year on this project was 3,827,600 cubic yards, and it was about 50 per cent completed.

Improvement project No. 2.—This project is the widening of the channel at Lirio curve so as to enable all classes of vessels to pass this sharp turn with ease and a much better range of visibility. The excavation is from the west bank of the cut. It starts with an easement approach curve at the south end, station 1747, striking the wide portion of the project at 1731+80, at which point the increase in width amounts to 160 feet; the cut-off then narrows to 110 feet at station 1717+30, from which point an easement approach runs northward and tangent to the present prism line opposite station 1710. The length of the whole project is approximately three-fourths of a mile. Work was started on September 16, 1927, and to the end of the fiscal year 769,700 cubic yards of material were removed by the dipper dredges *Gamboa* and *Paraiso*. A drill boat worked one month on this project, breaking up 20,784 cubic yards of rock and using 17,390 pounds of dynamite. A hydraulic grader also worked on this project from October to the end of the year, removing 110,505 cubic yards of material, and air compressor barge *No. 27* was recommissioned for drilling operations, for which 10 wagon and 15 tripod drills, purchased in the United States, were placed in service in May and June.

Improvement project No. 9.—This project is the widening of the channel fronting West Culebra slide so as to minimize danger to ships entering Culebra reach besides providing a factor of safety in the way of a possible stoppage in case of a push from the West Culebra slide area, and, likewise, to minimize the tendency of the material in this area to push up in the channel. Work was started on this project on June 9, 1928, and during the remainder of the month 51,150 cubic yards of material were removed. The excavation was begun in conjunction with the periodical clean-up cut which is made

along the prism line. It is planned to start with an easement approach curve at station 1776, joining up with a 100-foot additional channel width opposite 1781, which continues south to station 1790, from which point an easement approach curve runs southward with the old prism line at station 1797.

EQUIPMENT

Service of excavating equipment during the year was as follows: Three 15-yard dipper dredges were operated 7, 7½, and 9 months, respectively; two 20-inch pipe-line suction dredges were operated 5 and 10 months; hydraulic grader, 10½ months; two drill boats, 11 and 11½ months; air compressor, 2 months. The following craft were in commission throughout the year except as withdrawn for repairs or overhaul: Two 250-ton floating cranes, 5 large and 2 small tugs, and 10 launches. The new Diesel electric tug *Chagres* was received from the mechanical division and commissioned on March 2, 1928, at which time the tug *Gatun* was retired. The *Gatun*, a veteran of canal construction, was used in the first operation of Gatun Locks, September 26, 1913. The tug *Bolivar* was also laid up pending emergency call. The new launches *Tarpon* and *Porpoise* were received on January 16 and March 14, 1928, respectively, and one old launch was retired from service.

FERRY SERVICE

On October 8, 1927, the vehicular ferry previously operated by the United States Army at the north end of Pedro Miguel Locks between the east and west banks of the canal was taken over by the dredging division. The equipment consisted of the gasoline tug *Lieut. W. B. Gaither* and a barge. From that date to the end of the fiscal year 3,846 single trips were made across the canal, carrying a total of 26,452 vehicles. In normal operation the ferry makes 10 round trips every day except on Tuesdays and Thursdays, when 4 trips are made.

SLIDES

Cucaracha slide was active in June of the fiscal year 1927 and again showed activity in July, 1927, necessitating the removal of 102,000 cubic yards of material, This makes a total of 9,299,752 cubic yards excavated on account of this slide to the end of the fiscal year 1928.

East Culebra slide has been practically inactive since June 4, 1927. There was a slight movement of West Culebra slide in July, 1927, and during July and August 191,950 cubic yards of material were removed, making a total of 29,207,810 cubic yards of material

excavated on account of the East and West Culebra slides to the end of the fiscal year.

Three movements of West Lirio slide occurred during the year, August 1, September 21, and February 20, involving about 100,000 cubic yards of material. All of these breaks were within the new project and none of the material entered the canal prism. The total excavation to the end of the year from the West Lirio slide is 1,843,820 cubic yards.

A small bank break at East Lirio occurred in October, 1927, between stations 1743 + 50 and 1745, and a very small amount of material pushed over the prism line. The total excavation to the end of the fiscal year on the East Lirio slide, including the East Empire slide, is 396,212 cubic yards.

Several other small breaks occurred at various points in the cut during the year.

In the Atlantic entrance channel a break occurred on the east bank near Mindi, stations 307 to 310 + 75, on December 29, 1927. Approximately 35,000 cubic yards of material were involved, of which 1,200 cubic yards reached the canal prism.

No other slides were active during the year, and there was no interference with shipping on account of slides.

AIDS TO NAVIGATION

The maintenance of lights, buoys, and beacons established in the canal proper and adjacent waters as navigational aids was continued throughout the year; also the clearing and marking of small boat channels in Gatun Lake. A gas and whistling buoy was established at South Fraile Island, west of Cape Mala, on July 15. During the year 35 new lights were placed along the banks of Gaillard Cut, reducing the distance between lights to approximately 500 feet. At the close of the year there were 72 lights on the east bank of the cut and 80 on the west bank.

The cost of purchase, installation, and operation of navigational aids during the year was $222,496.46, as compared with $196,543.90 for the previous year.

ACCIDENTS

Investigations were conducted and reports submitted by the board of local inspectors on 99 accidents to vessels in transit through the canal or using its terminal ports. In the majority of these accidents the damages were relatively slight, there being but 14 in which the estimated damages were $1,000 or more. A classification of accidents shows the following: Collision between ships, 2; grounded in canal, 1; struck bank of canal, 21; struck lock walls, 18; other accidents in locks, 14; incidental to assistance by tugs, 11;

docking accidents, 13; miscellaneous, 19. The following is a brief description of the more serious accidents.

On July 9 the steamship *Marore* struck the east bank of the cut in Empire reach, doing damage estimated at $6,000, exclusive of dry-docking; accident was attributed to overloaded condition of vessel and poor operation of steering gear.

On July 17 the *Reginolite* struck the west bank of the canal, causing damage estimated at $6,400, exclusive of dry-docking; due to sheer caused by suction after passing another vessel.

On August 21 the *Susherico* struck lock wall at Gatun, causing damage estimated at $1,600; due to steering-gear shafting becoming disengaged.

On September 11 the *Holland Maru* struck south approach wall, Gatun Locks, causing damage to ship estimated at $1,000 and to lock fender $25; cause was failure of engines to respond promptly to bridge signals.

On September 21 the *Salina* struck west bank of canal, causing damage estimated at $2,500 exclusive of cleaning and steaming tanks; cause, overdraft and ship not responding to efforts to break sheer.

On September 29 the *Marore* struck west bank of canal, causing estimated damage of $10,500, exclusive of dry-docking; cause, sheer of vessel.

On November 9 the *City of Khios*, standing down Miraflores reach from Miraflores Locks, struck drill barge *Teredo No. 2* and water barge *No. 97*, due to failure of ship's steering gear. The damage to the ship was slight; that to the canal equipment was estimated at $4,350 exclusive of delay for overhauling.

December 1 the *Pisco* struck the west bank of the cut, causing damage estimated at $13,575, exclusive of dry-docking; due to sheer.

February 2 the *Santore* struck east bank of cut, doing damage estimated at $2,500; cause, pilot giving wrong order to helmsman.

On March 12 the *Niobe*, while approaching dock at Balboa, struck against a Navy barge, denting plates and damaging fender piling of the dock. Estimated cost of repairs to the *Niobe* was $3,000, and to dock $200.

On March 22 the *Sagadahoc* struck the west bank of the canal, doing damage to ship estimated at $6,500, exclusive of dry-docking, and to signal station estimated at $136.58; cause, failure of steering gear.

SALVAGE OPERATIONS

In accordance with practice since 1926, when commercial salvage companies arranged to operate in the Caribbean area, the Panama Canal no longer undertakes salvage operations in other than canal waters except where lives are endangered or great emergency exists.

In line with this policy the only services of this nature furnished during the fiscal year 1928 were as follows:

On September 2 the tug *Tavernilla* was dispatched to the assistance of the steamship *Favorita*, aground on the San Blas coast, and the vessel was successfully floated.

May 8 the tug *Gorgona* went to the assistance of the steamship *Jacob Luckenbach*, stranded near Guiones Point, on the west coast of Central America.

On May 24 the *Gorgona* went to Salina Cruz, Mexico, to the assistance of the disabled steamer *Tashmoo*, returning to Balboa with the *Tashmoo* in tow on June 9, 1928.

On June 26 the *Gorgona* went to Cape Mala to the stranded motorship *Cynthiana* with a survey party.

The cost of maintaining the salvage section as an aid to navigation was $118,963.83, against a revenue of $51,083.68, a deficit of $67,880.15 as compared with a deficit the preceding year of $44,534.23. It is thought that it is advisable to maintain a complete salvage unit to assist vessels in distress although the revenue derived is not commensurate with the plant maintenance.

RULES AND REGULATIONS

The rules and regulations for the navigation of the Panama Canal and adjacent waters effective January 1, 1926, issued under Executive order of September 25, 1925, were supplemented during the year by four supplements referring to the number of locomotives to be used during the lockage of vessels; persons on arriving vessels who are being deported from or repatriated to any country; the load and trim of vessels desiring to transit the canal; and vessels exempted from pilotage.

SECTION II

BUSINESS OPERATIONS

A detailed statement of the expenses (including depreciation), revenues, and profit or loss on the various subsidiary business operations conducted by the Panama Canal will be found in Table No. 26, Section V, of this report. The total net profit on these operations was $736,719.43, as compared with $876,536.80 in the preceding year and $841,310.29 in the fiscal year 1926.

The business operations of the Panama Railroad Co. on the Isthmus yielded an additional revenue of $1,659,750.53. In 1927 this revenue was $1,644,189.37 and in 1926 it was $1,347,887.33. Details pertaining to the major business units of both the Panama Canal and Panama Railroad are discussed briefly in the following paragraphs:

MECHANICAL AND MARINE WORK

The volume of shop and marine work handled during the fiscal year was appreciably greater than for 1927 and slightly higher than in 1926. The fluctuation in the number of employees carried was not as great as in former years, and the policy was continued of distributing the repairs to canal and Panama Railroad equipment, the manufacture of spares for the locks, and work of a similar character so as to provide employment for the mechanical force when outside commercial work was distinctly below normal.

The value and class of work done, and the source of it for 1928, as compared with the two preceding years, are shown in the following table:

	1926	1927	1928
AMOUNT OF WORK DONE			
Marine	$2,123,956.45	$1,619,815.30	$2,320,712.23
Railroad	629,478.27	612,276.46	534,711.38
Sundries	382,422.45	476,821.34	420,665.14
Stock materials	383,866.90	358,814.90	263,596.27
Total	3,519,724.07	3,067,728.00	3,539,685.02
ORIGIN OF WORK DONE			
Individuals and companies [1]	1,001,586.00	764,619.46	814,249.09
The Panama Canal	1,473,071.54	1,324,896.56	1,774,184.85
The Panama Railroad Co	731,251.52	671,940.06	603,832.40
Other departments of United States Government	313,815.01	306,271.92	347,418.68
Total	3,519,724.07	3,067,728.00	3,539,685.02

[1] Includes Panama Railroad Steamship Line.

MARINE WORK

During the year the two Diesel electric tugboats, *Chagres* and *Trinidad*, mentioned in the report for 1927, were completed and placed in service, and dynamometer tests indicate that they are the most powerful now in the service of the canal. The *Chagres* was assigned to the dredging division, the *Trinidad* to the marine division.

The 12 barges to be used in the construction of port works at Buenaventura were completed and delivered.

A total of 17 small oil tankers, belonging to the fleets of oil companies operating on the shores of Lake Maracaibo, were given annual overhaul. One oil company is building a marine railway on Lake Maracaibo and it is expected that hereafter its tank ships will come to the canal for heavy repairs only. Other companies, however, are adding to their fleets, and a decrease in this work is not anticipated in the near future.

The submarines stationed at the Coco Solo submarine base were docked and overhauled. The United States cruiser *Rochester*, flagship of the special service squadron stationed in local waters, was overhauled, and miscellaneous work was done for other vessels of the squadron. Repairs to United States Army tugs, mine planters, and launches were made during the year.

The work of remodeling the ends and renewing the loading sides of the dredging division dump scows was completed, and the complete remodeling of another scow was undertaken. Two launches were completed for the dredging division and one for the marine division, and a 50-foot hull was made for the marine division. A shallow draft, twin-deep propeller barge, driven by two engines, was designed and is nearing completion. The barge is for use on the Chagres River in connection with the Alhajuela Dam project.

OTHER WORK

Large quantities of repair parts for the lock machinery for use during the overhaul of the Pacific locks in 1929 were manufactured, and the work on these items will continue during the fiscal year 1929. The largest item consists of 59 cylindrical valves, which are to replace worn-out valves which have been in service at the locks since the completion of the canal.

A third Panama Railroad locomotive was converted from saturated to superheated steam and was practically ready for service at the end of the year. Two new passenger coaches for the Fort Randolph branch were completed and one other was partly finished. Preliminary work was started on four additional coaches for main-line service of the railroad. Decision was reached to fit steel underframes and standard freight-car trucks under refrigerator cars in future. Work

was started on six new refrigerator cars, using this construction, and three were completed.

DRY DOCKS

A total of 174 vessels were dry docked during the year, 102 at Balboa and 72 at Cristobal. A classification of these vessels follows:

	Balboa	Cristobal	Total
Panama Canal equipment	33	10	43
United States Navy vessels	20	4	24
United States Army vessels	1	3	4
Other United States Government vessels		2	2
Panama Railroad vessels		7	7
Commercial line vessels	48	46	94
Total	102	72	174

The average tonnage of commercial vessels docked at Balboa was 2,805 and at Cristobal 536.

The days in which there were no vessels in dry dock at Cristobal numbered 149, at Balboa none. The Cristobal dock was out of commission from June 11 to August 10, 1927, in connection with alterations and proposed extensions.

The docking and overhaul of the United States cruiser *Rochester*, flagship of the special service squadron, was completed in 30 working days. Due to likelihood that the vessel might be called for emergency service, the work was so arranged that after the first 14 working days the vessel could have been released for duty at any time on 5 days' notice.

An attempt was made at the beginning of the year to lengthen the present dry dock at Cristobal to 361 feet. The project was abandoned when the difficulty of building a cofferdam at the harbor end indicated that the cost of the work would be excessive for the benefit derived. Revised plans have been prepared for extending this dock to a usable length of 475 feet, with a clear opening of 65 feet at the entrance and a depth of 30 feet over the sill. A dock of this size could accommodate approximately 80 per cent of the vessels passing through the canal.

PLANT

New corrugated asbestos roofs were installed on the machine, paint, and car shops at Balboa and on the new boiler shop at Cristobal. A simplified and cheaper method of installing the roofs was adopted and found satisfactory. The new roundhouse at Cristobal was completed at a considerable saving, and part of the saving was applied toward the purchase of new machine tools for this roundhouse and Balboa roundhouse as well. A new oil-burning 40-ton

crane for vessel repairs was ordered for Balboa and a new 30-ton locomotive crane for Cristobal. The new pattern storage building extension at Balboa was completed and placed in use. A section of Pier 15 settled to such an extent during the year that removal was necessary. It is now being rebuilt by the municipal division. A new roof will be installed on the instrument repair shop at Balboa during the year 1929 from the reserve fund previously established.

The rearrangement of the Cristobal shops has been revised so as to group the buildings about the proposed new dry dock. The revised plan provides for an approach pier and fitting-out wharf for vessels under repair at Cristobal shops. Replacements of obsolete and worn-out shop buildings at Cristobal will be made by modern structures with steel frames. The construction program contemplates replacement of all the old buildings in about four years, and practically all the funds for the work will be derived from earnings of the mechanical division. It is hoped to build the new dry dock toward the end of this 4-year construction period, provided the necessary funds are appropriated. The new boiler shop at Cristobal was completed, ready for machinery installation, and erection of the new machine shop will probably be undertaken during 1929.

FINANCIAL

The mechanical division earned net profits of $56,132.36 during the year, after providing funds sufficient to increase the reserve for renewals and repairs to machinery, equipment, and buildings to $159,259.69, in which is included $128,159.14 for improvements to the Cristobal shops. Local reserves as of June 30, 1928, for replacements of machinery and equipment, Cristobal dry dock, repairs to equipment and buildings, reroofing Balboa shops, improvements to Cristobal shops, and gratuity for employees' leave, totaled $774,071.39 as compared with $786,048.49 for the same items at the end of the fiscal year 1927.

COAL

The sales of coal from the plants at Cristobal and Balboa totaled 340,774 tons during the year as compared with 372,641 tons during 1927 and 347,319 tons during 1926. Of the 340,774 tons sold during the year, 299,861 tons were sold to 964 commercial vessels other than Panama Railroad, as against 365,367 tons sold to commercial vessels during the year preceding. The price of coal was reduced from $9 per ton to $8.50 on September 1, 1927, and again to $8 on June 15, 1928.

The total receipts from the sale of coal and charges for extra handling during the year amounted to $2,907,516.31; the total cost of sales, including operating expenses, was $2,502,203.35, resulting in a

net profit of $405,312.96, as compared with $562,280.32 last year, a decrease of $156,967.36. Additional reserve for repairs and replacements of colliers and barges amounting to $216,000 was set up. As in the preceding year practically all deliveries were made from the Cristobal plant.

FUEL OIL, DIESEL OIL, GASOLINE, KEROSENE

During the year the Standard Oil Co. of New York erected one fuel oil tank of 80,000 barrels capacity, and Fidanque Bros., of Panama, erected a gasoline tank of 20,000 barrels capacity, both at Balboa. At the close of the year the total storage capacity for fuel and Diesel oil was 2,361,040 barrels—1,246,540 barrels at Balboa and 1,114,500 at Mount Hope (Cristobal).

All deliveries to and from the tanks, for private companies as well as for the Panama Canal and the United States Navy, continued to be handled through the pipe lines and pumping plants of the Panama Canal.

FUEL OIL

The volume of fuel oil handled, including receipts, issues, and miscellaneous transfers, is shown by the following tabulation:

	Balboa	Mount Hope	Total
	Barrels	*Barrels*	*Barrels*
Received by the Panama Canal	190, 553	149, 096	339, 649
Used by the Panama Canal	220, 373	86, 448	306, 821
Pumped for individuals and companies	8, 323, 110	6, 908, 591	15, 231, 701
Sold by the Panama Canal	4, 633	7, 401	12, 034
Miscellaneous transfers	43, 384	44, 059	87, 443
Total	8, 782, 053	7, 195, 595	15, 977, 648

The number of ships handled in connection with receipts and issues of fuel oils totaled 2,678, of which 150 were Panama Canal craft.

DIESEL OIL

Sales of Diesel oil to vessels by the Panama Canal totaled 3,017 barrels, and sales made by the various private companies aggregated 740,393 barrels.

GASOLINE

During the fiscal year 2,341,072 gallons of gasoline were received for bulk storage; of this 1,544,610 gallons were stored in tanks at Balboa and 796,462 gallons were stored in tanks at Mount Hope. The total storage space available for bulk gasoline is 1,307,560 gallons—1,082,560 gallons at Balboa and 225,000 gallons at Mount Hope.

KEROSENE

Kerosene shipments received in bulk aggregated 501,160 gallons during the year; of this amount 332,028 gallons were stored at Balboa and 169,132 at Mount Hope.

The handling of mineral-oil products resulted in net profits of $279,030.20 after deduction of operating expenses and fixed capital charges.

SHIP CHANDLERY AND OTHER SUPPLIES—STOREHOUSE OPERATIONS

The operation of the storehouses was continued under the same policy as during the preceding fiscal year. The operating forces were held at a minimum, and every effort was made to keep inventory values as low as possible. However, on account of the unusual construction activities on the Atlantic side of the Isthmus it was necessary to enlarge the sand and gravel storage and handling facilities there, and the quantity of other building materials handled was in excess of ordinary requirements at Cristobal. The total value of materials received on purchases from the United States during the year was $5,068,172.13, as compared with $5,142,178.42 during the preceding year. Local purchases totaled $647,498.91, as compared with $550,-417.55 during the preceding year. The value of stock on hand at the close of the year was $4,450,196.60, an increase of $480,003.95 as compared with the preceding year.

The general storehouse at Balboa and the branch storehouses at Paraiso and Cristobal handled a total of 152,014 requisitions and foremen's orders during the year. The value of all issues for the year was $6,905,435.48. Material and supplies sold to steamships, employees, and others aggregated $999,827.75 and involved 61,809 separate sales. Business with shipping comprised sales to 3,736 vessels of material and supplies, including fuel oil, having a total value of $149,055.47, compared with sales of $134,106.36 to 3,420 vessels during the year preceding.

A total of 583 net tons of scrap iron was sold, of which 278 tons were sold in the local market.

NATIVE LUMBER OPERATIONS

Native hardwood lumber operations were continued as during the preceding year, and 225,051 board feet of logs were purchased as compared with 251,689 feet during 1927. Purchase was also made of 2,587 native hardwood railroad ties, as compared with 1,947 during the preceding year.

HARBOR TERMINALS

The total revenue from harbor terminal operations during the fiscal year amounted to $1,603,266.98; the operating expenses were $1,271,580.34, resulting in a net revenue of $331,686.64, as compared with $275,547.87 last year, an increase of $56,138.77 for the year. There were 1,666,903 tons of cargo stevedored and transferred this year, as compared with 1,456,363 tons last year, an increase of 210,540 tons. A 50-ton capacity stiff-legged derrick was erected on Pier No. 8, Cristobal, and a new 125-kilowatt generator was installed in the battery-charging station at Cristobal. Three thousand one hundred and twenty-two cargo ships and 597 banana schooners were handled and agency service was furnished to 397 commercial vessels during the year. At the close of the year a reserve of $50,000 was set up to cover extraordinary repairs and dredging.

A comparison of cargo tonnage handled, gross and net revenue from terminal activities, etc., for the past three years is given in the tabulation below:

	1926	1927	1928
Tons of cargo stevedored	372,760	305,506	330,392
Revenue per ton stevedored	$0.3570	$0.3888	$0.3450
Cost per ton stevedored	$0.2543	$0.2248	$0.1719
Tons of cargo handled and transferred	1,089,244	1,150,807	1,336,511
Revenue per ton handled	$0.9708	$0.9580	$0.8620
Cost per ton handled	$0.7412	$0.7894	$0.5450
Gross operating revenue	$1,381,375.58	$1,423,357.77	$1,603,266.98
Gross operating expense	$1,066,376.07	$1,147,809.90	$1,271,580.34
Net revenue	$314,991.51	$275,547.87	$381,686.64
Per cent of expense to gross revenue	77.20	80.64	79.31

The distribution of business between the Cristobal and Balboa terminals is indicated below:

	Cristobal	Balboa
Number of vessels discharging or taking cargo	2,017	1,105
Tons of cargo received	684,869	87,468
Tons of cargo dispatched	513,726	14,056
Tons of cargo stevedored by Panama Railroad	301,432	28,960

COMMISSARIES

The operations of the commissary division were continued along the same lines as in previous years. Few complaints were received from patrons during the year and in general it is considered that the quality of the merchandise, prices, and service furnished were satisfactory. No considerable price changes were made, as has been the case in previous years. The establishment of sailings of ships with refrigerated space from the west coast of the United States by one of the steamship companies made possible the purchase of food supplies in that locality. The results have been so satisfactory that it is proposed to open a purchasing office in San Francisco.

SALES

Every effort was made during the year to restrict sales in the commissary stores to those entitled to buy in them. Infractions were of a relatively minor nature and were corrected promptly, the guilty persons being cautioned or punished as found advisable. Total commissary sales during the year amounted to $9,682,240.78, as compared with $9,128,580.10 during the preceding year, an increase of $553,660.68. Sales to vessels amounted to $1,429,647.35, as compared with $1,308,520.02 during the preceding year, an increase of $121,127.33. Of the aggregate sales to vessels, $430,954.72, or approximately 30 per cent, were to vessels of the United States Navy.

The principal item of improvement was the advance toward completion of the new large reinforced concrete warehouse, checking-in shed, and general manager's office under construction at Mount Hope. The warehouse will contain 180,000 square feet of floor space on three floors, and in addition to the stocks to be carried there it will house a new bakery, coffee-roasting plant, and merchandise-packing department. The new office building is of two stories, 60 by 80 feet, built so as to face the warehouse, which in turn adjoins the cold-storage plant at Mount Hope. The checking-in shed is 70 by 120 feet, and will house the timekeepers, a time-clock system, etc., and will be equipped with shower baths for silver employees handling food supplies.

The gross receipts from the sale of commissary supplies during the year were $562,648.31 in excess of sales during the preceding year and the net profits were $455,721.25, as compared with $320, 754.03 during the year preceding, an increase of $134,967.22 for the year. The distribution of sales as compared with the two preceding years was as follows:

	1926	1927	1928
U. S. Government, Army and Navy	$1, 370, 929, 81	$1, 321, 933. 11	$1, 431, 333. 77
The Panama Canal	685, 894. 65	697, 522. 98	728, 124. 03
Steamships	766, 989. 50	794, 689. 06	980, 513. 28
Panama Railroad Steamship Line	192, 360. 29	264, 685. 11	411, 324. 77
Individuals and companies	660, 336. 75	697, 673. 98	681, 812. 45
Employees	5, 477, 106. 19	5, 751, 234. 99	5, 857, 279. 24
Gross sales	9, 153, 617. 19	9, 527, 739. 23	10, 090, 387. 54
Less discounts, credits, etc	421, 776. 19	399, 159. 13	408, 146. 76
Revenue from sales	8, 731, 841. 00	9, 128, 580. 10	9, 682, 240. 78
Supplies for expense and equipment:			
Retail commissaries and warehouse	42, 527. 73	47, 017. 90	45, 170. 25
General	1, 231. 70	1, 089. 78	1, 257. 79
Plants	15, 827. 28	20, 571. 66	20, 387. 43
Total	59, 586. 71	68, 679. 34	66, 815. 47
Loss by condemnation, pilferage, shrinking, clerical errors, etc	195, 113. 84	207, 196. 15	207, 120. 76
Grand total	8, 986, 541. 55	9, 404, 455. 59	9, 956, 177. 01

PURCHASES

Purchases during the year aggregated $9,334,407.43, an increase of $1,977,999.95 over the preceding year. Supplies to the value of $1,581,000 were on hand at the close of the year. The following tabulation shows the value of the various items purchased as compared with the two preceding years:

	1926	1927	1928
Groceries	$1,428,138.67	$1,672,887.79	$2,043,878.68
Hardware	613,123.67	565,982.22	578,726.51
Dry goods	1,035,508.32	1,174,818.42	1,594,971.34
Shoes	199,873.72	328,489.83	365,424.19
Cold storage	1,498,313.07	1,470,016.76	2,261,445.55
Tobacco	382,528.94	398,654.36	616,687.05
Cattle and hogs	550,711.25	445,852.08	394,417.07
Milk and cream	101,499.55	158,293.55	125,643.57
Eggs	237,233.74	230,689.73	235,389.43
Butter	237,872.44	326,082.08	261,035.06
Raw material	283,142.81	325,821.11	646,415.98
Toys	(1)	34,585.22	58,323.06
Dressed beef		224,234.33	152,049.94
Total	6,567,946.18	7,356,407.48	9,334,407.43
PLACE OF PURCHASE			
United States	4,877,886.32	5,313,970.34	6,804,054.13
Europe and Orient	551,756.09	1,030,279.83	1,197,658.61
Central and South America	234,280.61	275,702.01	495,504.25
Cattle industry	596,971.70	440,150.12	258,411.44
Panama Canal	90,993.77	112,612.75	109,855.42
Local	216,057.69	183,692.43	468,923.58
Total	6,567,946.18	7,356,407.48	9,334,407.43

[1] Included under hardware.

MANUFACTURING PLANTS

The output of the manufacturing plants had a total value of $1,959,914.60, as compared with $1,795,127.10 in the preceding year, an increase of $164,787.50. The principal products of the major plants and their value are summarized as follows:

BAKERY

The output of the leading items manufactured included 3,917,760 loaves of bread, 1,849,422 rolls, 40,134 pounds of cake, 2,034 dozen doughnuts, 7,366 pies, and 177,635 pounds of soda crackers, having a combined value of $268,223.55.

COFFEE-ROASTING PLANT

Among the products handled were 217,189 pounds of coffee, 23,233 pounds of corn meal, 56,896 pounds of peanuts, and 1,508 pounds of almonds. These products had a combined value of $97,771.88.

ICE CREAM AND MILK-BOTTLING PLANT

The principal output consisted of 43,130 gallons of ice cream manufactured, 441,319 quarts of milk and 16,823 quarts of cream bottled, and 186,023 Eskimo pies manufactured. The total value of the output was $194,903.21.

ICE PLANTS

Ice manufactured totaled 37,112 tons, valued at $323,532.43.

LAUNDRY

The number of pieces of laundry handled was 6,192,323, and receipts aggregated $253,183.32.

SAUSAGE FACTORY AND PICKLING DEPARTMENT

The aggregate output of the various products manufactured totaled 975,777 pounds, valued at $27,724.46.

INDUSTRIAL LABORATORY

The value of the output of the laboratory during the year was $218,615.17.

ABATTOIR

Included among the animals slaughtered were 6,341 head of cattle and 198 hogs; the output was valued at $365,960.58.

HOTELS AND RESTAURANTS

The restaurants and silver messes continued to be operated under contract during the year, and service was rendered at fair prices.

The Hotel Tivoli at Ancon and the Hotel Washington in Colon were operated by the supply department throughout the year. These hotels are essential adjuncts to the canal in affording accommodations to visiting Government officials, persons having business to transact with the canal, tourists, and others. The policy of advertising these hotels was continued, additional copies of the folder prepared for this purpose during the preceding year being printed and distributed. During the tourist season the capacity of these hotels is frequently taxed to the limit.

The cost of operating the Hotel Tivoli during the year was $217,020.16, which includes $10,000 reserved for new furniture, and the profits amounted to $20,914.73, as compared with a profit of $26,737.03 the previous year. At the Hotel Washington the total revenue for the year was $223,878.35 and the operating expenses were

$209,026.82, leaving a net revenue of $14,851.53, as compared with $1,815.55 during the preceding year, an increase of $13,035.98.

BUILDING CONSTRUCTION

The principal items of new construction work consisted of work on the new warehouse, checking-in shed, and general manager's office at Mount Hope, the building of forty 2-family gold quarters at New Cristobal, and commencement of work on the new administration building at Cristobal. Another considerable project was the removal from the old town of Culebra on the west side of the canal, later known as Camp Gaillard and finally abandoned by the Army, of 17 buildings which were reconstructed at Pedro Miguel for quarters, and of 5 buildings similarly demolished, transferred, and rebuilt at Red Tank. Work was begun on a new building for the printing plant to cost $80,000 and on ten 12-family silver quarters in Cristobal.

General maintenance work on all canal and railroad buildings was carried on as in the past. Due to the severe climatic conditions on the Isthmus and to the white termites this work is heavy. The new-type quarters being constructed have a concrete basement with reinforced columns and beams to the first floor level, and from there they are built of wood. It is thought that this will eliminate the termites. The steps are also of concrete and there are no wooden parts which are not under roof; this is expected to reduce future repair costs.

ANIMAL AND MOTOR TRANSPORTATION

Animal and motor transporation for all departments and divisions was supplied by the transportation division, this centralization of activities permitting the reducing of both employees and equipment to the minimum necessary to meet transportation demands.

Twenty-five cars and trucks were purchased and 15 were retired during the year. Equipment on hand at the close of the fiscal year consisted of 279 cars and trucks, 9 trailers, 23 motor cycles, 7 mowing machines and rakes, and 11 mules.

The division is required to operate on a self-sustaining basis. Revenues exceeded expenditures for the fiscal year by $32,699.26, as compared with an excess of $10,940.24 for the year 1927.

PANAMA CANAL PRESS

The printing plant carries in stock and manufactures such necessary stationery, forms, etc., as are required on the Isthmus in connection with canal and railroad operations. It is the established policy to curtail all classes of printing work as much as possible so as to avoid the printing of excessive quantities of any item. The manufacturing output of the plant during the year was valued at $165,729.34, and the issues and sales from the stationery section amounted to $138,033.65,

making a combined total of $303,762.99, as compared with a total of $299,435.33 during the preceding year. The inventory value of all stock on hand at the close of the year was $97,995.09.

PANAMA RAILROAD

The gross revenues from the operations of the Panama Railroad proper during the fiscal year amounted to $1,709,095.79; the gross operating expenses were $1,379,327.05, resulting in a net revenue of $329,768.74, as compared with $331,910.37 for the year preceding, a decrease of $2,141.63 for the year 1928. Tonnage of commercial freight transported during the year aggregated 341,349 tons, as compared with 298,033 tons during 1927, an increase of 43,316 tons. The increase was due primarily to greater shipments of building materials and of bananas.

The following table presents statistics covering various phases of operations during the past three years:

	1926	1927	1928
Average miles operated, Colon to Panama	47.61	47.61	47.61
Gross operating revenue	$1,564,074.30	$1,638,753.66	$1,709,095.79
Operating expenses	$1,433,263.08	$1,306,843.29	$1,379,327.05
Net operating revenue	$130,811.22	$331,910.37	$329,768.74
Per cent of expenses to revenue	91.64	79.75	80.71
Gross revenue per mile of road	$32,851.80	$34,420.37	$35,897.83
Operating expenses per mile of road	$30,104.24	$27,448.92	$28,971.37
Net revenue per mile of road	$2,747.56	$6,971.45	$6,926.46
Number of passengers carried:			
First-class	177,611	184,430	188,796
Second-class	304,652	311,343	328,460
Total	481,263	495,773	517,256
Passenger revenue:			
First-class	$248,471.44	$249,061.03	$239,498.24
Second-class	194,564.59	189,206.66	214,006.06
Total	443,036.03	438,267.69	453,504.30
Revenue per passenger train-mile	$5.18	$5.20	$5.34
Revenue per freight train-mile	$11.98	$11.28	$11.99
Total revenue train mileage	$179,932.00	$179,258.00	$183,858.00
Railroad revenue per train-mile	$8.69	$9.14	$9.29
Railroad operating expenses per revenue train-mile	$7.96	$7.29	$7.50
Net railroad revenue per revenue train-mile	$0.73	$1.85	$1.79
Freight, passenger, and switch locomotive mileage	295,156	294,994	303,486
Work-train mileage	1,992	1,992	2,392
Passenger-train mileage	104,563	103,135	105,697
Freight-train mileage	75,369	76,123	78,161

Little change was made in the trackage in use during the year. The principal change in equipment was the building and putting into service of two passenger coaches and three refrigerator cars. The new 12-stall roundhouse at Cristobal was almost completed at the close of the year.

TELEPHONES AND TELEGRAPHS

The gross revenue from the operation of telephones, electric clocks, and electric printing machines amounted to $225,462.55 and the operating expenses were $194,503.62, leaving a net revenue of $30,958.93

for the year as compared with $24,321.62 for the preceding year, an increase of $6,637.31.

During the year 978 telephones were installed and 888 removed, making a net increase of 90 telephones for the year. There were 2,674 telephones in service at the close of the year, exclusive of those in the Hotel Tivoli and the Hotel Washington.

ELECTRIC PRINTING MACHINES

Sixteen electric printing machines were in service at the close of the year, 11 of which were being used by the Panama Canal, 3 by the United States Navy, and 2 by the Panaman Government. Two additional machines for reserve were on order.

Twenty-one telegraph stations using Morse were in service, as follows: Panama Railroad, 9; United States Army, 6; United States Navy, 6. No changes were made in this service during the year.

LANDS AND BUILDINGS

Panama Railroad lands in the cities of Panama and Colon and public lands in the Canal Zone are administered by a joint land office.

PANAMA RAILROAD CO. LANDS AND LEASES

At the close of the fiscal year 1,355 leases and 15 licenses granted by the Panama Railroad Co. covering the use of its property in Panama and Colon were in effect. The income derived from these leases and licenses during the year was $198,837.78, representing an increase in revenue of $9,271.73 over the preceding year.

Land in the city of Panama not required for Government business purposes, comprising a total of 4,750.93 square meters, was sold during the year at an aggregate price of $286,738.62. The sale of this property brought about a reduction of $12,439.72 in the annual land rentals, but the reduction was more than offset by the increase in rentals on other property and by new leases issued.

AGRICULTURAL LANDS IN THE CANAL ZONE

A total of 2,041 licenses, covering 6,466.5 hectares of agricultural lands in the Canal Zone, were in effect on June 30, 1928. The rental from these lands for the year aggregated $32,705.31, of which $459.50 was outstanding at the close of the fiscal year. The average holding under these licenses was 3.1 hectares (7.66 acres) per license. The area held under license shows a reduction of 345 hectares from the preceding year, while the number of licenses shows an increase of 22. This was due to the relicensing and apportioning to small cultivators of some of the larger plantations.

ALHAJUELA BASIN

On July 1, 1927, the land office took over the collection of revenues on bananas brought out of the Alhajuela Basin by licensees who sold their land and improvements to the United States. The revenue for the fiscal year amounted to $3,056.95.

The gross revenue realized from all real estate operations handled by the joint land office amounted to $234,600.04, not including $286,738.62 derived from sales of property. These figures do not include the rental on the oil tank sites at Mount Hope and Balboa, nor the sites held under license in the Canal Zone by individuals and companies on which office buildings and residences are maintained. Neither do they include rentals for quarters occupied by employees of the Panama Canal and Panama Railroad.

Improved business conditions in the cities of Panama and Colon have enhanced the value of the real estate holdings of the Panama Railroad. The export through Cristobal during the fiscal year of 3,236,839 bunches of bananas, valued at $1,571,051.70, a large part of which were grown in the Canal Zone, contributed materially to the improvement.

PLANT-INTRODUCTION GARDENS AND EXPERIMENTAL STATION

The work at the plant-introduction gardens and experimental station, begun in June, 1923, was carried forward under the direction of the agronomist. His report for the fiscal year ending June 30, 1928, is being published as a separate pamphlet. Since June, 1927, 879 accessions have been added to the list of plants in the gardens, many of them entirely new on the Isthmus. These accessions came from as widely divergent sources as Ceylon, the Philippines, Hawaii, the United States Department of Agriculture, and the Missouri Botanical Gardens.

Although the gardens are still comparatively new, they are beginning to attract the attention of visitors from many parts of the world and to distribute plants which should materially improve agriculture in this and near-by countries. During the year 11,700 plants and about 700 sacks of grass were distributed for planting purposes. The demand is far in excess of the supply.

Particular attention has been given and will continue to be given to the propagation of plants valuable for their edible fruits, such as bananas, pineapples, papayas, avocados, mangos, oranges, grapefruit, limes, etc.

QUARTERS FOR EMPLOYEES

GOLD EMPLOYEES

In all districts the demand for family quarters was greater than the supply. At the close of the year 47 employees were on the waiting list at Balboa, 36 at Cristobal, 21 at Pedro Miguel, and 5 at Gatun. There is no prospect that the demand for quarters will decrease. In fact, the indications are for an increase due to constantly increasing business and a probable increase in force due to the construction of the Alhajuela Dam.

During the year 40 new 2-family quarters were constructed at New Cristobal and 17 of the buildings transferred from the west side of the canal were being erected for gold quarters at Pedro Miguel. Funds have been provided by Congress to continue the building program, and it is intended to construct 33 additional 2-family quarters at New Cristobal and five 1-family houses at Balboa.

The established rental rates were collected for all gold quarters occupied. The revenue received was sufficient for necessary maintenance of the buildings, including some painting for preservation, but not sufficient to provide any income on the capital invested. A charge of 2 per cent of the capital value was made, however, as a part of the operating expenses to provide a reserve for replacement.

SILVER EMPLOYEES

The demand for silver quarters has always been in excess of the supply. At the close of the year there were 512 applications for silver family quarters on file at Balboa, 470 at Cristobal, 137 at Pedro Miguel, and 48 at Gatun. During the year the old 3-story frame gold bachelor quarters and hotel building at Cristobal was removed and reerected for silver bachelor quarters at Camp Bierd. At Red Tank 55 silver family apartments were constructed from four houses and three barracks which were removed from Camp Gaillard on the west side of the canal. Work was also commenced on ten 12-family apartments at Cristobal to replace old buildings in that vicinity which are no longer serviceable.

The operation of silver quarters was continued on the same basis as during previous years. The cost of maintaining and operating silver quarters exceeded the rent collected by $95,000, which is the same amount appropriated in previous years for this purpose. No extraordinary repair work was necessary during the year and the buildings and premises were maintained in satisfactory condition.

CLUBHOUSES

To the maintenance of clubs and playgrounds for American and West Indian employees and their families the Panama Canal contributed $120,000. The additional expenses defrayed from current revenue were $467,974.92, and the income from moving pictures, soda fountains, candy and cigar counters, swimming pools, tennis courts, and other activities promoted was $485,601.71. The accumulated surplus of clubhouse funds on June 30, 1928, was $120,886.58. Additional detail of income and operating expenses may be obtained from Section V of this report. Report of activities is in Section IV.

FARM INDUSTRIES

PLANTATIONS

All plantations were operated under contract during the fiscal year, with the exception of the citrus fruit farm at Juan Mina, consisting of some 50 or 60 acres. The net loss from the operation of plantations during the fiscal year was $2,877.19, as compared with a net loss of $2,615.44 during the preceding year.

DAIRY FARM

The operation of the dairy farm for the fiscal year shows a net profit of $1,765.95, as compared with a net profit of $317.46 last year, an increase of $1,448.49.

CATTLE

The gross revenue from the sale of cattle during the fiscal year amounted to $391,322.14 and the cost of sales was $456,878.60, resulting in a loss of $65,556.46, as compared with a loss of $16,254.85 during the preceding year, an increase in deficit of $49,301.61. This increase in deficit is due primarily to the introduction of a grub known as "Dermatobia hominis" through the importation of Venezuelan cattle. This grub killed 900 head and rendered approximately 3,000 more unfit for slaughter. The same grub was brought into the Zone pastures once before by the importation of cattle from Nicaragua; the results then were much less serious and the grub disappeared during the following year. If the climate on the Isthmus were suitable for its development it would have been established here for years.

On July 1, 1927, there were 5,908 head of cattle in the pastures. During the year 5,618 head were purchased and 51 calves were born, 6,303 head were slaughtered, 901 died, and 15 were transferred to the dairy, leaving 4,358 head on hand in the pastures at the close of the year.

During the year 15,939 acres of pasture were recleared and burnt at an average cost of $1.69 per acre. All pastures thus recleared show decided improvement in the stand of grass.

OPERATIONS WITH PANAMA RAILROAD FUNDS

Many of the business activities on the Isthmus connected with the canal are conducted with the funds of the Panama Railroad Co. Included in these are the wharves and piers at the harbor terminals, the commissary system, coaling plants, and various minor activities, as well as the Panama Railroad itself. In this report only the major features of these operations are noted in their relation to the canal administration as a whole. Details are given in the annual report of the Panama Railroad, which is published separately.

The operations of the railroad proper, harbor terminals, coaling plants, stables, and baggage transfer were continued throughout the year under the direction of the superintendent of the railroad; the telephone system under the electrical engineer of the Panama Canal; renting of land and buildings under the land agent; and the commissaries, Hotels Washington and Tivoli, plantations, dairy farm, and cattle industry under the chief quartermaster of the Panama Canal.

PANAMA RAILROAD STEAMSHIP LINE

The gross operating revenue of the steamship line for the fiscal year ended June 30, 1928, amounted to $2,289,791.54, and the gross operating expenses amounted to $2,188,278.14, leaving a net revenue of $101,513.40. This net operating revenue of $101,513.40 as compared with the net deficit of $48,967.77 for the fiscal year ended June 30, 1927, shows an improvement of $150,481.17.

The steamship line carried all freight and passengers for account of the Panama Canal and other departments of the Government of the United States at material reductions from tariff rates, which amounted to the important sum of $478,647.70. Had regular rates been charged by the steamship line for such freight and passenger service performed for the Panama Canal and other Government departments its operating profit of $101,513.40 would have been increased to a net profit of $580,161.10.

For the year ended June 30, 1928, the tonnage carried amounted to 247,068 tons as compared with 205,196 tons for the previous year, an increase of 41,872 tons.

CANAL ZONE FOR ORDERS

The system of shipping cargo to the Canal Zone subject to the orders of the consignor or consignee after arrival was established March 17, 1925. Under this system merchandise may be shipped

to Canal Zone terminal ports to be held there for orders, the Panama Railroad Co. acting as warehouseman. Such cargo, or integral parts of it, may be withdrawn and delivered locally or forwarded as the consignor or consignee may desire, except that goods for use in the Canal Zone or the Republic of Panama by others than those entitled to the free entry privileges are released only upon the presentation of satisfactory evidence of the payment of the proper duty to the Republic of Panama.

This system is useful, and the volume of business is increasing. Following is a comparison for the fiscal years 1927 and 1928:

	1927	1928	Increase
Number of receipts issued	602	1,072	470
Number of withdrawals	3,641	5,839	2,198
Tons received	8,200	26,864	18,664
Tons withdrawn	6,125	28,087	21,962
Packages received	76,316	94,782	18,466
Packages withdrawn	77,885	92,207	14,322

The following is detail of the operations by months at Cristobal and Balboa:

Month	Number of receipts issued	Number of withdrawals	Tons received	Tons withdrawn	Packages received	Packages withdrawn
CRISTOBAL						
July	48	264	876	1,610	4,398	2,451
August	62	255	2,143	1,218	5,540	4,854
September	54	337	1,126	1,706	6,457	6,881
October	67	331	1,277	1,600	5,943	4,629
November	87	329	1,948	926	10,913	6,050
December	57	367	776	1,942	6,185	9,155
January	54	316	1,272	1,507	5,551	5,858
February	67	339	1,335	735	5,904	5,668
March	71	370	10,257	10,538	1,602	1,196
April	66	319	1,343	1,226	3,840	5,620
May	67	369	626	1,130	3,522	5,791
June	56	408	1,244	1,497	7,943	6,957
Total	756	4,004	24,223	25,635	67,798	65,110
BALBOA						
July	22	128	179	173	1,711	1,738
August	21	133	112	103	1,384	1,408
September	23	124	175	136	2,014	1,782
October	19	130	114	120	1,425	1,518
November	24	134	199	157	3,420	1,712
December	35	173	338	303	2,673	4,512
January	30	171	223	272	3,562	3,462
February	23	176	208	227	2,908	3,022
March	39	216	344	275	3,574	3,311
April	42	148	584	168	2,157	1,319
May	25	164	116	230	1,492	1,867
June	13	138	49	288	664	1,446
Total	316	1,835	2,641	2,452	26,984	27,097

SECTION III

GOVERNMENT

Civil government of the Canal Zone is conducted as prescribed by the Panama Canal act of August 24, 1912, and other acts and Executive orders applicable to the Canal Zone. The assignment of governmental duties wherever practicable to departments organized primarily for the operation and maintenance of the canal has effected a coordination of functions which results in greater economy and efficiency.

Data on the expenses and revenues of various features of canal operation and government are shown in the financial and statistical statements in Section V.

POPULATION

A census of the civil population of the Canal Zone was taken by the police force during the month of June, 1928, a summary of which is given below:

	American					All others					Grand total
	Total men	Employees	Total women	Employees	Children	Total men	Employees	Total women	Employees	Children	
Balboa district	1,852	1,612	1,885	316	1,872	3,365	2,289	2,399	178	4,670	16,043
Cristobal district	540	482	607	28	697	3,420	2,202	2,116	89	4,428	11,808
Prisoners	29	------	------	------	------	119	6	1	------	2	151
Total employees	------	2,094	------	344	------	------	4,497	------	267	------	[1] 7,202
Total persons	2,421	------	2,492	------	2,569	6,904	------	4,516	------	9,100	28,002
Fiscal year 1927	2,375	2,111	2,501	349	2,585	6,761	4,166	4,464	103	8,938	[1] 27,624
Fiscal year 1926	2,316	2,087	2,664	353	3,010	6,880	4,375	4,373	46	8,449	[1] 27,692

[1] Includes 221 civilian employees of the Army and Navy in 1928, 72 in 1927, and 91 in 1926.

In addition to the civilian population listed above, the military and naval forces in the Canal Zone in June, 1928, numbered 9,510, making a total population of 37,512.

PUBLIC HEALTH

A brief outline of general health conditions in the Canal Zone and the cities of Panama and Colon is given below. This subject is discussed in much greater detail in the health department annual reports for calendar years, which are issued as separate publications.

MALARIA

The total number of malaria cases reported from the Canal Zone and terminal cities during the fiscal year 1928 compared with the six previous years, ending June 30, was as follows:

	1928	1927	1926	1925	1924	1923	1922
Employees	183	155	[1] 312	180	208	216	176
Personnel of Army and Navy	538	739	854	762	894	870	828
Nonemployees	529	420	445	494	521	657	243
Total	1, 250	1, 314	[1] 1, 611	1, 436	1, 623	1, 743	1, 247

[1] Omitting the cases from Bruja Point, where a gang of men was engaged in construction work for the Army and housed in a temporary camp outside the sanitated areas, the number of employees reported with malaria was but 188 and the total number of cases 1,487. Over half of the men employed at Bruja Point developed malaria within 5 months, and this furnished an example of what would occur throughout all the villages and settlements in the Canal Zone should sanitary measures be relaxed.

There were no deaths among employees from malaria during the year. The last death of an employee from malaria occurred in 1924.

CANAL ZONE

The population of the Canal Zone (civil and military) on July 1, 1927, was 36,600, and this figure has been used as a base for vital statistics. From this population 315 deaths occurred during the year, 274 of which were from disease, giving a rate of 7.49 for disease alone, as compared with 6.84 for 1927 and 6.87 for 1926. The principal causes of death, and number from each principal cause, were tuberculosis (various organs), 25; pneumonia (broncho and lobar), 25; and nephritis (acute and chronic), 19.

There were 544 live births reported during the year, and 39 stillbirths. Including stillbirths this is equivalent to an annual birth rate of 15.93 per 1,000 population. The infant mortality rate, based on the number of live births reported for the year, was 52.33 for white children and 112.90 for colored children, with a general average of 97.43. Of the total births reported, 6 per cent were stillbirths. Of the total deaths reported, 23 per cent occurred among children under 5 years of age.

The maternal mortality rate (from conditions due to the puerperal state) was 15.44 per thousand births, stillbirths included.

PANAMA CITY

The estimated population of the city of Panama for the year was 59,635. From this population 1,282 deaths occurred during the year, of which 1,235 were from disease, giving a rate of 20.71 for disease alone, as compared with 20.26 for the fiscal year 1927.

The three principal causes of death in 1928, compared with the past few years, were as follows:

	1928	1927	1926	1925	1924
Pneumonia (broncho and lobar)	185	209	154	187	276
Tuberculosis (various organs)	177	199	201	201	193
Nephritis (acute and chronic)	119	-------	-------	-------	-------
Diarrhea and enteritis	-------	149	85	90	121

There were 2,465 live births reported during the year and 116 stillbirths. Including stillbirths, this is equivalent to an annual birth rate of 43.28 per 1,000 population. The infant mortality rate, based on the number of live births reported, was 126.17. Of the total births reported, 4 per cent were stillbirths. Of the total number of deaths reported, 34 per cent occurred among children under 5 years of age. The maternal mortality rate (from conditions due to the puerperal state) was 3.87 per thousand births, stillbirths included.

COLON

The estimated population of the city for the year was 31,940. From this population 437 deaths occurred during the year, of which 416 were from disease, giving a rate of 13.02 for disease, as compared with 13.65 for 1927.

The three principal causes of death in 1928, as compared with the past few years, were as follows:

	1928	1927	1926	1925	1924
Tuberculosis (various organs)	69	76	71	87	57
Pneumonia (broncho and lobar)	53	50	36	54	42
Cancer (various organs)	31	-------	-------	-------	-------
Diarrhea and enteritis	-------	17	26	27	33

There were 751 live births reported during the year and 47 stillbirths. Including stillbirths, this is equivalent to an annual birth rate of 24.98 per 1,000 population. The infant mortality rate, based on the number of live births, was 122.50. Of the total births reported, 5 per cent were stillbirths. Of the total deaths, 25 per cent occurred among children under 5 years of age. The maternal mortality rate (from conditions due to the puerperal state) was 6.27 per thousand births, stillbirths included.

CANAL HOSPITALS

Following is a summary of patients treated in Panama Canal hospitals during the fiscal year 1928:

	Number in hospital July 1, 1927		Admitted		Died		Discharged		Transferred		Remaining June 30, 1928	
	White	Black	White	Black	White	Black	White	Black	White	Black	White	Black
Gorgas	184	187	5,687	4,388	88	222	5,512	4,009	57	96	214	248
Colon	27	39	1,060	1,399	21	63	879	1,228	168	115	19	32
Corozal:												
Insane	121	380	131	169	8	54	116	61	2	12	126	422
Cripples	3	23	1	10	-------	-------	-------	1	-------	7	4	25
Chronic	3	32	1	21	-------	4	1	4	-------	10	3	35
Palo Seco Leper Colony	6	98	-------	8	1	5	-------	3	-------	-------	5	98
Total	344	759	6,880	5,995	118	348	6,508	5,306	227	240	371	860

QUARANTINE AND IMMIGRATION SERVICES

Continuing operations as formerly, an effective quarantine was maintained without any delay to shipping. Particular attention was given to the inspection of vessels and their cargoes coming from ports infected with bubonic plague. It was not necessary to detain any vessel or any member of crews on account of the presence on board of a quarantinable disease. No additional quarantine rules and regulations have been promulgated.

The rat proofing of ships and a closer inspection for rat infestation aboard has resulted in a slight decrease in the number of fumigations.

The time required for the fumigation of a vessel has been materially lessened since the introduction of a new fumigant. This fumigant, Zyklon–B, is a liquid hydrocyanic acid incorporated in a calcined and granulated silicious earth. The material is placed in conveniently sized cans under pressure in concentrated form and is handled easily. The use of this fumigant lessens the labor in connection with fumigation as there is only a negligible amount of residue remaining and no equipment is demanded. In the past it has been necessary to load bulky equipment on the vessel for generating the fumigant, and following the fumigation to remove it.

The international Standard Form Bill of Health was adopted for use by the Panama Canal on May 16, 1928. This form of bill of health was promulgated by the Pan American Sanitary Conference and has been ratified by a number of the member countries. Its use will be of great aid to shipping and will make for uniformity in quarantine procedure.

In addition to their duties as quarantine officers, the physicians of the quarantine division continued in the capacity of immigration officers for both the Canal Zone and the Republic of Panama. The following table summarizes the activities of the division for the fiscal year 1928:

	Cristobal	Balboa	Total
Vessels inspected and passed	1,396	1,065	2,461
Vessels granted radio pratique	76	47	123
Vessels passed on certificates of masters	2,794	2,191	4,985
Total vessels received	4,266	3,303	7,569
Supplementary inspection of vessels	4,084	1,555	5,639
Vessels fumigated	87	39	126
Box cars fumigated	11	113	124
Crew inspected and passed	80,684	52,696	133,380
Crew passed by radio	28,353	3,243	31,596
Crew passed on certificates of masters	178,165	100,586	278,751
Passengers inspected and passed	29,137	17,668	46,805
Passengers passed on certificates of masters	58,926	21,820	80,746
Total persons received	375,265	196,013	571,278
Persons deported under immigration laws	661	431	1,092
Persons detained account immigration laws and later allowed to enter or to resume their journey for which they transshipped here	152	918	1,070
Persons vaccinated	----------	324	324

MUNICIPAL ENGINEERING

WATER SUPPLY

A number of projects were carried out for the improvement and enlargement of the Canal Zone water system in addition to the regular maintenance work on pipe lines, reservoirs, filtration plants, and pumping stations. The more important of the improvements were the construction of gravity filters at Gamboa; relocation of water lines on account of the new administration building at Cristobal; installation of new 12-inch high-pressure water line to Old Cristobal; construction of manifold at Mount Hope pumping station; construction of clear-water well and pump sump at Agua Clara filtration plant; construction of new 20-inch high-pressure main from Mount Hope to New Cristobal; installation of water lines to serve new improved areas in New Cristobal; construction of drains and improvement of grounds around the Mount Hope filtration plant.

The amount of water consumed during 1928 as compared with the two preceding years is shown in the following table:

	1928	1927	1926
	Gallons	*Gallons*	*Gallons*
Canal Zone	3, 227, 313, 000	3, 087, 507, 913	3, 000, 372, 000
City of Panama	1, 354, 354, 000	1, 211, 019, 000	1, 163, 545, 000
City of Colon	661, 253, 000	628, 014, 000	575, 429, 000
Sales to ships	150, 737, 000	143, 297, 227	144, 191, 672
Total	5, 393, 657, 000	5, 069, 838, 390	4, 883, 537, 672

SEWERS

In addition to the usual maintenance work performed on the sewer systems, the following extensions and improvements were made: Construction of 3 by 2 foot box sewer at Old Cristobal, to eliminate flooding around the site of the new administration building; repair and extension of existing storm drains near Ancon post office and laundry; and rebuilding of a section of storm sewer at La Boca.

ROADS, STREETS, AND SIDEWALKS, CANAL ZONE

Usual maintenance work was performed on roads, streets, and sidewalks during the year, and in addition about $80,000 were used on 36 projects of street, road, and sidewalk repairs and improvements ranging from $200 to $12, 000 each.

CITIES OF PANAMA AND COLON

The following is a summary of the more important work handled during the year in addition to the necessary maintenance work on the sewer and water systems and on the streets: Paving Sixth Street, Colon, from intersection of Bolivar to Broadway; paving Eighth

Street, Colon, from Bolivar to Broadway; constructing sidewalks in Broadway Park area, Colon; paving, water, and sewer installations between Ninth and Tenth Streets, Central Avenue and B Street, on National Avenue, and Third of November Street, Panama City.

ARMY AND NAVY

Varied work, such as the furnishing of gravel, extending fence around Pedro Miguel Locks, building roadways, working on sea-plane runways, and furnishing rock to Coco Solo, was performed for the Army and Navy during the year.

REPAIRS TO DOCK 15

The largest single repair job during the year was the repairing and reanchoring of Dock 15 at Balboa. This dock was constructed rather hurriedly in 1911 as it was needed badly to handle lumber shipments from the west coast. The first outward movement of the dock was observed in 1914 and by November, 1927, the outward movement at the center was approximately 2 feet, of which about 5 inches had occurred after November, 1926. The deck system was removed in two bays, in an area measuring 60 by 35 feet, as was also the back fill in the area where the greatest movement occurred. The old caissons were replaced with new ones, which were filled with concrete. Form work was then begun for replacement of the deck system. The work was nearing completion at the close of the year.

WATER PURIFICATION PLANTS AND TESTING LABORATORY

The water purification plants performed the usual work of purifying the water used on the Canal Zone and in the cities of Panama and Colon. The testing laboratory carried on a variety of work, in which were included the inspection of 145 vessels, gas tanks, and their confined spaces; the testing of 2, 507 samples of mineral oils, cement, oxygen, hydrogen, water, various metals, concrete, and numerous other materials not classified; and the maintenance of chlorinators at swimming poois and the Gamboa filtration plant.

BRIDGE ACROSS MIRAFLORES SPILLWAY

During the closing months of the fiscal year 1927, work was begun on a bridge across Miraflores spillway discharge channel about 200 yards below the dam to carry both a track from the Panama Railroad and a highway to Miraflores Locks. The building formerly housing the steam electric plant is thus connected with the locks by railroad and highway, making the building available for use as a storehouse for the locks. Work on this project was continued throughout the fiscal year 1928 and at the close of the year was 90 per cent completed. The bridge is a concrete trestle bridge 530 feet in length, carrying a

16-foot concrete roadway for vehicular traffic, with the 5-foot railroad track carried along the center line of the decking.

PUBLIC ORDER

During the year 3,400 persons were arrested, of whom 204 were females. Of these 2,392 were convicted, 336 dismissed, 27 were under trial at the close of the year, and 645 were disposed of otherwise on proper authority.

The more common causes of arrest were violations of the vehicle and traffic regulations, 1,192; violation of immigration regulations, 404; disorderly conduct, 394; loitering, 179; petit larceny, 113; violation of the national prohibition act, 107. The persons arrested included representatives of 84 countries and territories and 168 different trades and professions.

There was one case of manslaughter during the year for which a sentence of nine months in the penitentiary was inflicted. Two cases of suicide occurred during the year, one of whom was a white Englishman and the other a black Panaman, inmate of Corozal Hospital. The coroner investigated 58 deaths during the year; accidental drowning was found the cause in 29 instances.

A monthly average of 63 prisoners served sentences in the common jails during the year, and all those physically able were employed on maintenance of trails, road repairs, and other municipal improvements; others were employed on janitor and miscellaneous work at police and fire stations and target ranges. The total value of labor performed by the prisoners was $22,131.90

Fifty convicts were committed to the Canal Zone penitentiary during the year, with sentences aggregating 132 years and 10 months; 40 convicts were discharged, 9 were pardoned, and 1 was released under parole. Labor performed by convicts during the year was valued at $34,912.34, on the basis of standard rates of pay. Convicts were employed principally on municipal improvements, clearing trails, road work, and in the cultivation of fruits, vegetables, etc., at the penitentiary farm and the experimental farm at Summit. At the close of the year 97 convicts remained in custody as compared with 87 at the close of the previous year.

The total traffic accidents reported in the Canal Zone during the year was 366. These resulted in the death of four persons and injuries to 114. A classification by causes of accidents shows that practically all of these accidents were avoidable, 305 being due to careless or reckless operation of vehicles, 22 to careless pedestrians, and 18 to intoxicated drivers; 24 were due to wet streets (skidding).

In addition to the routine police work in the Canal Zone villages, a continuous patrol of the harbors of Balboa and Cristobal was main-

tained throughout the year, principally for the enforcement of navigation regulations and for the prevention of smuggling and irregular traffic. Police launches were maintained also for the patrol of the Chagres River and Gatun Lake, and details of police officers were continued throughout the year at all canal locks and at the spillway at Gatun. Monthly patrols of the interior sections of the Canal Zone were continued to determine if any unauthorized clearings or cultivations were being made, or any unauthorized new buildings were being constructed. Motor-cycle patrols for special emergency service and for the enforcement of vehicle traffic regulations were maintained at various points.

OFFICE OF THE DISTRICT ATTORNEY

The district attorney and his assistant prosecuted 177 criminal cases before the district court, with 141 convictions, 5 acquittals, and 31 cases dismissed. There were 23 criminal cases pending at the close of the fiscal year exclusive of two in which bail has been forfeited and the parties departed from the jurisdiction of the court and one remanded to the district court of the Canal Zone on appeal to the United States circuit court at New Orleans. Of the criminal cases prosecuted, 69 were for violation of the national prohibition act, 20 for assault, 18 for grand larceny, and 17 for burglary.

The district attorney represented the Panama Canal or the United States Government in two civil cases, one of which was still pending at the close of the year.

DISTRICT COURT

Sessions of the district court were held at Ancon and Cristobal, and the following business was transacted during the fiscal year:

Cases pending July 1, 1927: Civil, 38; probate, 77; criminal, 13.
Cases filed during the year: Civil, 116; probate, 275; criminal, 167.
Cases settled during the year: Civil, 89; probate, 289; criminal, 157.
Cases pending June 30, 1928: Civil, 65; probate, 63; criminal, 23.

Of the civil cases disposed of, 71 were decided, 17 dismissed, and 1 was consolidated; of the criminal cases disposed of, 3 resulted in acquittal, 127 in conviction, and 27 were dismissed.

Marriage licenses issued numbered 658, deeds recorded numbered 4, and collections from fines, fees, licenses, etc., totaled $5,726.44.

MARSHAL

In connection with 90 civil cases filed in the district court the marshal served 82 summonses, 44 writs, and 104 subpœnas for witnesses. In connection with 52 criminal cases, 10 juries were summoned, and witnesses were summoned in 11 cases. Nine admiralty

cases were handled during the year. Two sailing vessels were seized; one of these was released on payment of charges and costs, and the other was sold to satisfy the judgment of the court. Thirty-five writs were served in connection with admiralty cases. Writs and summonses were received from district courts in the United States in eight cases for service in the Canal Zone. Fees collected amounted to $498.16 and fees paid to witnesses and interpreter amounted to $145. The handling of trust funds by the marshal was discontinued on December 31, 1927. The persons to whom money in the fund was due since 1922 were located and payments of the amounts due were made to them. A small balance of $86.14, consisting of unallocated interest, was deposited with the collector of the Panama Canal.

MAGISTRATES' COURTS

In the magistrate's court at Balboa, 7 cases were pending at the beginning of the year, 1,757 cases were docketed, and 1,733 cases were disposed of, leaving 31 cases pending at the close of the year. Of the criminal cases settled, 1,443 resulted in conviction, 40 in acquital, 147 were dismissed, and 74 held to the district court. During the year petitions were made to the district judge for the commitment to Corozal Hospital of 126 persons for observation.

In the magistrate's court at Cristobal, 10 cases were pending at the beginning of the fiscal year, 1,298 cases were docketed, 1,308 were disposed of, leaving no cases pending at the close of the year. Of the criminal cases settled, 941 resulted in convictions, 100 in acquitals, 94 were dismissed, and 100 held to the district court.

Fines and other collections totaled $14,218.75 at Balboa and $9,181 at Cristobal.

FIRE PROTECTION

During the year 98 fires, 6 emergency calls, and 14 false alarms were reported. Of the fires, 68 occurred in property of the Panama Canal, 13 in Panama Railroad property, 1 in United States Army property, 1 in property of the United States Navy, and 15 in private property.

The total loss from all fires amounted to $4,540.38 during the year, distributed as follows: Panama Canal, $1,182.68; Panama Railroad Co., $90.10; United States Army, $2,500; United States Navy, $300; private property, $467.60. The total value of the property involved was $3,056.973.50.

Periodical inspections of all Government buildings, docks, yards, etc., were conducted, and fire extinguishers and other equipment were maintained in good condition throughout the year. Seventy-two extinguishers and 2,000 feet of hose were added to the equipment, mostly for replacements.

In addition to the paid firemen, who numbered 44 at the close of the year, an average of 18.3 volunteer fire companies were maintained at the several villages, the personnel of which numbered 200 on June 30.

Due to deterioration of the beams and pillars, the interior of the Cristobal central fire station was completely remodeled during the year, at a cost of $22,500.

PUBLIC SCHOOL SYSTEM

Separate public schools for white and colored children are provided in each of the major settlements in the Canal Zone. For white children there are elementary schools in Ancon, Balboa, Pedro Miguel, Paraiso, Gatun, and Cristobal, with high schools at Balboa and Cristobal. The school at Paraiso was opened during the past year, primarily for the instruction of children of Spanish employees of the dredging division. It is conducted by one teacher and has a net enrollment of 29 pupils. For colored children graded schools are operated in La Boca, Red Tank, Paraiso, Las Cascadas, Gamboa, Gatun, and Cristobal. During the past year the white school at Culebra and the colored school at Empire were discontinued on account of the abandonment of the Army camps at Culebra and Empire with the resultant depopulation of the adjacent area. The closing of the white school at Camp Gaillard (Culebra) with 156 pupils, most of whom left the Isthmus on account of the transfer of their parents to other stations, diminished the usual increase in total net enrollment in white schools for the Canal Zone. This net enrollment was 2,585, as compared with 2,577 in the preceding year. This is the first year in the history of the Canal Zone schools in which there has been so slight an increase in net enrollment in either white or colored schools.

In the colored schools there was an increase in net enrollment of 698 pupils. This large increase was due to the employment of 13 additional teachers at the beginning of the year and the placing of additional schoolrooms in service. There are still, however, 1,278 colored children between the ages of 6 and 16 in the Canal Zone for whom there are no facilities, due to lack of funds to provide more rooms and teachers. The need of remedying this situation has been recognized and facilities for colored children are being expanded as rapidly as appropriations will permit. It is hoped that in the near future there will be room in the schools for all of the children of colored employees living in the Canal Zone.

WHITE SCHOOLS

Teachers in the white schools are required to be college graduates for the high schools and normal school graduates for the graded

schools and to have had two years' experience in schools in the United States. At the close of the year 84 teachers were employed in the white schools as compared with 87 at the end of the previous year. At the close of the school year 63 pupils graduated from the Balboa high school and 13 from the Cristobal high school, a total of 76 as compared with 71 in 1927. During the year 15 colleges and universities in the United States agreed to accept graduates of the Canal Zone high schools upon a "certificate" or "accredited" basis. The seventh and eighth grades in the Balboa and Cristobal schools were reorganized in the past year along the lines of junior high schools.

COLORED SCHOOLS

The net enrollment for the year was 3,030 as compared with 2,332 in the fiscal year 1927. The increase was due primarily to the construction of 8 new classrooms at Silver City, Cristobal, and 6 additional rooms at Gatun, and the employment of 13 additional teachers. Manual training, which had been begun in the La Boca school in 1926–27, was introduced into the schools at Silver City and Gatun in the past year. The pupils are supplied with work benches and tools for simple carpentry. The instruction is for the boys in the seventh and eighth grades. The colored schools were operated on the 12 months' basis during the past year, an innovation in Canal Zone schools. The number of colored teachers in the past year was 60 as compared with 47 in the previous year. These teachers are all West Indians. The curriculum does not extend beyond the elementary school grades.

POSTAL SYSTEM

Eleven post offices were in operation at the end of the year, all of which, except Gamboa, were authorized to transact money-order business. No new post offices were opened during the year. The post office at Culebra was closed on September 30, 1927, as the Army post at Camp Gaillard which this office served was abandoned on that date. Service for the few remaining residents on the west side of the canal was afforded by the Pedro Miguel office up to the time of their removal from that area.

Due to the removal from the canal of the large number of troops formerly served by the Culebra post office and the discontinuance of C. O. D. parcel-post service with the United States July 1, 1927, total receipts were slightly smaller than during the preceding year, the total being $181,922.78 during 1928 as compared with $182,589.04 during 1927. Gross receipts exceeded gross expenditures by $1,234.31 as compared with a deficit of $223.25 for the previous year. The returns for 1928 indicate that the service is self-sustaining despite

the fact that a large proportion of all mail handled locally is dispatched under official frank (estimated at 60 per cent), from which the bureau of posts derives no revenue, but for which it must bear the burden of transportation and other charges. If the cost of handling this official matter were charged against the various divisions concerned, the surplus of receipts over expenditures would amount to about $40,000.

The sale of United States postage stamps and postal cards surcharged "Canal Zone" was continued, but stamped envelopes were manufactured by the Panama Canal press. It is proposed to discontinue the use of such surcharged postage stamps eventually and provide a distinctive series of Canal Zone postage stamps and other stamped paper. During the latter part of the year orders were placed for the engraving and printing of two distinctive stamps for this service. The stamps are to be 1 and 2 cent denominations and are to bear the likeness of General Gorgas and General Goethals, respectively.

Deposit money orders, issued without the payment of fee in lieu of postal-savings certificates, had a total value of $659,015. The total amount on deposit at all post offices at the close of the year, including deposit money orders, old postal-savings accounts, and unpaid fee-paid money orders in favor of the remitter was $481,526 as compared with $471,743.10 at the close of the previous fiscal year. Since the system was placed in effect in 1916, the earnings from the money-order account, through interest paid by banks, have exceeded interest paid or payable by $169,079.60 to the close of the fiscal year 1928.

During the year there were 113,485 money orders issued, amounting to $2,412,104.17, on which fees amounting to $10,522.91 were collected. Payments amounting to $1,081,599.59 were made on 37,929 money orders during the year.

In the registry division of the post offices, 234,858 letters and parcels were handled, of which 40,504 were official mail under frank and accepted for registration without fee.

During the fiscal year, a total of 3,876 dispatches of mail were made to United States and various foreign exchange post offices by the office at Cristobal and 4,437 foreign dispatches were received. At Balboa, 1,785 dispatches were made to United States and foreign countries and 1,020 dispatches were received from foreign offices.

The routing of mail to and from the United States via Key West and Habana continues to show gratifying results. On account of the increase in the number of letters mailed locally for conveyance by the United States air-mail routes, special dispatches were made to New Orleans to connect with the air routes from Pilottown to New Orleans and thence with the New Orleans-New York air-mail route.

When the route is established to Miami and Key West, special air-mail sacks will be made up and routed via Habana. A supply of stamped envelopes was printed during the year for use in connection with air-mail letters and have proven popular with post-office patrons. It is expected that the proposed air-mail route to Panama from Key West, via Habana and certain Central American ports, will be placed in operation during the coming year.

CUSTOMS

Vessels entering and clearing Canal Zone terminal ports numbered 14,323 and 14,327, respectively, as compared with 12,497 entered and 12,506 cleared during the previous fiscal year, an increase of nearly 15 per cent.

All merchandise discharged at Cristobal and Balboa, destined to persons or firms in the Republic of Panama not connected with the Panama Canal, the Panama Railroad Co., or the United States Army or Navy, is in the custody of the Canal Zone customs until submission of the necessary papers from Panaman officials showing that duty has been paid. Permits for 9,663 releases were granted at the customhouse at Cristobal during the year, and 401 releases were authorized at the customhouse at Balboa. Free-entry requests numbering 3,652 were approved for employees of the Panama Canal, the Panama Railroad Co., and members of the United States Army and Navy who have the privilege of importing articles for their personal use without payment of duty.

Customs duty was paid to the Republic of Panama in the amount of $114,317.65 on 33,395 mail parcels containing dutiable articles imported through the Canal Zone post offices.

No arrests were made for violations of the customs regulations during the year, but numerous attempts to smuggle small quantities of merchandise of various classes were frustrated, and such merchandise was confiscated and delivered to the proper authorities of the Republic of Panama.

Three arrests were made by police and customs officers during the year for alleged violations of the narcotic drug act. Conviction was secured in one case and the offender was sentenced to hard labor for five years in the Canal Zone penitentiary.

In order to facilitate the discharge of passengers from vessels arriving after the usual working hours, special customs service was furnished to 274 vessels at Balboa and 509 at Cristobal, 783 in all. Fees totaling $6,235 were collected for this special service.

SHIPPING COMMISSIONER—SEAMEN

The shipping commissioner and his deputies have the same powers with respect to American seamen as shipping commissioners in the United States and American consuls in foreign ports. During the year 2,452 seamen were shipped on American vessels and 2,293 discharged at Canal Zone ports. There were 142 American seamen lodged and subsisted at the expense of the United States Government. Sick or destitute seamen returned to the United States under the appropriation for the relief of destitute American seamen numbered 160, and 101 were signed on vessels as seamen or workaways and returned to the United States without expense to the Government.

The wages earned by seamen discharged at Canal Zone ports aggregated $79,018.14; the total approved for deductions on account of advances, allotments, fines, slop-chest account, etc., was $19,595.52, and the balance of $59,422.62 was either paid to the seamen under the supervision of the deputy shipping commissioners or received on deposit for their account. The wages and effects of 10 American seamen who died in Canal Zone hospitals, or who died at sea and were brought to the Canal Zone for interment, were handled by the shipping commissioner.

PROHIBITED ALIENS

Chinese passengers arriving at Canal Zone ports during the fiscal year 1928 numbered 531, in addition to four on hand July 1, 1927, making a total of 535 in transit to the Republic of Pamama and other countries. Of this number, 228 were admitted to the Republic of Panama by authority of that Government, and the others, with the exception of four awaiting transportation at the end of the year, either proceeded on their journeys or were returned to the ports of embarkation.

Chinese crews were checked on arrival and again on the vessel's departure, to insure that no illegal landings were made. The crews of 853 vessels were so checked during the year as compared with 602 during the previous year.

ADMINISTRATION OF ESTATES

The estates of 92 deceased or insane employees of the Panama Canal and Panama Railroad Co. were settled during the year and there were 15 estates in course of administration on June 30, 1928, in addition to 26 that were being investigated in which no money or property had been received.

LICENSES AND TAXES

Licenses issued for motor vehicles, bicycles, animal-drawn vehicles, permits for the peddling of foodstuffs, the vending of merchandise, etc., numbered 7,419 during the year and the total fees collected aggregated $36,875.89. Automobiles accounted for 5,458 of the licenses and $32,305.89 of the fees, an increase of 480 licenses and $2,275.10 in fees for them.

IMMIGRATION VISAS

During the year ended June 30, 1928, a total of 49 visas were issued to alien residents of the Canal Zone going to the United States. Of these, 21 were quota, 20 nonquota, and 8 nonimmigrant visas. One application for a visa was refused on account of the applicant being diseased. Fees collected for visas amounted to $490.

RELATIONS WITH PANAMA

Matters handled between the government of the Canal Zone and that of the Republic of Panama related to aid in designing a water system for Bocas del Toro, sales of Panama Railroad property in Panama City, concession of lands at Taboga and Taboguilla, reciprocal agreements as to automobile licenses, attachment of property in the Canal Zone, reception of Colonel Lindbergh in January, deportation of undesirables, passport inspection procedure, increase in water rates, complimentary transportation on the Panama Railroad, estimates on municipal improvements, condition of patients maintained by Panama at Palo Seco Leper Colony and Corozal Hospital for the insane, maintenance of certain aids to navigation, charge accounts at commissionaries for diplomats, sanitation, and other matters principally of local interest.

The matter of a new treaty between the United States and Panama, embracing a revision of existing agreements between the two Governments, remained in abeyance during the past fiscal year.

SECTION IV

ADMINISTRATION

CHANGES IN ORGANIZATION AND PERSONNEL

There were no changes in the organization of the Panama Canal during the fiscal year 1928.

Capt. Clark H. Woodward, United States Navy, was appointed marine superintendent, effective May 16, 1928, relieving Capt. John Downes, United States Navy.

Commander Isaac C. Kidd, United States Navy, was appointed captain of the port, Cristobal, effective July 17, 1927, relieving Commander Walter F. Jacobs, United States Navy.

Commander Sherwood A. Taffinder, United States Navy, was appointed captain of the port, Balboa, effective December 21, 1927, relieving Commander Elmer W. Tod, United States Navy.

Mr. John T. Barrett was appointed marshal of the Canal Zone on July 6, 1927, vice Mr. Irvin M. Lieser. Mr. Barrett qualified for office on July 16, 1927.

Mr. Charles J. Riley was appointed district attorney February 17, 1928, vice Mr. Francis E. Mitchell.

FORCE EMPLOYED

The force employed by the Panama Canal and the Panama Railroad Co. on the Isthmus increased from 13,403 in June, 1927, to 13,922 in June, 1928, an addition of 519, or 3.87 per cent. The following tabulation shows the distribution of the personnel on the third Wednesday in June of both years. The increase in gold, or American personnel, comprising the supervisory, technical, higher clerical, and highly skilled mechanical force, was 102; and that of the silver, or

alien employees, was 417. The precentages of increase were 3.47 and 3.98, respectively:

Department	June 15, 1927			June 20, 1928		
	Gold	Silver	Total	Gold	Silver	Total
Operation and maintenance:						
Office	37	40	77	41	39	80
Electrical	142	180	322	153	183	336
Municipal engineering	78	803	881	81	696	777
Lock operation	211	606	817	226	707	933
Dredging	182	898	1,080	185	876	1,061
Mechanical	442	794	1,236	416	834	1,250
Marine	196	596	792	211	701	912
Fortifications	14	35	49	26	275	301
Supply department:						
Quartermaster	187	1,716	1,903	197	1,744	1,941
Subsistence	7	97	104	8	105	113
Commissary	203	1,056	1,259	216	1,133	1,349
Cattle industry	7	127	134	5	131	136
Hotel Washington	8	95	103	8	94	102
Transportation	46	208	254	54	208	262
Accounting department	200	8	208	193	8	201
Health department	240	784	1,024	272	873	1,145
Executive department	490	279	769	497	297	794
Panama Railroad:						
Superintendent	48	234	282	50	294	344
Transportation	64	113	177	66	120	186
Receiving and forwarding agent	86	1,588	1,674	84	1,327	1,411
Coaling stations	48	210	258	49	239	288
Total	2,936	10,467	13,403	3,038	10,884	13,922

The larger number of employees on the rolls of some of the divisions at the end of the fiscal year as compared with June, 1927, was due to increased construction work in some divisions and to increased business in others. Explanations of the larger increases on the gold roll are given below:

OPERATION AND MAINTENANCE, OFFICE

The increase by four positions is due to increased building construction and work on the Alhajuela Dam project. This larger force will probably be needed for a considerable length of time.

ELECTRICAL DIVISION

Increase is due to vacation relief and additional work; most of it is temporary.

MUNICIPAL ENGINEERING

The increase of three positions is due to increased construction work and employment of an apprentice.

LOCK OPERATION

The increase is due to employment of additional operators on account of increased traffic and is probably permanent.

DREDGING DIVISION

One additional temporary position is to take care of vacation relief and one is on account of supervision of the construction of a new dredge in the United States. One permanent gold-roll increase is due to transfer of a silver watchman to the gold roll.

MARINE DIVISION

The increase is due to increased traffic through the canal and is probably permanent.

FORTIFICATIONS DIVISION

The force in this division fluctuates with the funds available. The appropriations for the fiscal year 1929 indicate the retention of the present organization.

SUPPLY DEPARTMENT

Increase is due to increased construction work and increased business. There is no present prospect of a decrease in force.

HEALTH DEPARTMENT

Due largely to increased number of patients at Gorgas Hospital and appears permanent.

EXECUTIVE DEPARTMENT

Due to increased patronage of the library, one clerk, and to increased number of pupils of school age, six teachers. Both permanent.

PANAMA RAILROAD

The increase is due to vacation relief and to increased construction work, and is temporary.

WAGE ADJUSTMENTS

GOLD EMPLOYEES

Since the effective date of the Panama Canal act establishing conditions for the operation and maintenance of the canal it has been the policy to pay gold employees not more than 25 cer cent over the compensation for similar employment in the United States, and to pay them the full 25 per cent within the limitations of appropriations and within local limitations on account of coordination. During years past, owing to insufficient appropriations, it has not been possible to pay the full 25 per cent increment to a number of employees of the civil government. During the past year these employees were paid approximately 19 per cent over United States

rates as compared with 16 per cent in the previous year. Arrangements have been made to pay them approximately 22 per cent over United States rates during the fiscal year 1929.

The most important wage adjustment made during the past year was completed at the end of the year, to be effective with the beginning of the new fiscal year. This was a revision of canal rates affecting approximately 1,200 gold employees, in consequence of the readjustment of rates in Washington as the result of the Welch law of May 28, 1928, amending the earlier classification act.

The more important of the other changes in rates of pay made during the past fiscal year were those of employees in mechanical trades based on the annual adjustment in the navy yards of the United States effective January 1; the bimonthly adjustments of rates for building-trades craftmen engaged on construction work; and adjustments of rates for Panama Railroad transportation employees, following changes in rates paid on railroads in the United States.

The wage board, consisting of the assistant engineer of maintenance and a representative selected by the organizations of employees, held 20 meetings during the year.

The salary board, composed of the heads of the nine major departments and divisions of the Panama Canal and Panama Railroad, held a number of meetings in December and June. Both boards function merely in an advisory capacity to the governor, who is charged with the fixing of all rates of pay. During the year their respective spheres were defined, and classes of employees were allotted to each board.

ALIEN EMPLOYEES ON THE SILVER ROLL

The board on silver rates of pay, consisting of the heads of 17 departments and divisions of the Panama Canal and Panama Railroad, held meetings in November and May. As with the boards on gold rates of pay, this board acts in an advisory capacity to the governor.

There was no change in the basic rate of 20 cents per hour for unskilled labor, but effective January 1, 1928, administrative advances for silver employees were made possible by the establishment of additional rates in the schedule, as follows:

(*a*) Hourly rates 1 cent per hour in excess of those already in the schedule, up to 30 cents, with additional rates of 32 and 34 cents per hour for artisans and an addition of 1 cent per hour to the rates for foreman at the receiving and forwarding agency and coaling plant only.

(*b*) Monthly rates $2.50 per month in excess of those already in the schedule up to $77.50 per month, with $80 remaining the maximum.

In all cases the previous rates in the silver-roll schedule were continued in effect; no promotions were made on account of the abolition of rates.

Under Executive orders, the maximum rates allowed for alien employees have been $80 per month or 40 cents an hour. Exception to this is made by an Executive order signed September 14, 1927, which permits not to exceed 100 alien employees of the Panama Canal and Panama Railroad to be paid more than the established maximum but with the same leave and other privileges, and no more, as are accorded alien employees whose pay does not exceed this limit. This allows the administration to accord some recognition to efficiency and long service to the alien employees, many of whom are capable and deserving. To the end of the fiscal year 96 of the 100 positions allowed had been allocated.

The average rates paid to alien employees as of April 1, 1928, when the last general survey was made, as compared with preceding years, were as follows:

	Average earnings			Average earnings	
	Monthly employees	Hourly employees		Monthly employees	Hourly employees
	Per month	*Per hour*		*Per month*	*Per hour*
Nov. 1, 1923	$55.27	$0.2312	Nov. 1, 1926	$55.40	$0.2395
Nov. 1, 1924	54.74	.2323	Oct. 1, 1927	54.88	.2411
Nov. 1, 1925	55.28	.2385	Apr. 1, 1928	56.17	.2417

During the four years and five months covered by the foregoing table there have been increases of 90 cents per month in the average pay of alien employees on a monthly basis and slightly over 1 cent per hour in that of those on an hourly basis. During this same period the index of the cost of living, based on weighted prices in the commissary stores, with July, 1914, as 100, declined from 146.69 as of October 1, 1923, to 133.09 as of April 1, 1928.

COMPLAINTS BOARD

This board was organized in July, 1920, and called the grievance board; the name was changed in May, 1927, to the complaints board. It is composed of the assistant engineer of maintenance, the head of the department or division in which the specific complaint originates, and two representatives of the employees who are nominated by the central body of the employees' associations and approved by the

governor Two cases were handled by this board during the year as compared with three in the fiscal year 1927 and six in 1926. The small number of cases brought before this board is considered indicative of the generally satisfactory conditions of employment that exist under the Panama Canal and Panama Railroad.

RECRUITING AND TURNOVER OF FORCE

GOLD EMPLOYEES

The number of persons above the grade of laborer tendered employment through the Washington office of the Panama Canal during the year was 455 of whom 210 accepted and were appointed, covering 53 different kinds of positions. Acceptances and appointments were 46.1 per cent of the tenders. In the previous year the tenders numbered 495 and appointments 261, making the percentage of acceptances 52.7, and in the fiscal year 1926 the corresponding figures were 401 and 167, percentage 41.6. In addition to the 210 employments in the United States there were 344 employments on the Isthmus, making a total addition to the gold roll during the year of 554. Separations numbered 394, of which 12 were due to retirement. Based on a force of 2,936 gold employees at the beginning of the year, 394 separations make a turnover of 13.4 per cent from all causes as compared with 17.6 per cent during the previous year.

When an additional employee is needed efforts are made to fill the position by promotion from the force already employed or by transfer to it of an employee whose work in another department is about to terminate. This tends to reduce employments of people unused to Canal Zone conditions, to reduce recruiting costs, and to give the organization the benefit of the accrued experience in local conditions of the employee. It has a further value in strengthening the morale of the force through giving the employees a reasonable expectation of continued employment as long as their services are satisfactory, which builds up loyalty to the canal. Of the 344 gold-roll employments made locally during the past year, 152 were reemployments.

Two thousand five hundred and fifty-six persons (2,393 from New York, 102 from New Orleans, and 61 from Pacific coast ports), including new appointees, those returning from leave of absence and members of employees' families, were provided transportation from the United States to the Isthmus. In addition considerable correspondence was conducted by the Washington office in answering inquiries in connection with applications for employment and the issuance of appointments, etc., as well as in connection with the gathering of wage data.

SILVER EMPLOYEES

No figures are available concerning the number of separations and employments among the alien personnel composing the silver roll, but no difficulty was experienced in maintaining an adequate force, and the percentage of turnover was low for this class of labor.

PUBLIC AMUSEMENTS AND RECREATION

Operation of 10 clubhouses in canal towns for the benefit of employees and their families was continued through the year. Five of the houses are for gold or white employees and five for the colored employees. They provide moving pictures, bowling, pool, reading rooms, and limited refreshment and restaurant service, and are centers for community entertainments and athletic enterprises. They are open daily from 7 a. m. to 11 p. m.

Games and kindergarten work were provided for children from 3 to 6 years old at the playgrounds. The playgrounds were also used by the school children outside of school hours and during the summer vacation, and baseball, soccer ball, basket ball, volley ball, and indoor-baseball leagues were organized. Gymnasium classes were held for high-school students as well as mixed classes for adults during the evening. The swimming pools at Balboa, Pedro Miguel, and the Hotel Washington continued popular and swimming, diving, life-saving, and physical-development exercises were taught. Swimming meets for children and adults were arranged at intervals.

Literary clubs, talks on education, health, and other subjects helpful to children as well as adults form an important part in the community welfare work carried on at the clubhouses for colored employees. On one or more nights weekly there are meetings of classes in which shorthand, typewriting, and grade subjects are taught; and classes are conducted in cooking, baking, and sewing for girls.

Most of the present clubhouses are old, in bad condition, and extensive repairs are needed to keep them in usable condition. New buildings are needed at Ancon and Balboa and a new clubhouse and athletic and baseball field at New Cristobal. The baseball field at the Atlantic end has been located in Colon and is soon to be taken over for the erection of buildings. It is important that other grounds be provided.

Some of the clubhouse activities are carried on at a profit; others are not self-sustaining, and the deficit resulting therefrom is made up from appropriations. The justification for their continuance is that they add materially to the morale of the organization and to the physical and moral health of the community. Clubhouse finances for the fiscal year are taken up in the section on business operations.

PURCHASES AND SALES IN THE UNITED STATES

The principal purchases of supplies were made by the Washington office of the Panama Canal as in previous years. Branch offices in charge of assistant purchasing agents were continued at New York, New Orleans, and San Francisco, and the personnel at these offices also acted as receiving and forwarding agents for materials forwarded to the Isthmus from their respective ports.

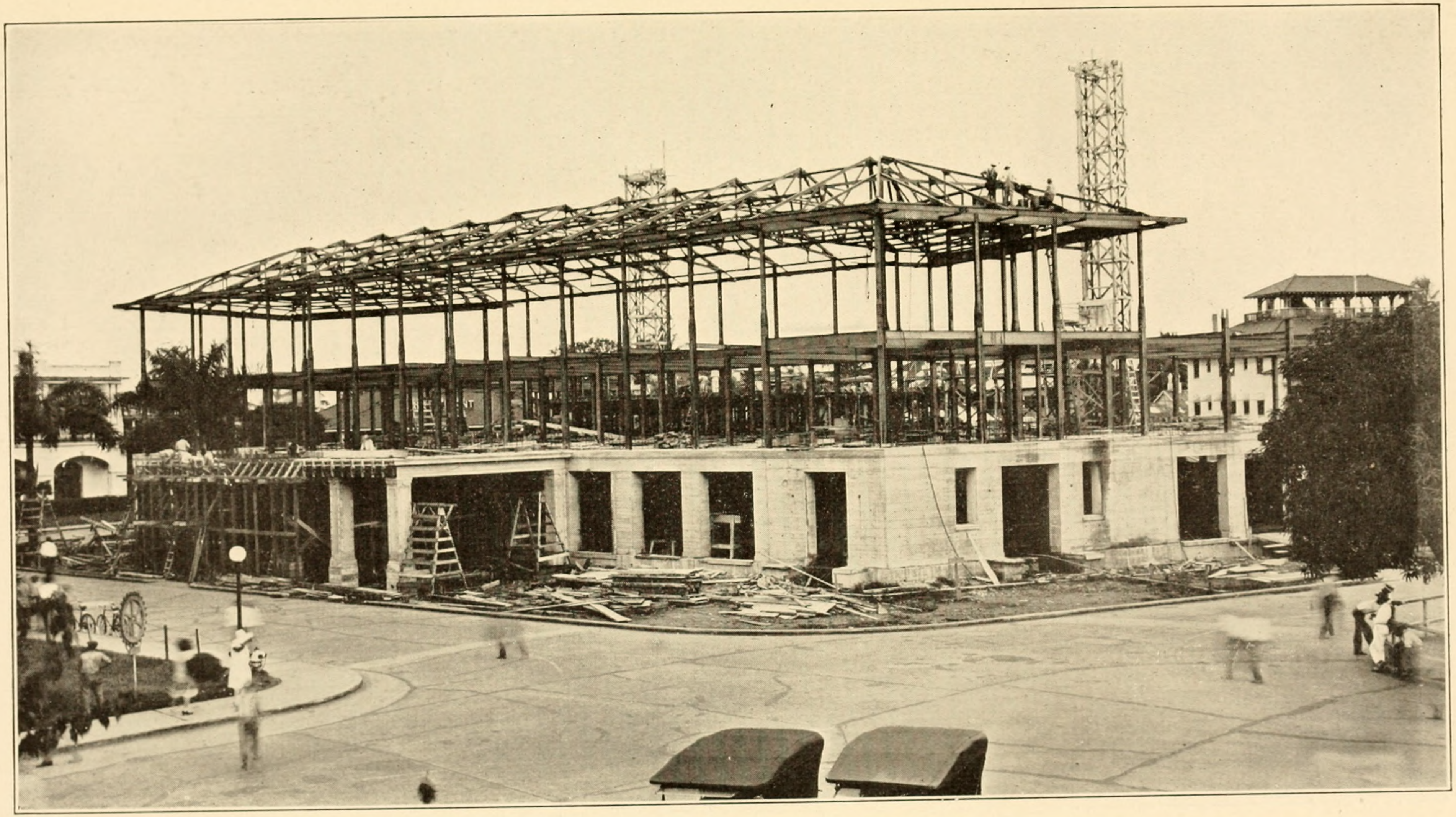
The principal medical and hospital supplies were purchased through the medical section, New York general intermediate depot, United States Army, Brooklyn, as in the past.

The number of orders placed for supplies during the fiscal year was 7,764 as compared with 7,693 for the preceding fiscal year. More orders were placed during the fiscal year 1928 than during any fiscal year since 1904, except 1915, 1916, 1917, and 1920. The force handling this work was not increased and considerable overtime was worked. The total value of orders placed during the year was $4,769,893.30 as compared with $5,676,669.58 during the fiscal year 1927, a decrease of $906,776.28 in value. The decrease in value during 1928 in the face of an increase in number is due to the fact that three large contracts aggregating $1,314,763.36 were placed during 1927 while no such large contracts were made during 1928. The grand total for the purchase of materials and supplies by orders placed in the United States by and under the direction of the Washington office since 1904 is $199,143,914.98.

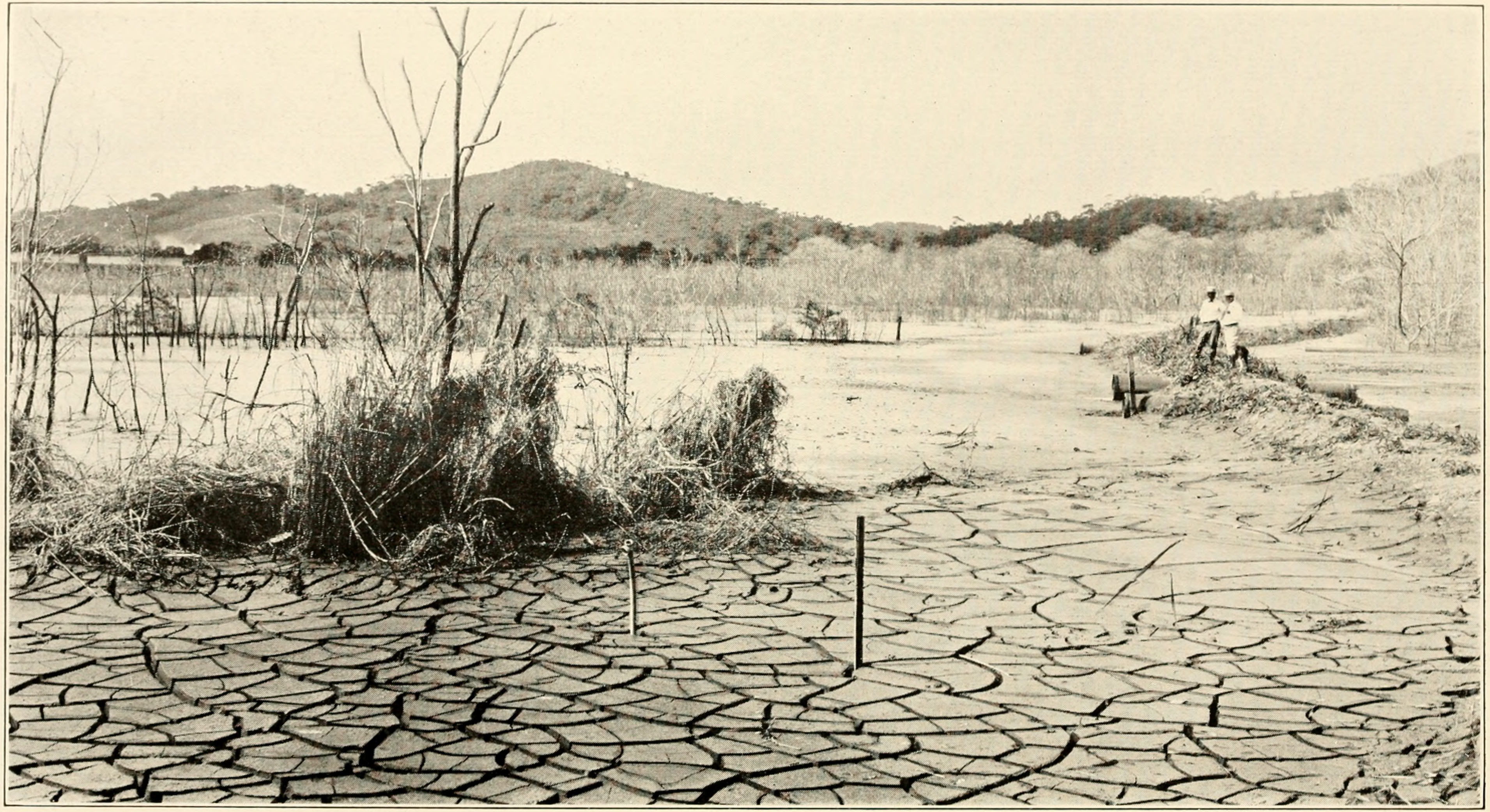
During the fiscal year 1928, 68 contracts were prepared amounting to $2,035,952.84, as compared with 54 contracts and $3,020,357.07 in value during the year preceding, an increase in number of 14 and a decrease in value of $984,404.23.

The sale of surplus canal material by the purchasing department in Washington during the fiscal year amounted to $16,418.18, as compared with $60,031.52 during the preceding fiscal year.

In representing the Panama Canal in the United States, the Washington office handled extensive correspondence and maintained representation on various Government boards and coordinating committees, in addition to contacts with other governmental departments and business interests with reference to canal activities.



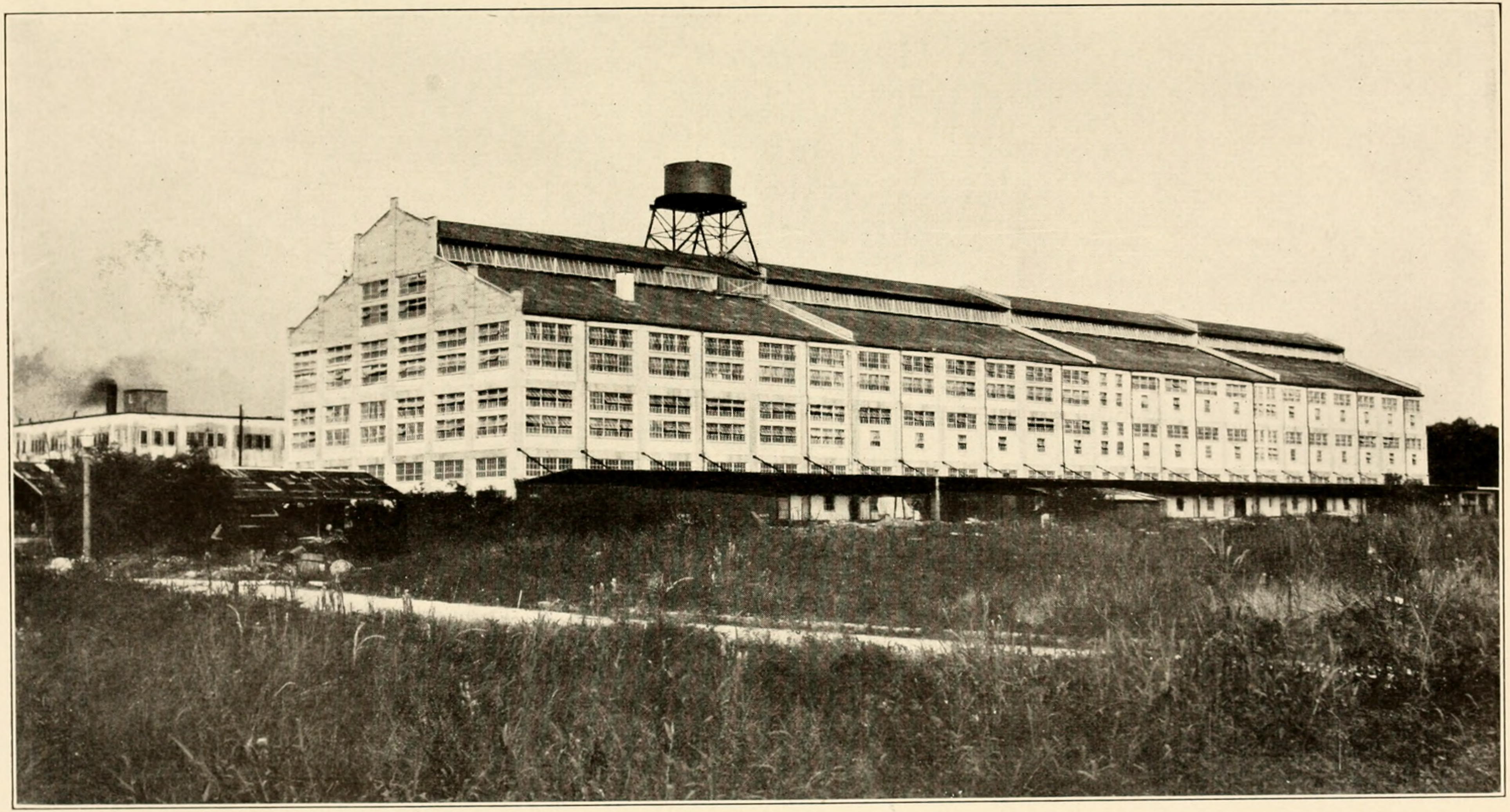
ADMINISTRATION BUILDING AT CRISTOBAL



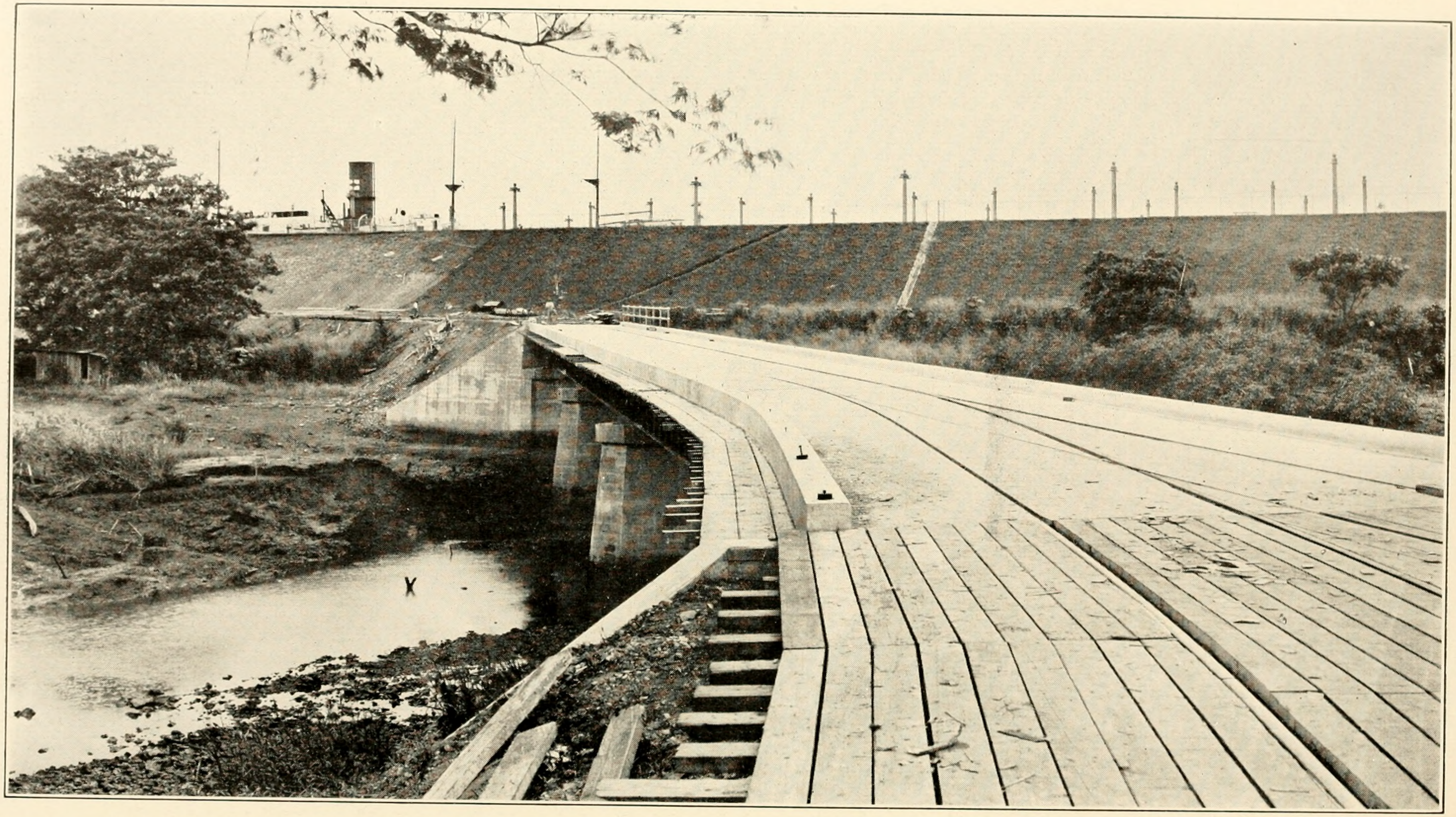
DREDGING DIVISION ACTIVITIES. VIEW OF DUMP AREA IN SWAMP RECLAMATION NEAR COROZAL

NEW BUILDINGS AT COROZAL HOSPITAL FOR THE INSANE

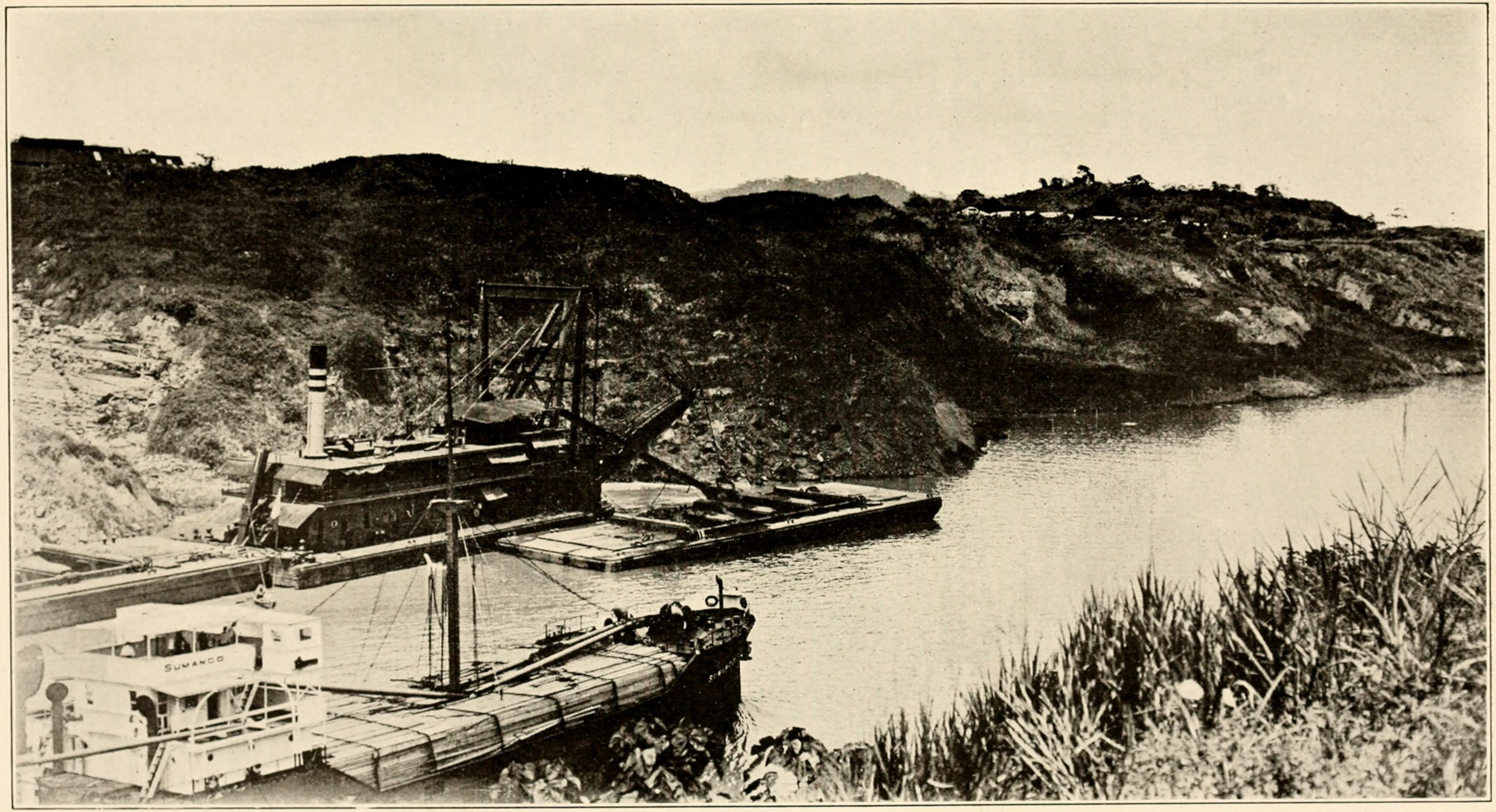
THE "CHAGRES," ONE OF TWO DIESEL ELECTRIC TUGS BUILT AT BALBOA SHOPS, CANAL ZONE



WHOLESALE WAREHOUSE OF COMMISSARY DIVISION, MOUNT HOPE



RAILWAY AND HIGHWAY BRIDGE AT MIRAFLORES LOCKS, OVER DISCHARGE CHANNEL MIRAFLORES LAKE SPILLWAY



IMPROVEMENT PROJECT NO. 2. WIDENING GAILLARD CUT. VIEW LOOKING WEST FROM STATION I, EAST BANK SHOWING DREDGE WORKING ON SOUTH SHOULDER

SECTION V

FINANCIAL AND STATISTICAL STATEMENTS

Various financial statements with reference to the Panama Canal and three tables relative to the traffic through the canal are presented on the following pages. The financial statements are abstracted from the annual report of the accounting department and the traffic tables were compiled by the bureau of statistics.

The following is a list of all of the tables contained in the annual report of the accounting department and of the three traffic tables. Tables Nos. 6, 10, 27, 32, and 34, 37 to 41, inclusive, and 43 to 57 inclusive, in the accounting department report are not published because they are concerned with details of operation which lack general interest; as noted under "Appendixes not Printed," page VI, the complete report for the accounting department may be consulted at the Washington office of the Panama Canal or at the office of the governor. For purposes of reference, however, the numbers given these tables are preserved below and all of them are listed.

Following this list is a series of notes of explanation of the financial tables. These notes explain both the published and unpublished tables. Following the notes are the tables, with the exception of those the omission of which is noted above.

The complete list of tables is as follows:

Table No.

1. General balance sheet.
2. Summary of expenses and revenues.
3. Balances in appropriation and fund accounting.
4. Appropriations by congress.
5. Cash receipts and disbursements for account of the United States.
6. Payments made by the paymaster.[1]
7. Receipts and disbursements by collector of Canal Zone funds.
8. Collections repaid to appropriations and to individuals and companies.
9. Collector's special-deposit account.
10. Audited pay rolls.[1]
11. Accounts receivable registered.
12. Comparative statement of accounts receivable outstanding June 30, 1928.
13. Comparative statement of accounts payable.
14. Defense capital expenditures.
15. Canal fixed property.
16. Canal equipment.
17. Business property by divisions.
18. Business fixed property.

---

[1] Omitted from publication; see notes on following pages.

Table No.
19. Business equipment.
20. Status of public works, Panama and Colon.
21. Canal material and supplies on hand.
22. Material and supplies received, issued, and sold.
23. Canal earnings, expenses, and net expenses.
24. Canal revenues.
25. Business expenses, revenues, and profit and loss.
26. Comparison of expenses, revenues, and surplus to date.
27. Pay-roll deduction from employees for rent, etc.[1]
28. Replacement reserves.
29. Repair reserves.
30. Gratuity reserves.
31. Cost of production and distribution of electric current.
32. Cost of production of water per 1,000 gallons.[1]
33. Dredging operations (channel maintenance).
34. Money orders issued and paid by the Canal Zone and money orders paid by other administrations, 1907 to 1928, inclusive.[1]
35. Postal service, monthly money-order business of the Canal Zone postal service.
36. Postal service, postal revenues, 1907 to 1928, inclusive.
37. Postal service, postal-savings payments and deposit money-order transactions.[1]
38. Income and expenditures, clubs and playgrounds.[1]
39. Balance sheet, clubs and playgrounds.[1]
40. Commissary coupons issued, sold, and honored.[1]
41. Injury payments made during the period August, 1908, to June 30, 1928.[1]
42. Deaths and injuries on the Panama Canal and Panama Railroad Co. and expenditures for account of the United States Employees' Compensation Commission.
43. Cost of commissary supplies purchased and sold.[1]
44. Collections from other than employees.[1]
45. Collections, Panama Railroad land rents.[1]
46. Silver quarters statistics.[1]
47. Panama Canal accounts payable vouchers registered.[1]
48. Panama Railroad accounts payable vouchers registered.[1]
49. Employees' bonds.[1]
50. Report of the accounting bureau (general and cost accounts).[1]
51. Report of the pay-roll section (claims bureau).[1]
52. Report of the claim officer personal injury claim.[1]
53. Report of the claim clerk freight and cargo claim.[1]
54. Report of rent and other collections from silver employees.[1]
55. Report of the general inspection bureau.[1]
56. Report of the time inspection bureau.[1]
57. Report of the property inspection bureau.[1]
58. Origin and destination of cargo passing through the canal, fiscal year 1928, Atlantic to Pacific.
59. Origin and destination of cargo passing through the canal, fiscal year 1928, Pacific to Atlantic.
60. Statement showing by nationality the number of transits of vessels, aggregate Panama Canal net tonnage, tolls assessed, and tons of cargo carried through the Panama Canal by fiscal years from the opening of the canal, August 15, 1914, to June 30, 1928.

[1] Omitted from publication; see notes on following pages.

EXPLANATION OF FINANCIAL AND STATISTICAL STATEMENTS

A brief explanation of tables numbered 1 to 60 follows:

Table No. 1—General balance sheet.—No change was made in the general accounts during the past year. The debit and credit items are analyzed and explained in subsequent tables.

Table No. 2—Summary of revenues and expenses.—This table shows a comparison for the fiscal years 1927 and 1928, of the net results of operation of both transit and business units. The canal transit surplus for 1928 amounts to $18,224,844.86, which is $10,881,070.47 in excess of the fixed capital charge. The net revenue from business operations amounts to $736,719.43, which is $45,144.72 less than the fixed capital charge. This deficit is explained under Table No. 25. The combined operations show a net revenue or surplus of $18,961,-564.29, or $10,835,925.75 in excess of the fixed capital charge on the total commercial investment in the Panama Canal.

Table No. 3—Appropriation and fund accounting.—This table shows the balance of appropriated and available funds in the United States Treasury and in the hands of the Panama Canal fiscal officers as of June 30, 1928. The fiscal officers (i. e., the disbursing clerk in Washington, and the paymaster and collector on the Isthmus) had cash on hand amounting to $2,147,093.68, as compared with $1,983,-725.21 at the end of the previous fiscal year. The paymaster's cash balance was $1,189,193.23, compared with $968,406.01 the previous year, an increase of $220,787.22. Taking the miscellaneous receipts and trust funds out leaves a working cash balance in the hands of the fiscal officers of $1,485,848.28.

The balance available for expenditure after providing for direct liabilities, obligations, and reserves, is $1,246,191.72, the greater part of which is allotted and obligated for expenditure during the fiscal year 1929 on projects not completed at the end of the fiscal year.

The amount shown under the heading of work in process and suspense represents the expenditures which have been made but which have not been charged off or set up in the capital account on the books. The credit items under this heading payable from sanitation and civil government funds represent reserves for items obligated for the fiscal year 1929. The $4,069,876.69 under the heading of general ledger reserves is made up of the reserves for replacement, extraordinary repairs, gratuity, and contingencies shown in the general balance sheet, Table No. 1.

From the balance available June 30, 1928, the sum of $680,915.84 representing the profits on business operations during the fiscal year 1928, is immediately transferrable to miscellaneous receipts.

Table No. 4—Appropriations by Congress.—There has been no change in the appropriations for canal construction. The various acts are shown in detail in Table No. 3 of the annual report for 1924.

The status of the authorized bond issue, showing the amount appropriated and the balance available for appropriation within the limit of the cost of the canal and the authorized bond issue, is shown at the end of this table.

The total amount appropriated to date for the annual payments to the Republic of Panama for the use of the Canal Zone, is $4,250,000.

The total amount appropriated for the operation and maintenance, sanitation, and civil government of the Panama Canal and Canal Zone, to June 30, 1928, is $104,515,081.88. From this amount there has been returned to the surplus fund in the United States Treasury, $7,754.98. This leaves $104,507,326.90 expended or available for expenditure.

The appropriations for the fiscal year 1929, not included in the above figures, are as follows:

Maintenance and operation	$6, 832, 000
Sanitation	670, 000
Civil government	1, 158, 000
Codification of Canal Zone laws	10, 000
Total	8, 670, 000

In addition to this, there is obligated for expenditure during 1929 an unexpended balance of $190,000.00 brought forward from the fiscal year 1927, and $400,000 from the reserve funds.

Table No. 5—Cash disbursements and receipts.—The Treasurer of the United States advanced to the fiscal officers of the Panama Canal during the fiscal year 1928 the sum of $10,069,000 and disbursed directly from the Treasury, $296,757.57, a total disbursement of $10,365,757.57. Against this amount, the fiscal officers of the Panama Canal remitted to the Treasury the sum of $174,795.41, and direct collections by the Treasurer amounted to $326,540.07, a total of $501,335.48, resulting in a net withdrawal from the United States Treasury of appropriated funds amounting to $9,864,422.09, as compared with $6,816,980.98 withdrawn the previous fiscal year. This difference is accounted for by the fact that the paymaster's withdrawals were approximately $1,000,000 below normal in 1927, and that capital additions and replacements were about $1,000,000 greater in 1928 than in 1927. The balance of approximately $1,000,000 is covered by increase in working capital assets (cash, accounts receivable, and storehouse stock) and reduction of current indebtedness.

The sum of $820,669.15 was transferred from the appropriation for maintenance and operation, to miscellaneous receipts in the United States Treasury, covering the business profits for the fiscal year 1927.

Table No. 6—Disbursements by the paymaster.—Disbursements to the amount of $21,577,702.76 were made during the year by the paymaster. Of this amount, the sum of $8,235,817.39 was for the account

of the Panama Railroad Co. Employees on the gold rolls were paid $7,124,765.30 and those on the silver rolls, $4,735,113.96. The amount of $1,482,006.11 was paid on miscellaneous vouchers.

Collections on the pay rolls amounted to $4,566,739.54. Of this amount the sum of $3,337,363.13 was collected for commissary coupon books, the remainder for miscellaneous items. Of the total collections, the sum of $3,769,723.49 was disbursed by the paymaster, the balance, $797,016.05, being transferred to the collector's accounts.

The Chase National Bank of New York, Panama branch, was continued as a Government depositary, and the National City Bank of New York, Panama branch, was continued as a depositary for the Panama Railroad Co. on the Isthmus. During the year the sum of $9,519,720, Panama Railroad funds, was transferred to the Treasurer, New York. This sum includes $1,819,720 cash transfer, of which $1,090,000 was mutilated currency. Approximately $350,000 in new currency was put in circulation by the paymaster during the year. The paymaster requisitioned $3,515,000 from the Treasurer of the United States. Of this amount, $365,000 was sent to the Isthmus in cash. The cash situation as a whole continued satisfactory. A shortage of American change was apparent during the year, and was relieved by imports of the paymaster. The gold reserve increased slightly to approximately $400,000.

Tables Nos. 7, 8, and 9—Receipts and disbursements by the collector.—The miscellaneous receipts collections amounted to $27,303,416.98, of which $26,943,513.11 was for tolls and the balance for postal receipts, taxes, fees, fines, etc., and amortization and interest on the investment in public works in the cities of Panama and Colon. Collections repaid to appropriations amounted to $10,018,771.37. The amount handled through the collector's security deposit accounts totaled $34,321,796.63, as shown in Table No. 5. In addition to these amounts, the collector handled independent funds consisting of clubhouse funds, trust funds, postal-savings funds, money-order funds, interest, and Treasury savings certificates as shown in Table No. 7, amounting to $1,810,601.42. Collections for account of the Panama Railroad Co., not appearing in these tables, amounted to $16,428,502.34, making a total cash turnover, exclusive of the security deposit funds, of approximately $55,500,000.

Table No. 10—Salaries and wages.—The amount of money earned by the Panama Canal employees during the fiscal year 1928 was $11,899,168. Of this amount, $7,138,126.91 was earned by gold employees, and $4,761,041.09 by employees on the silver rolls. The total pay roll for the fiscal year 1927 was $11,412,461.30. Of the amount paid for salaries and wages during the fiscal year 1928, $10,027,450.09 was payable from the appropriation for maintenance and operation; $941,999.63 from the sanitation appropriation; and

$929,718.28 from the appropriation for civil government. These figures include the employees of the business divisions, the outlay for which is collected back and repaid to the appropriation.

Table No. 11—Accounts receivable.—The number of bills registered during the year was 45,695, covering $35,471,785.67, compared with 41,009 bills and $32,044,990.24 during the fiscal year 1927, an increase of 4,686 bills covering $3,426,795.43. The total amount of tolls bills registered was $26,945,609.11, which is $2,715,543.82 more than last year.

Table No. 12—Comparative statement of accounts receivable.—The uncollected bills at the end of the fiscal year 1928 amounted to $814,913.51, compared with $651,660.10 the previous year.

Table No. 13—Comparative statement of accounts payable.—Vouchers payable at the end of the fiscal year amounted to $1,629,927.83, compared with $1,632,376.04 for the previous year. The unpaid vouchers exceeded the uncollected accounts receivable by $815,014.32.

Table No. 14—National defense expenditures.—This table has been changed to show only the total charges to this account at the beginning of the year (for detail see Table 14, Annual Report for 1927) and the current year transactions. It was increased during the fiscal year by $4,444.92, covering the completion of protective fences around the locks, the total cost of which amounted to $64,605.15. The total amount now charged to national defense in order to write down the cost of the Panama Canal to a fair commercial value, as directed by the Secretary of War in a letter to the governor dated October 18, 1921, is $113,127,337.75.

Table No. 15—Canal fixed property.—The book value of the fixed property used in connection with the transiting of vessels as of June 30, 1928, amounts to $237,074,172.38. Additional property was set up in the capital account during the year amounting to $423,043.31, and property valued at $23,772 was withdrawn. Two additional towing locomotives were placed in service at a cost of $82,352.26. Additional expenditures were made in connection with the proposed Alhajuela Dam, amounting to $2,774.83. The total amount expended on this project to date is $246,360.67, most of which is for purchase of rights and the depopulation of the area which will be submerged. Sixty-six thousand three hundred and seventy-nine dollars and fifty-two cents were spent on additional streets and sidewalks, and $13,664.45 on storm sewers. The sum of $220,438.03 has been spent to the end of the fiscal year on the new Administration Building, Cristobal (formerly called Municipal Building), which was authorized at an estimated expense of $559,000, to house the post office, police station, courts, and various other offices at the Atlantic terminal. A dynamite magazine was constructed at Summit at a cost of $10,234.17. Under the heading of asylums, $22,553.81 were spent during the year in com-

pleting the construction of the female ward, and $27,745.92 for the mess hall, Corozal, making a total completed cost of $157,313.85 for the female ward, and $115,749.18 for the mess hall. A new mess hall and kitchen building was constructed at Palo Seco at a cost of $14,091.99. The cost of constructing a school building in the silver settlement at Gatun amounted to $10,250.68.

Of the amount withdrawn, $15,340 covers the value of old frame buildings demolished at the Corozal Asylum, and $8,432 for buildings demolished at the Colon Quarantine Station. The material recovered at the quarantine station was used in constructing silver bachelor quarters in the silver settlement at Gatun.

Table No. 16—Canal transit equipment.—The amount invested in equipment used in connection with the transiting of vessels and channel maintenance is $5,136,758.22, an increase of $632,268.44 over the previous year. The reductions amounted to $69,240.29 covering the sale of pipe-line-suction dredge No. 83, valued at $61,850, and road roller No. 3, valued at $2,750. The balance of $4,640.29 represents the value of launch *G* and the *Hyacinth*, which were surveyed for sale and their value removed from the capital account.

Additions were made to this account amounting to $701,508.73, the largest item of which represents the cost of the two Diesel tugs *Chagres* and *Trinidad* constructed at a cost of $620,000. Four launches were also constructed—*Heron*, $14,566.42; *Jacana*, $7,019.99; *Porpoise*, $11,333.83; and *Tarpon*, $11,307.02. A gasoline road roller was purchased at a cost of $5,539.02. The balance of $31,742.45 covers capital improvements on other items of equipment as shown in the table.

Table No. 17—Business property.—This table shows the entire investment in the business activities of the canal, consisting of fixed property, equipment, material and supplies, cash, work in process, and undistributed business capital, separated according to the divisions using same. The undistributed business capital charges against the divisions is made up of a portion of the general store stock (representing the value of standard material and supplies held in reserve for the business divisions); cash; and accounts receivable registered in the transit accounts for account of the business units. The capitalization of these business units amounts to $31,762,114.95, an increase of approximately $400,000 over the previous year. These increases are principally in connection with additional fixed property and equipment which are explained under Tables 18 and 19.

Table No. 18—Business fixed property.—The total amount of fixed property in use by the business divisions as shown in Table No. 17, was reduced by $65,163.31 and increased by $632,363.76. The

reductions include the amortization of public works in the cities of Panama and Colon amounting to $56,388.31.

A number of gold and silver quarters were sold, demolished, or transferred and withdrawn from the account, in the sum of $8,775.

Additional charges were made for construction of the new Miraflores Diesel electric power plant amounting to $80,853.67, making the total completed cost $1,524,416.92. Charges for extension of power system distribution lines were made at a cost of $13,842.46. The sum of $5,449.55 was spent in completing the new filter plant, Gamboa, the total completed cost amounting to $17,505.93. Additions and improvements were made to the Gatun-Colon and New Cristobal water system amounting to $48,362.78, the detail of which is shown in this table. A charge of $60,360.39 for construction of additional pipe lines at the fuel oil plant, Balboa, was added during the year. Fifty-five thousand eight hundred and sixty dollars and thirty-nine cents of this amount represents an adjustment for pipe lines constructed during the previous year and charged against replacement funds, but later decided that in order to get them on the financial property records, the charge should be added to the capital account. The balance of $4,500 covers the purchase of an 8-inch gasoline pipe line from the West India Oil Co.

Expenditures amounting to $388,363.88 were made during the year in completing the 87 new houses at New Cristobal, the total completed cost amounting to $758,196.33. The old Cristobal hotel was taken down and reerected at Camp Bierd, Cristobal, for use as silver family quarters at a cost of $14,127.27. Additional garage stalls were erected at a cost of $21,003.76.

Table No. 19—Business equipment.—The value of equipment in use by the various business divisions of the Panama Canal at the end of the fiscal year was $1,151,847.61. The total withdrawals amount to $26,717.07, representing transfers, sales, and surveys. Equipment was purchased during the year amounting to $60,994.17, of which $32,400.25 covered automobiles, and $28,593.92 for new machinery and tools for current use.

Table No. 20—Waterworks, sewers, and pavements in cities of Panama and Colon.—The amount invested in waterworks, sewers, and pavements in the cities of Colon and Panama, reimbursable to the United States, on June 30, 1928, was $1,656,554.72, of which $902,019.22 is in the city of Panama and $754,535.50 in Colon.

The Panama Canal supplies water to these two cities from the Canal Zone system and maintains the sewers and streets in the two cities under a contract entered into between the Panama Canal and the Republic of Panama in 1907. The Panama Canal collects the water rentals from the residents of these two cities and uses the funds to cover the cost of the water and the maintenance of sewers

and streets, interest on the unamortized investment at 2 per cent per annum and amortization based on 50 years from 1907. During the term of this contract, the Panama Canal has used $3,614,739.62 for maintenance, operation, and repairs of the water system, sewers, and streets; interest on the investment amounting to $1,123,866.13, and $1,017,483.17 repaid on the capital cost have been covered into the United States Treasury as miscellaneous receipts.

Table No. 21—Material and supplies.—The total store stock on hand June 30, 1928, amounted to $4,806,353.92. The reserve for inventory store stock adjustments amounts to $356,157.32.

Table No. 22—Material and supplies received and issued.—The amount of stores purchased for stock during the year was $4,944,457.69 in addition to which material and supplies were purchased for direct delivery to divisions at a cost of $2,028,639.59, making the total purchases for the year $6,973,097.28. The mechanical division manufactured material and supplies for stock at a cost of $315,250.28, making a grand total from all sources of $7,288,347.56. The business divisions drew material and supplies to the extent of $3,117,778.55 and the transit divisions, $2,449,177.41. The sales amounted to $1,169,792.79, which includes sales to the Panama Railroad Co.

The comparative statement of material and supplies by commodities, appearing as Table No. 23 in the Annual Report for 1927, is not included this year as the information with reference to the quantity of stock on hand, etc., is covered by Tables 21 and 22.

Table No. 23—Canal transit expenses and earnings.—Under the present system of accounting, the gross operating expenses of the divisions engaged in the transiting of vessels through the canal, together with the cost of sanitation and civil government, are first reduced by the earnings in those units and the net expense is then compared with the revenues from tolls and other miscellaneous receipts.

The net cost of operation and maintenance, sanitation, and civil government of the Panama Canal and Canal Zone, exclusive of the theoretical amortization and depreciation charges, was $7,965,843.06, compared with $8,049,474.08 the previous year. The net expense is divided as follows:

	1928	1927
Civil government	$1,090,334.20	$1,000,675.31
Sanitation, hospitalization, and medical service	669,386.87	669,948.88
Operation and maintenance	6,206,121.99	6,378,849.89
Total	7,965,843.06	8,049,474.08

These figures do not include expenditures for improvements and construction enumerated in Tables 14 to 19, inclusive.

The gross operating costs, including the amortization and depreciation charges, were $12,319,575.59, but these are reduced by earnings amounting to $3,368,374.77 covering all kinds of supplies and service furnished employees for which the employees are required to pay, for pilotage, tug and launch service, handling lines for vessels, and for charges made to business divisions which in turn make collections for the supplies and services to the credit of the appropriations. The net expenses, including amortization and depreciation charges, amount to $8,951,200.82.

EXECUTIVE DEPARTMENT

Under this heading are grouped the salaries and office supplies and expenses of the governor, engineer of maintenance, executive secretary correspondence bureau, personnel bureau, record bureau, etc., the shipping commissioner, cost of publishing the Canal Record, land office and law book expenses, official railroad motor cars, and clubs and playgrounds. The net executive office expenses amounted to $221,314.66. Expenses in connection with the work of the shipping commissioner amounted to $42,145.13. The cost of printing the Canal Record was $12,595.53. More than one-third of the strictly executive expenses is charged off to business divisions as overhead, which is reimbursed to the Panama Canal through the various business activities by adding surcharges to direct costs.

The Government's contribution to the operation and maintenance of clubs and playgrounds had been limited to $100,000 a year for a number of years, and everything over and above that amount paid from the receipts and profits from the operation of the clubhouses. However, during the past two fiscal years, an additional $20,000 was allotted for the purpose of making necessary repairs to clubhouses themselves, making the total contribution $120,000. The business activities of the Panama Canal clubhouses are shown in Tables 38 and 39. The total net expenses of all units grouped under the executive department amounted to $400,425.61.

ACCOUNTING DEPARTMENT

The gross expenses of the accounting department on the Isthmus, including the collector's and paymaster's offices, were $525,385.91. Of this amount $338,542.81 is charged off to business divisions and the Panama Railroad for clerical and accounting work performed for them and was absorbed in those operations in the form of overhead recovered through surcharges. This leaves the net expense of the accounting department payable from appropriations at $186,843.10. Some of the bureaus of the accounting department, such as the railroad accounts bureau, commissary accounts, and commissary coupon accounts, are entirely chargeable to the Panama Railroad.

WASHINGTON OFFICE

The net expenses of the Washington office, including the chief of office, the purchase and inspection bureau, the assistant auditor and disbursing clerk, were $229,002.95. From the gross expense of the purchasing bureau, the sum of $40,000 was charged off to business storehouse operations on the Isthmus, representing the proportion of purchasing and inspection expenses chargeable to material and supplies purchased for use in business activities and for sale, which amount is recovered through surcharges added to the price of material.

CIVIL GOVERNMENT

The gross expense of all activites under the heading of civil government amounted to $1,160,918.86, of which $70,584.66 was charged off or collected from other interests, leaving a net operating cost of $1,090,334.20. In addition to this amount a silver school building was constructed at Gatun at a cost of $10,250.68, which was set up in the capital account, making the total expenditure of civil government funds $1,100,584.88, out of an appropriation of $1,100,000 and savings brought forward from 1927 amounting to $878.17, or a total of $1,100,878.17. The net expense for the administration of estates and other civil affairs was $18,609.29. In the customs service certain collections are made for the inspection of household goods and personal effects for shipment to the States. The gross post-office expenses were reduced by $11,299.31, collected for the handling and transferring of mail other than Canal Zone, leaving the net expenditure of $157,012.76. The net cost of operating the school system, including two high schools, was $309,414.02, after deducting $10,325.59 for school tuitions and the proceeds from the sale of school books and supplies, as compared with the net operating cost of $260,604.29 the previous year, an increase of approximately $49,000. The increase is due to increase in salaries of school teachers to 22 per cent above the rates in Washington, D. C., of approximately $4,000, and $45,000 for the expansion of colored schools made up of salaries, $20,000; equipment, $10,000; and repairs to buildings, $15,000. Fire protection expenses increased approximately $22,000 over the previous year, $20,000 of which covered alterations to Cristobal fire station and the balance on account of increase in pay of firemen. The gross expense of the police department, including the prisons and penitentiary, was $411,328.38, of which $38,000 was recovered for police service furnished the Panama Railroad, and $10,330.88 for subsistence furnished persons detained, sale of produce, ammunition, etc., leaving a net expense of $362,997.50, an increase of approximately $10,000 over the previous year. This increase is due to increase in salaries of policemen on the gold roll to 22 per cent above

the rates in Washington, D. C., amounting to approximately $8,000, and miscellaneous expenses of $2,000.

HEALTH DEPARTMENT

The gross cost of operating all hospitals, asylums, quarantine and public health service, sanitation, and street cleaning, was $1,570,401.38, and the earnings amounted to $901,014.51, leaving the net expenditure from appropriation $669,386.87. The largest amount of revenue derived from the operation of any single unit was at Gorgas Hospital, amounting to $452,056.77. The gross expenses of operating Corozal cripple farm and insane asylum amounted to $205,927.85, of which $167,066.16 was recovered from the Republic of Panama for taking care of its insane and from the sale of produce from the farm, leaving the net expense to the Government only $38,861.69. Under the present agreement of charging the Republic of Panama for 75 per cent of the cost of street cleaning and garbage collection in the cities of Panama and Colon, which went into effect on August 1, 1926, the Panama Canal's proportion for this expense during the fiscal year amounted to $22,944.91, compared to approximately $50,000 per year prior to this new arrangement.

OFFICE ENGINEER, METEOROLOGY AND HYDROGRAPHY, AND SURVEYS

The gross cost of planning and drafting, blue printing, etc., was $75,773.80, of which $59,715.66 was charged off to business operations and construction work, leaving the net expense from appropriation at $16,058.14, which is slightly in excess of the net expense last year.

The net expense of the division of meteorology and hydrography was $34,457.06, and of the survey work, $29,415.99.

GENERAL STOREHOUSES

The net expense of operating the general storehouses payable from the appropriations, including Balboa, Paraiso, Cristobal, and Administration Building store, Balboa Heights, was $299,871.95, which is slightly less than last year. In addition to this amount, $220,800 of storehouse expenses were charged to business storehouse operations, representing that part of the general storehouse expenses chargeable to material used by business divisions and sold, which is recovered through surcharges added to the price of material.

PUBLIC BUILDINGS AND GROUNDS

The gross expense of the chief quartermaster's office and the four district quartermasters, was $424,009.82. This expense is reduced by $241,082.95, covering services and supplies charged to employees, business divisions, the Panama Railroad, etc., for general utility

service, janitor service, care of grounds chargeable to employees, sale of gasoline, mattress-factory operations, etc. The net expense payable from appropriation for care of buildings and grounds was $182,926.87, which includes the cost of operating and maintaining the Administration Building at Balboa Heights.

MISCELLANEOUS

The cost of lighting streets and roads of the Canal Zone was $19,969.21, which is approximately $4,500 more than the previous year.

The item of $23,400 for water for municipal purposes is a fixed figure credited to the municipal engineering division for watering public grounds, flushing sewers, and for water supplied to swimming pools.

The cost of maintaining roads, streets, and sidewalks was $131,164.61, which includes some construction work not of sufficient importance, however, to be set up as a capital addition.

The Pedro Miguel Ferry, which had previously been operated by the United States Army, was taken over for operation by the dredging division on October 8, 1927. The ferry equipment, consisting of the gasoline tug *Lieut. W. B. Gaither* and barge *No. 105*, was transferred to the Panama Canal on memorandum receipt. The cost of operation from October 8, 1927, to June 30, 1928, was $32,201.91, which includes $6,500 for repairs to the tug.

The cost of recruiting and repatriating employees was $14,029.68.

The lump sum paid the Panama Railroad for the transportation of Panama Canal employees on the Isthmus has been $120,000 per annum for a number of years. A large part of this expense represents the cost of transporting ships' line handlers to their home station after transiting the canal.

The expenditures on laborers' quarters were limited to the funds available, the exact amount appropriated being $95,000, of which $94,923.06 was expended. Under the present arrangement, the rent collected from silver employees occupying Panama Canal quarters is somewhat less than the actual cost of operating these quarters, but the silver employees' wages are fixed on the basis of living costs and if the rents were increased their salaries would also have to be correspondingly increased in order to maintain the ratio, and the payment of higher salaries, then charging more rent, would also have the undesirable effect of having more of the silver employees live in the cities of Panama and Colon. The deficit, therefore, from the operation of silver quarters is first covered from this appropriation of $95,000 and the balance is used for extraordinary repairs to silver quarters. During the last fiscal year the difference between the cost of operating

silver quarters and the rent paid by the occupants approximated $36,000.

MARINE DIVISION

The gross expenses of the marine division, including the port captains' offices, dispatching vessels through the canal, board of admeasurement, board of local inspectors, pilots, tugs, launches, handling lines, and aids to navigation, all of which have to do with the transiting of vessels through the canal, amounted to $1,651,749.41. Against this expense, the marine division earnings amounted to $1,154,252.13, leaving a net expense of $497,497.28, as compared with a net expense of $385,483.11 the previous fiscal year. The collections from vessels for harbor pilotage amounted to $336,724.76, as compared with approximately $324,600 the previous year. The gross expenses of operating tugs and launches at both ends of the canal, were $493,906.70, whereas the revenues derived from the service of this equipment amounted to $488,415.33, leaving a net expense of $5,491.37 chargeable against appropriation funds. Last year the revenues exceeded the expenses by $32,674.64. Collections from vessels for furnishing line handlers exceeded the amount paid for this service by $8,831.42.

AIDS TO NAVIGATION

The net cost of operating the lighthouse subdivision in connection with the purchase, installation and maintenance of aids to navigation, was $222,496.46 as compared with $196,543.90 the previous year. A large part of this expense is in connection with the purchase, repair, and replacement of buoys.

LOCKS OPERATION

The cost of operating the Gatun Locks was $479,649.47. The maintenance expense increased $45,000 over the previous year due to overhaul of towing tracks. The cost of operating the locks at Pedro Miguel was $377,594.88, and at Miraflores, $595,675.95. The maintenance cost at Miraflores includes approximately $155,000 for trestle replacement and bridge. No general overhaul was made to any of the locks during the year. The locks storehouse now located at Miraflores, was operated at a cost of $9,866.70. The sum of $1,247.14 was spent on the Miraflores Spillway during the year. The amount expended at all locks was $1,464,034.14. The net cost of maintenance of the Gatun Dam and Spillway was $56,748.83.

DAMAGES TO VESSELS

The amount actually expended during the year in connection with damages to vessels in the locks was $8,120.45, and in the canal, $5,578.75. The largest items paid were for damages to steamship *Belgenland*, $3,251.35; steamship *Chilcop*, $2,599.52; steamship *Charles G. Black*, $1,200; steamship *Niobe*, $1,534.20; steamship *Padilla*, $943.04; steamships *Manchester*, *Merchant*, and *Wilkeno*, $600 each; and steamships *Bologna*, *La Perla*, and *F. H. Hillman*, $500 each.

DREDGING AND CHANNEL MAINTENANCE

The total cost of operating the dredging division payable from the appropriation was $2,317,110.99, compared with $2,304,398.83 the previous year. This includes an expense of $38,522.40 for removing floating obstructions from the canal channel and lake and $45,871.70 for maintaining the two large floating derricks, *Ajax* and *Hercules*. The balance is for channel and harbor maintenance including a considerable expense for deepening the Pacific entrance. Work was continued on the deepening of the canal channel from the Pacific entrance to the Miraflores Locks to a depth which will permit the movement of vessels in that channel at low tide. The yardage so excavated, the class of equipment used, locations, and unit costs are shown in Table No. 33.

AMORTIZATION AND DEPRECIATION

The sum of $350,000 for amortization and $635,357.76 for depreciation was added to the actual operating costs for the year in order to arrive at the theoretical total cost in comparison with the revenues earned. This brings the grand net total to $8,951,200.82. The method of calculating the amortization and depreciation charges is fully explained in the annual report of 1927, page 94.

Table No. 24—Canal revenues.—This table shows a comparison of the amounts deposited in the United States Treasury as miscellaneous receipts during the fiscal years 1927 and 1928. The amount of tolls earned during the fiscal year 1928 was $26,943,513.11, as compared with $24,217,185.32 the previous fiscal year. The taxes, fees, and fines collected amounted to $74,288; the postal receipts from the sale of stamps, etc., amounted to $148,218.14, approximately $2,000 more than last year, the details of which are shown in Table No. 36. The total canal revenues which will be covered in as miscellaneous receipts amounted to $27,176,045.68. The foregoing figures are exclusive of the profits from business operations, amounting to $736,719.43, shown in Table No. 25, which will be covered in as miscellaneous receipts, and the $3,368,374.77 earnings shown in Table No. 23, which were repaid to appropriations.

Table No. 25—Business expenses and revenues.—This table shows the business operations of the Panama Canal as separate and distinct from the operation and maintenance activities directly connected with the transiting of vessels. Under the annual appropriation act, the Panama Canal is authorized to use funds appropriated for the operation and maintenance of the Panama Canal in conducting auxiliary business enterprises with the provision that funds so used will be recovered and repaid to the appropriation to be used for the purpose for which they were originally appropriated and with the further provision that any profits derived from such business activities be covered into the United States Treasury as miscellaneous receipts annually.

ELECTRICAL DIVISION

The electric light and power system includes the operation of the Gatun hydroelectric plant, the Miraflores Diesel electric plant, operation of substations, transmission lines and distribution system, detailed cost of which is shown in Table No. 31. The basic rate for electric current to departments and divisions of the Panama Canal, Panama Railroad, and other departments of the Government, remained 1¼ cents per kilowatt hour during the year. The basic rate to outsiders is 4 cents per kilowatt hour. The total cost of producing and distributing electric light and power was $474,777.31 and the net revenue $244,980.03.

The other operations of the electrical division, including electrical installation and repair work not chargeable to the production and distribution of electric light and power, amounted to $525,307.11, which includes the value of the equipment installed.

The cost of operating and maintaining the telephones, telegraph, and automatic signal system for the Panama Railroad was $202,682.21 as compared with $185,638.38 the previous year. The entire amount expended by the electrical division for operating the telephone, telegraph, and signal systems is charged to the Panama Railroad, which receives the revenue derived from the service, and the net results are shown in the Panama Railroad annual report.

MUNICIPAL ENGINEERING DIVISION

The water system involves the operation of pump stations, filtration plants, reservoirs, pipe lines for the production, filtration, and distribution of water throughout the Canal Zone and in the cities of Colon and Panama, including water delivered to vessels using the terminals and transiting the canal. The total cost of operating the system was $474,100.93. The net revenue of $49,058.75 includes an item of $23,400 to cover the value of water used for municipal purposes and the balance represents an excess of revenue over the

actual cost of production. This net revenue, however, lacks approximately $37,000 of covering 3 per cent on the investment, which represents the water and water facilities provided by the municipal engineering division for fire protection, for which the municipal engineering division receives no book credit.

The cost of municipal engineering work performed outside of the cost of water amounted to $1,000,938.61. This includes the cost of excavation, filling, concrete, and street work performed for the various departments and divisions of the canal, railroad, other departments of Government, and the Panaman Government. The expenditures, revenues, and return on the investment in public works in the cities of Panama and Colon, which are operated and maintained by the municipal engineering division, are explained under Table No. 20.

MECHANICAL DIVISION

The total expense of shop and dry-dock operations amounted to $3,483,680.18 and the revenues, $3,539,812.54, leaving a net revenue of $56,132.36. The expenses include $128,000 reserved for the construction of new shop buildings at Cristobal, for which $80,000 was reserved in 1927. The expense and revenue figures include the cost of work performed for departments and divisions of the Panama Canal, Panama Railroad, and other departments of government, including the maintenance of Panama Railroad rolling stock, which service is performed approximately at cost, and the profit represents the excess of revenues over expenses for work performed for outsiders, including repairs to vessels. A surcharge of 35 per cent is added on direct labor to cover shop overhead.

WHARFAGE

The gross expense of docks, wharves, and piers was $204,975.86, compared to $71,918.21 the previous year. The wharfage revenues amounted to $79,001.12. The increase in cost of maintenance was due to repairs to Dock 15, Balboa, amounting to $179,632.30. This extraordinary repair was necessary on account of the failure of the dock.

Pier 6, Cristobal, owned by the Panama Canal, was turned over to the Panama Railroad for operation on December 1, 1927, at a rental of $1,000 per month. The railroad will maintain and repair the pier and receive all revenue for wharfage.

FUEL OIL HANDLING PLANTS

The cost of operating the pumping plants at Balboa and Mount Hope was $384,682.55 and the revenues from pumping (including $19,930.84 tank rentals) was $663,712.75, leaving a net revenue of $279,030.20.

BUSINESS STOREHOUSE OPERATIONS

The value of general store material and supplies, including fuel oil issued to the business divisions of the Panama Canal, together with the value of the material sold directly to outsiders and the storehouse expense chargeable against such material, amounted to $4,350,681.66. The revenues exceed the costs by $49,894.15, a part of which represents profit on the sale of material, and the balance represents the difference between the operating expense charged to this account and the surcharge added to the price of material. The surcharge to departments and divisions is 10 per cent and on material sold to outsiders 25 per cent. The value of fuel oil included in this account was $388,278.58.

MISCELLANEOUS OPERATIONS

The cost of operating the motor transportation division was $410,177.01.

The motor-car repair shop did a business amounting to $193,368.47.

The operating costs of the building division, including both construction and maintenance of buildings, amounted to $2,137,272.75.

The operating cost of the Panama Canal press was $270,162.08, which includes an item of $10,000 charged in to create a reserve for the contemplated transfer of the printing plant from its present location.

The expenses of operating and maintaining gold quarters are ordinarily limited to the amount received in rent from the occupants; the amortization, depreciation, and interest on the investment having previously been authorized to be expended for the proper housing of employees. During the current fiscal year an additional expenditure has been authorized for new furniture not to exceed $90,000 at the rate of $30,000 per year, which is the cause of the deficit in operations.

The rents collected from silver employees for the occupation of silver quarters was $198,988.74, which is approximately $36,000 less than the cost of operating and maintaining these quarters. The deficit was charged to the allotment for maintenance of laborers' quarters referred to under Table No. 23.

Under the heading of building rentals are included the rentals from garages, boathouses, restaurants, and markets. The revenues derived from these sources amount to $70,534.71, which is $20,937.92 in excess of the maintenance costs.

The district quartermaster's supplies and services amounted to $198,968.13, which is $5,196.52 in excess of the revenue derived from this source. Last year the loss was over $7,800.

The cost of operating the Hotel Tivoli was $217,020.16, which includes $10,000 reserved for new furniture, and the profits amounted

to $20,914.73, as compared with a profit of $26,737.03 the previous year.

The expenses under the heading of farm bureau and land rentals include the expenses of the agronomist, experimental farm, and plant introduction, which are limited to $24,000 per annum. The revenues, amounting to $40,907.97, include the rentals from agricultural licenses and the proceeds from the sale of produce.

The cost of maintaining the salvage section as an aid to navigation, was $118,963.83, against a revenue of $51,083.68, resulting in a net expense of $67,880.15. This loss is due to the fact that a complete salvage unit is maintained to give prompt assistance to ships in distress, although the revenue derived from this source is not commensurate with the expensive plant maintained.

The value of sand and gravel and the cost of handling issues and sales amounted to $95,588.53, and the revenue, $95,418.05, or a loss of $170.48. On July 1, 1927, the value of sand and gravel in the storage pile at Gamboa was written down to $1 per cubic yard, and the difference of approximately $35,000 was charged to inventory adjustments. Under the old system of washing sand and gravel, the account showed a loss of $4,224.39 for the first 10 months of the fiscal year. A cable conveyor system was installed and placed in operation about May 1, 1928, and in the two remaining months of the fiscal year, due to the plant running at full capacity by shipping all surplus washed material to the general storekeeper's storage pile at Cristobal, and a large reduction in the handling and washing costs by the new plant, the loss in the account was reduced to $170.48 at the close of the fiscal year, as stated above.

The profit from the sale of nautical charts and publications was $1,010.84.

The gross revenues from all business operations amounted to $16,-929,247.24, compared with $15,878,654.57 the previous year. The profits to be covered in as miscellaneous receipts amount to $736,-719.43 compared with $876,536.80 last year, which is approximately $45,000 less than 3 per cent on the investment in business activities, due to the extraordinary expenditures on Pier 15, explained under the heading of Wharfage.

Table No. 26—Surplus.—The gross canal transit revenues since the opening of the canal amounted to $196,257,966.49, and the corresponding expenses, $104,028,845.36, making a surplus of $92,229,-121.13. During the same period the revenues from business operations amounted to $166,295,052.84, and the expenses, $159,608,734.15, making a total business profit to June 30, 1928, of $6,686,318.69. The combined surplus to date amounts to $98,915,439.82. The canal transit expenses, however, include annual charges for theoretical amortization and depreciation amounting to $2,450,000 and $2,799,-

172.10 respectively, a total of $5,249,172.10, which added to the surplus shown above makes a total of $97,478,293.23, representing the difference between actual operating expenses and revenues.

Table No. 27—Collections from gold employees.—The total amount collected from gold employees for house rent, supplies, and services, was $955,588.52, an increase of approximately $56,000 over last year. The collections are detailed as follows: House rent, $400,224.48; electric current, $61,209.75; water, $29,051.62; telephones, $31,-008.13; garage rentals, $38,721.71; hospital charges, $53,376.15; miscellaneous, $341,996.68.

Tables Nos. 28 and 29—Reserve for repairs and replacements.—The theoretical amortization and theoretical depreciation are shown in the general balance sheet separately, calculated as follows:

Amortization charged into operating expenses to June 30, 1928	$2, 450, 000. 00
Plus theoretical interest on same	233, 021. 49
Total	2, 683, 021. 49
Depreciation charges to June 30, 1928	2, 799, 172. 10
Plus theoretical interest on same	760, 165. 95
Total	2, 559, 338. 05

The total reserve for replacement at the end of the fiscal year as shown in Table 28 was $2,498,721.31 and the reserve for extraordinary repairs, as shown in Table No. 29, $1,016,553.03, a grand total of $3,515,274.34 available for extraordinary repairs, renewals, and replacements of equipment and business property.

On July 1, 1927, the replacement reserve amounted to $3,023,792.39, to which was added during the year, by charges into operations and by transfer from the repair reserves, $1,295,174.66, making a total of $4,318,967.05. During the last fiscal year there were used or released from this replacement reserve, the following amounts in round numbers: New tug, *Chagres*, $310,000; tug, *Trinidad*, $310,000; new launches, *Heron*, $14,400, *Jocana*, $7,100, *Porpoise*, $11,400, *Tarpon*, $11,400; new Diesel dredge (part), $886,000; extension fuel oil lines, $28,700; motor vehicles, $32,500; gold quarters at Pedro Miguel (part), $64,000; new garages, $21,100; miscellaneous machinery and tools, $120,000; and miscellaneous renewals, $5,400.

On July 1, 1927, the reserve for extraordinary repairs amounted to $1,987,511.57, to which was added during the year $1,031,645.80, making a total of $3,019,157.37. From this amount was expended for repairs during the year $754,206.66, reroofing Balboa shops, $107,308.73, relocation pattern shop, $36,641.10, rebuilding tug *Siri* and launch *Dorothy*, $35,409.36, transferred to the reserve for replacements, $526,412.02, and loaned to the Budget for current operating expenses, $542,626.47, a total of $2,002,604.34, leaving the balance on June 30, 1928, at $1,016,553.03.

Against the combined reserves available for repairs and replacements at the end of June, 1928, $3,515,274.34, we already have the following obligations: Cristobal shop improvements, $270,000; improvements to fuel-oil plants, $150,000; new bachelor quarters, $115,000; new storehouse, Cristobal, $90,000; improvements and extension of garages, $30,000; balance of Diesel dredge, $250,000; air compressor, barge, $35,000; automobile replacements, $60,000; and miscellaneous business equipment, $100,000; total, $1,100,000; which leaves only $2,415,000, of which approximately $1,000,000 is continuously obligated for periodic overhauling and extraordinary repairs to equipment in constant use.

Table No. 30—Reserve for gratuity.—The amount of cash held in reserve for vacation pay due the employees of the four principal business divisions is $503,679.64. This fund is created by adding a percentage to the gold-labor charges for work performed by business divisions and represents a live liability, being immediately payable when the employees take their vacations or leave the service.

Table No. 31—Electric current.—The cost of operating the hydroelectric plant at Gatun was $88,835.19; the new Diesel electric plant at Miraflores operating costs were $70,805.95; substations, $155,836.65; transmission lines, $51,080.17; distribution lines, $108,-219.35; making a total cost of production and distribution of $474,-777.31. The total kilowatt-hours' production was 57,696,673, and the unit cost $0.0082. This cost, of course, is exclusive of the fixed capital charge.

Table No. 32—Water.—The total cost of operating the pump stations, filtration plants, reservoirs, and pipe lines in the Pacific system during the fiscal year, including the overhead expenses, was $273,991.43, on a production of 3,205,051,000 gallons, resulting in a cost of $0.0855 per thousand gallons as compared with $0.0895 last year. The total operating cost in the Atlantic system was $190,564.58 on 2,058,957,000 gallons, resulting in a cost of $0.0926 per thousand gallons, as compared with $0.0858 per thousand gallons last year. The average cost for the year for pumping, filtering, and distributing water in the Canal Zone and in the cities of Panama and Colon was $0.0883 per thousand gallons.

This table shows the proportion chargeable for water delivered in the cities of Panama and Colon separate from that chargeable for water used in the Zone, the average cost for water delivered to Panama City being $0.0706, and to Colon City, $0.0581, an average for the two cities of $0.0665 per thousand gallons. The average cost of water used in the Canal Zone was $0.1017 as compared with $0.1007 per thousand gallons the previous year.

Table No. 33—Dredging.—The dipper dredges excavated material in Gatun Lake, Gaillard Cut, and at the Pacific entrance of the canal

to the extent of 2,333,700 cubic yards, at a cost of $0.6486 per cubic yard. The suction dredges removed 2,760,850 cubic yards of material from the Atlantic entrance, Cristobal Harbor, Gatun Lake, Balboa Harbor, and Pacific entrance at a unit cost of $0.1738. The total amount expended during the year on dredging was $1,993,399.03 on a total yardage of 5,094,550, or an average of $0.3913 per cubic yard.

Tables Nos. 34 and 35—Money orders.—During the fiscal year 113,485 money orders were issued in the Canal Zone, amounting to $2,412,139.09. Money orders, including deposit money orders, cashed by post offices in the Canal Zone amounted to $1,081,502.19. Canal Zone money orders paid in the United States amounted to $1,544,848.95. Interest paid on deposit money orders amounted to $12,376.40.

Table No. 36—Postal Service revenues.—The revenue from money-order fees, stamp sales, post-office box rent, and newspaper postage was $148,273.78. The stamp sales alone amounted to $120,936.60. Interest earned on money-order funds on deposit amounted to $22,349.69.

Table No. 37—Postal savings.—Postal savings money orders were issued in the amount of $659,510. The amount paid was $649,140, and the amount remaining on deposit June 30, 1928, was $480,085.

Tables Nos. 38 and 39—Panama Canal clubhouses.—Table No. 38 shows the net result of operations at each clubhouse, the total net result showing a profit for the year of $15,925.75. Table No. 39 shows the current assets and liabilities. The value of salable material and supplies on hand at the end of the fiscal year was $16,710.31 and the bills collectible amounted to $10,926.22. Against these assets there were bills payable amounting to $37,804.29, and the net accumulated surplus to June 30, 1928, was $120,886.58. These surplus funds are in possession of the collector, who has them on deposit in the bank at interest.

Table No. 40—Coupon books.—The total amount of coupon books issued to employees and paid for by deductions on the pay rolls was $4,049,312.50, and the value of books sold for cash was $1,759,205. In addition to these, books were issued on charge accounts amounting to $184,990, making a grand total of $5,993,507.50, an increase of $120,000 over the previous fiscal year. The value of coupon books lifted in the commissaries in exchange for goods was $5,584,477.72; at Panama Canal clubhouses, $138,499.35; at restaurants, $230,-562.92; at Hotels Tivoli and Washington, Y. M. C. A.'s, etc., $9,028.75; a total of $5,962,568.74.

Tables Nos. 41 and 42—Personal injuries.—The settlement of claims arising out of personal injuries to employees of the Panama Canal, Panama Railroad, and Panama Railroad Steamship Line

was continued in accordance with the act of September 7, 1916, and Executive order dated September 15, 1916, which transferred the administration of the act, so far as the canal and railroad employees are concerned, to the Governor of the Panama Canal. Under this Executive order the governor directed the auditor to designate an employee of the accounting department as claim officer. The contents of these tables are self-explanatory, and the report of the claim officer is attached hereto as Table No. 52. The total amount of injury compensation paid during the fiscal year was approximately $68,000.

Table No. 43—Commissary purchases and sales.—The cost of goods purchased during the year amounted to $9,334,407.73 and the proceeds from the sale of supplies at wholesale and retail prices combined amounted to $9,682,240.78, as compared with $9,128,580.10 the previous year. The profits from all commissary operations including these sales and the net results from the various manufacturing plants, were $455,721.55, as compared with $320,754.03 the previous year.

Table No. 44.—This table shows collections from other than employees for house rent and allied charges, such as electric current, water, janitor service, and telephone, amounting to $58,856.91.

Table No. 45.—This table shows collections from Panama Railroad real estate rentals, amounting to $198,837.78.

Table No. 46.—This table shows the silver quarters available and the monthly rental value, together with the actual collections made from silver employees during the fiscal year.

Table No. 47—Panama Canal vouchers registered.—The total number of bills passed for payment during the year was 2,717, covering $5,341,411.82, of which $1,509,910.75 was payable from appropriations and $3,831,501.07 from trust funds, principally the value of commissary coupon books deducted on the rolls from Panama Canal employees and paid to the Panama Railroad.

Table No. 48—Panama Railroad accounts payable vouchers.—The total number of Panama Railroad accounts payable vouchers passed for payment was 4,437, as compared with 4,588 the previous year. The amount covered by these vouchers is $5,074,003.41.

Table No. 49—Bonded employees.—This table shows the total number of Panama Canal and Panama Railroad employees bonded with the Maryland Casualty Co. On June 30, 1928, there were 552 employees under bond in the amount of $860,000 on which the premiums amount to $1,363. This is exclusive of the paymaster and his employees, and the collector, whose bonds are handled by themselves directly with the surety company.

Tables Nos. 50 to 57, inclusive.—These are reports by various bureau and section heads, which are self-explanatory.

Tables Nos. 58 and 59—Origin and destination of cargo.—These tables show by geographical areas the origin and destination of cargo passing through the canal during the past five fiscal years. During these five years nearly three-fourths of the cargo passing from the Atlantic to the Pacific through the canal originated on the east coast of North America and about one-half was consigned to the west coast of North America. The preponderance of traffic between the east and west coasts of North America is also shown by the Pacific to Atlantic cargo movement, as over two-thirds of the cargo moving in this direction originated on the west coast of North America and approximately the same proportion was destined to the eastern seaboard of North America. General traffic between the east and west coasts of North America has grown rapidly during the five years under comparison; this is not indicated by the table for the reason that there was a very heavy United States intercoastal movement in mineral oils in the fiscal year 1924 and this element has declined since, though it has been replaced by a similar movement in other commodities.

Table 60—Total traffic through the canal by nationality and fiscal years.—This table covers the total traffic through the Panama Canal during the 14 fiscal years since its opening, segregated by nationality of vessels and showing transits, Panama Canal net tonnage, tolls, and tons of cargo. During this period vessels flying the flags of the United States and Great Britain have comprised about three-fourths of total traffic through the canal, their percentages being:

United States.—Transits 44.83 per cent; Panama Canal net tonnage, 48.83 per cent; tolls, 48.43 per cent; and tons of cargo carried, 50.17 per cent.

Great Britain.—Transits, 29.31 per cent; Panama Canal net tonnage, 29.55 per cent; tolls, 29.97 per cent; and tons of cargo carried, 27.73 per cent.

The number of nationalities represented is 33.

TABLE NO. 1—*General balance sheet June 30, 1928*

ASSETS			LIABILITIES		
Canal fixed property	(Table 15)	$237,074,172.38	Commercial capital investment		$273,273,818.51
Canal equipment	(Table 16)	5,136,758.22	National defense capital investment		113,127,337.75
Revenue due U. S. Treasury		208,453.26	Accounts payable	(Table 13)	1,629,927.83
Cash	(Table 3)	1,485,848.28	Unclassified canal credits		38,782.38
Accounts receivable	(Table 12)	814,913.51	Amortization (unfunded)		2,683,021.49
Business property	(Table 17)	31,762,114.95	Depreciation (unfunded)		3,559,338.05
Stores	(Table 21)	4,450,196.60	Replacement reserves (funded)	(Table 28)	2,498,721.31
United States Treasury		105,050,747.57	Repair reserves (funded)	(Table 29)	1,016,553.03
National defense ex-expenditures	(Table 14)	113,127,337.75	Gratuity reserves (funded)	(Table 30)	503,679.64
Undistributed business capital (credit account)	(Table 17)	[1] 1,813,000.00	Contingent reserves (funded)		50,922.71
			Surplus	(Table 26)	98,915,439.82
Total assets		497,297,542.52	Total liabilities		497,297,542.52

[1] Denotes credit.

TABLE NO. 2.—*Summary of expenses and revenues*

	1927	1928
Canal operations:		
Canal expenses	$11,232,493.85	$11,334,217.83
Depreciation—Amortization fixed property	948,240.94	985,357.76
Gross canal expenses	12,180,734.79	12,319,575.59
Canal earnings [1]	3,183,019.77	3,368,374.77
Net canal expenses	8,997,715.02	8,951,200.82
Canal revenues [2]	24,608,808.82	27,176,045.68
Net canal revenues	15,611,093.80	18,224,844.86
Fixed capital charge [3]	7,309,248.28	7,343,774.39
Surplus or deficit	8,301,845.52	10,881,070.47
Business operations:		
Business revenues	15,878,654.57	16,929,247.24
Business expenses	15,002,117.77	16,192,527.81
Net business revenues	876,536.80	736,719.43
Fixed capital charge [3]	744,496.74	781,864.15
Surplus or deficit	132,040.06	[4] 45,144.72
Combined canal and business operations:		
Panama canal revenues	40,487,463.39	44,105,292.92
Panama canal expenses	23,999,832.79	25,143,728.63
Net revenues	16,487,630.60	18,961,564.29
Fixed capital charge [3]	8,053,745.02	8,125,638.54
Surplus or deficit	8,433,885.58	10,835,925.75

[1] Canal earnings consist of sales and services which by law are repaid to appropriation for canal maintenance, and hence are deducted from appropriation expenditures.

[2] Canal revenues consist principally of tolls, and by law must be covered into the U. S. Treasury as miscellaneous receipts.

[3] No capital interest is charged against the Panama Canal by the U. S. Treasury, but for statistical comparison a theoretical capital interest charge at 3 per cent, the rate at which most of the Panama Canal bonds were sold, is included in above table, based on an appraised commercial investment in the Panama Canal, amounting to between $270,000,000 and $275,000,000 according to fluctuating investments in working capital. The balance of construction cost of the Panama Canal, amounting to approximately $113,000,000 is shown on Table 14 making the total construction cost of the Panama Canal, exclusive of the military and naval establishments, approximately $385,000,000.

[4] Indicates deficit.

TABLE NO. 3.—*Balances in appropriation and fund accounting ledger June 30, 1928*

	U. S. Treasury appropriations	Cash on hand	Accounts receivable	Transfers available	Work in process and suspense items	Storehouse stock	Total
Assets:							
Maintenance and operation	$4,221,377.71	$1,318,002.87	$647,285.10	$141,963.99	$469,679,77	$5,008,115.95	$11,806,425.39
Sanitation	10,089.08	82,170.46	162,287.92		[1] 18,626.43	81,978.01	317,899.04
Civil government	112,835.19	85,674.95	5,340.49		[1] 37,933.92		165,916.71
Total appropriations	4,344,301.98	1,485,848.28	814,913.51	141,963.99	413,119.42	5,090,093.96	12,290,241.14
Miscellaneous receipts		163,621.99	44,831.27	680,915.84			889,369.10
Trust funds		497,623.41					497,623.41
Total	4,344,301.98	2,147,093.68	859,744.78	822,879.83	413,119.42	5,090,093.96	13,677,233.65

	Working capital allotment	Water revenue due miscellaneous receipts	Accounts payable	Transfers payable	General ledger reserves	Balance	Total
Liabilities:							
Maintenance and operation	$4,380,000.00	$31,365.07	$1,430,767.90	$680,915.84	$4,067,731.41	$1,215,645.17	$11,806,425.39
Sanitation	100,000.00		117,022.63	97,436.71	1,995.36	1,444.34	317,899.04
Civil government	10,000.00		82,137.30	44,527.28	149.92	29,102.21	165,916.71
Total appropriations	4,490,000.00	31,365.07	1,629,927.83	822,879.83	4,069,876.69	1,246,191.72	12,290,241.14
Miscellenaeous receipts			889,369.10				889,369.10
Trust funds			497,623.41				497,623.41
Total	4,490,000.00	31,365.07	3,016,920.34	822,879.83	4,069,876.69	1,246,191.72	13,677,233.65

	Disbursing clerk	Paymaster	Collector	Total
Fiscal officers, detail:				
Maintenance and operation	$239,865.74	$1,020,706.84	$57,430.29	$1,318,002.87
Sanitation	6,716.38	71,481.97	3,972.11	82,170.46
Civil government	6,915.07	78,081.20	678.68	85,674.95
Total appropriations	253,497.19	1,170,270.01	62,081.08	1,485,848.28
Miscellaneous receipts			163,621.99	163,621.99
Trust funds	24.28	18,923.22	478,675.91	497,623.41
Total	253,521.47	1,189,193.23	704,378.98	2,147,093.68

[1] Denotes credit.

TABLE NO. 4.—*Statement of appropriations by the Congress*

Net canal construction appropriations to June 30, 1928		$386,910,301.00
Total appropriations	$387,069,143.31	
Less amounts returned to surplus fund, United States Treasury, to June 30, 1928	158,842.31	
Panama Canal fund	$130,852.65	
Canal connecting Atlantic and Pacific Oceans	27,989.66	
(For details see annual report, 1924.)		
16 annual payments of $250,000 each to the Republic of Panama, including act of Feb. 24, 1927, for payment due Feb. 26, 1928		4,000,000.00
Maintenance and operation (detailed below)		104,507,326.90
Total appropriations		495,417,627.90

	Maintenance and operation	Sanitation, Canal Zone	Civil government Panama Canal and Canal Zone	Increase of compensation Panama Canal	Total
Act of—					
Mar. 3, 1915	$5,200,000.00	$700,000.00	$540,000.00	----------	$6,440,000.00
July 1, 1916	5,750,000.00	700,000.00	600,000.00	----------	7,050,000.00
June 3, 1917	9,000,000.00	700,000.00	700,000.00	----------	10,400,000.00
July 12, 1917	----------	----------	----------	$10,006.22	10,006.22
June 4, 1918	----------	150,000.00	----------	----------	150,000.00
July 1, 1918	9,000,000.00	900,000.00	750,000.00	----------	10,650,000.00
July 3, 1918	----------	----------	----------	16,000.00	16,000.00
Mar. 1, 1919	----------	----------	----------	32,592.66	32,592.66
July 19, 1919	7,547,939.00	850,000.00	702,000.00	----------	9,099,939.00
Nov. 4, 1919	----------	----------	150,000.00	----------	150,000.00
May 29, 1920	----------	----------	----------	34,500.00	34,500.00
June 5, 1920	7,531,851.00	850,000.00	900,000.00	----------	9,281,851.00
Mar. 1, 1921	----------	----------	24,670.00	----------	24,670.00
Mar. 4, 1921	7,250,000.00	850,000.00	900,000.00	21,500.00	9,021,500.00
June 30, 1922	2,659,434.00	525,000.00	930,000.00	16,800.00	4,131,234.00
Mar. 2, 1923	5,079,683,00	575,000,00	930,000,00	17,520,00	6,602,203,00
June 7, 1924	5,748,160.00	580,000.00	912,000.00	----------	7,240,160.00
Dec. 6, 1924	103,050.00	6,266.00	79,670.00	----------	188,986.00
Feb. 12, 1925	7,140,000.00	653,216.00	942,150.00	----------	8,735,366.00
April 15, 1926	5,986,094.00	670,000.00	999,980.00	----------	7,656,074.00
Feb. 23, 1927	5,830,000.00	670,000.00	1,100,000.00	----------	7,600,000.00
	83,826,211.00	9,379,482.00	11,160,470.00	148,918.88	104,515,081.88
Less amount transferred to surplus fund United States Treasury	----------	----------	----------	7,754.98	7,754.98
Total	83,826,211.00	9,379,482.00	11,160,470.00	141,163.90	104,507,326.90
Appropriations for fiscal year 1929 (act of Mar. 23, 1928)	6,832,000.00	670,000.00	1,158,000.00	----------	8,660,000.00
Codification of Canal Zone Laws Act of May 29, 1928	----------	----------	10,000.00	----------	10,000.00
Act of Feb. 15, 1928 annual payment to the Republic of Panama due Feb. 26, 1929	----------	----------	----------	----------	250,000.00

STATUS OF AUTHORIZED BOND ISSUE

Authorized bond issue			$375,200,900.00
Appropriated for canal construction		$386,910,301.00	
Less amount exempted by law:			
Colliers Ulysses and Achilles	$1,985,552.29		
Coal Barges Mamei and Darien	2,295,746.57		
Dock No. 6 Cristobal	2,093,190.00		
Equipping Colliers Ulysses and Achilles	250,000.00		
Painting tanks, Colliers Ulysses and Achilles	44,279.76		
Repairs to steamships, Ancon and Cristobal	720,000.00		
Expended for operation and maintenance of canal	4,289,159.00		
Stock of material and supplies for operation and maintenance of canal	2,225,000.00		
		13,902,927.62	
			373,007,373.38
Balance			2,193,526.62
Appraised value American Legation building in the city of Panama, exempt from charge to bond issue, Act July 1, 1916			22,256.00
Balance available for appropriation within limit of cost of canal and authorized bond issue			2,215,782.62

TABLE NO. 5.—*Cash receipts and disbursements for account of the United States, fiscal year ended June 30, 1928*

CASH RECEIPTS

	United States Treasurer	Disbursing clerk, Washington, D. C.	Paymaster, Canal Zone	Collector, Canal Zone	Total
On hand July 1, 1927, by appropriations and funds:					
Maintenance and operation, Panama Canal	$7,065,539.94	$247,106.25	$804,989.25	$104,153.34	$8,221,788.78
Sanitation, Canal Zone, Panama Canal	258,856.25	14,319.24	86,746.82	1,726.33	361,648.64
Civil government, Panama Canal and Canal Zone	104,997.03	3,683.03	42,777.89	1,097.51	152,555.46
Miscellaneous receipts, United States revenues				173,870.21	173,870.21
Special deposits		2,024.28	33,892.05	467,339.01	503,255.34
Total	7,429,393.22	267,132.80	968,406.01	748,186.40	9,413,118.43
Appropriations for fiscal year 1928:					
Maintenance and operation, Panama Canal	5,830,000.00				5,830,000.00
Sanitation, Canal Zone, Panama Canal	670,000.00				670,000.00
Civil government, Panama Canal and Canal Zone	1,100,000.00				1,100,000.00
Total	7,600,000.00				7,600,000.00
Transfers between fiscal officers:					
Maintenance and operation, Panama Canal	144,878.09	6,382,000.00	11,173,784.96		17,700,663.05
Sanitation, Canal Zone, Panama Canal	24,167.32	147,000.00	1,290,802.48		1,461,969.80
Civil government, Panama Canal and Canal Zone	5,750.00	25,000.00	1,113,000.74		1,143,750.74
Total	174,795.41	6,554,000.00	13,577,588.18		20,306,383.59
Collections:					
Maintenance and operation, Panama Canal	289,851.15	164,052.33	213,893.76	9,228,096.57	9,895,893.81
Sanitation, Canal Zone, Panama Canal	36,688.92	28,409.19		728,092.89	793,191.00
Civil government, Panama Canal and Canal Zone		6,900.00	.79	62,581.91	69,482.70
Miscellaneous receipts, United States revenues			1.43	27,303,416.98	27,303,418.41
Special deposits		201,265.94	3,769,723.49	34,321,796.63	38,292,786.06
Total	326,540.07	400,627.46	3,983,619.47	71,643,984.98	76,354,771.98
Total cash debits	15,530,728.70	7,221,760.26	18,529,613.66	72,392,171.38	113,674,274.00

CASH DISBURSEMENTS

Covered into United States Treasury:					
Maintenance and operation (business profits, 1927)	$820,669.15				$820,669.15
Miscellaneous receipts			$1.43	$27,313,665.20	27,313,666.63
Total	820,669.15		1.43	27,313,665.20	28,134,335.78
Transfers between fiscal officers:					
Maintenance and operation, Panama Canal	8,282,000.00	$143,843.43		9,274,819,62	17,700,663.05
Sanitation, Canal Zone, Panama Canal	712,000.00	24,122.69		725,847.11	1,461,969.80
Civil government, Panama Canal and Canal Zone	1,075,000.00	5,750.00		63,000.74	1,143,750.74
Total	10,069,000.00	173,716.12		10,063,667.47	20,306,383.59

TABLE NO. 5.—*Cash receipts and disbursements for account of the United States, fiscal year ended June 30, 1928*—Continued

CASH DISBURSEMENTS—Continued

	United States Treasurer	Disbursing clerk, Washington, D. C.	Paymaster, Canal Zone	Collector, Canal Zone	Total
Disbursements:					
Maintenance and operation, Panama Canal	$6,222.32	$6,409,449.41	$11,171,961.13	----------	$17,587,632.86
Sanitation, Canal Zone, Panama Canal	267,623.41	158,889.36	1,306,067.33	----------	1,732,580.10
Civil government, Panama Canal and Canal Zone	22,911.84	22,917.96	1,077,698.22	----------	1,123,528.02
Special deposits	----------	203,265.94	3,784,692.32	$34,310,459.73	38,298,417.99
Total	296,757.57	6,794,522.67	17,340,419.00	34,310,459.73	58,742,158.97
On hand June 30, 1928:					
Maintenance and operation, Panama Canal	4,221,377.71	239,865.74	1,020,706.84	57,430.29	5,539,380.58
Sanitation, Canal Zone, Panama Canal	10,089.08	6,716.38	71,481.97	3,972.11	92,259.54
Civil government, Panama Canal and Canal Zone	112,835.19	6,915.07	78,081.20	678.68	198,510.14
Miscellaneous receipts, United States revenues	----------	----------	----------	163,621.99	163,621.99
Special deposits	----------	24.28	18,923.22	478,675.91	497,623.41
Total	4,344,301.98	253,521.47	1,189,193.23	704,378.98	6,491,395.66
Total cash credits	15,530,728.70	7,221,760.26	18,529,613.66	72,392,171.38	113,674,274.00

TABLE NO. 7.—*Receipts and disbursements by collector of Canal Zone funds*

FISCAL YEAR 1927

Cash on hand		$940,686.22
Receipts:		
Clubhouse funds	$352,244.15	
Trust funds	19,289.27	
Money-order funds	1,648,269.53	
Interest	24,101.53	
		2,043,904.48
Total		2,984,590.70
Disbursements:		
Clubhouse funds	394,763.48	
Trust funds	17,683.96	
Money-order funds	1,771,011.25	
Interest	22,132.96	
		2,205,591.65
Cash on hand		778,999.05
Clubhouse funds	104,835.14	
Trust funds	9,274.06	
Postal savings	181.00	
Money-order funds	656,730.89	
Interest	7,977.96	

FISCAL YEAR 1928

Cash on hand		$778,999.05
Receipts:		
Clubhouse funds	$367,800.68	
Trust funds	17,877.36	
Money-order funds	1,402,573.69	
Interest	22,349.69	
		1,810,601.42
Total		2,589,600.47
Disbursements:		
Clubhouse funds	368,513.26	
Trust funds	19,315.79	
Money-order funds	1,394,853.45	
Interest	22,471.76	
		1,805,154.26
Cash on hand		784,446.21
Clubhouse funds	104,122.56	
Trust funds	7,835.63	
Postal savings	181.00	
Money-order funds	664,451.13	
Interest	7,855.89	

TABLE NO. 8.—*Statement of collections made by collector repaid to appropriations and to individuals and companies, and collections deposited to miscellaneous receipts during fiscal year ended June 30, 1928*

MAINTENANCE AND OPERATION, PANAMA CANAL

Collections credited to earnings:	
Executive office services	$58,284.16
Cables and radiograms	106.74
Sales of canal record	111.75
Clubs and playground services	78,966.17
Accounting office services	152,585.93
Lost metal checks	474.38
Paymaster's office services	15,900.00
Collector's office services	21,048.00
Safety deposit box rentals	772.50
Office engineer services	850.16
Sale of prints	3,944.19
Meteorology and hydrography division services	59.60
Survey section services	5,410.41

MAINTENANCE AND OPERATION, PANAMA CANAL—continued

Collections credited to earnings—Con.	
Balboa storehouse services	$484.68
Cristobal storehouse services	223.24
Chief quartermaster's office services	9,173.35
District quartermaster, Balboa, services	12,584.30
District quartermaster, Pedro Miguel, services	11,648.92
District quartermaster, Gatun, services	7,462.79
District quartermaster Cristobal, services	3,604.55
Port captain, Balboa, services	4,722.46

TABLE NO. 8.—*Statement of collections made by collector repaid to appropriations and to individuals and companies, and collections deposited to miscellaneous receipts during fiscal year ended June 30, 1928*—Continued

MAINTENANCE AND OPERATION, PANAMA CANAL—continued	
Collections credited to earnings—Con.	
Port captain, Cristobal, services	$10.00
Admeasurement of vessels	4,500.00
Inspection of vessels	3,844.85
Pilotage, Balboa	103,290.25
Pilotage, Cristobal	233,525.60
Tug and launch service, Balboa	225,167.06
Tug and launch service, Cristobal	239,061.65
Handling lines, Balboa	141,720.87
Handling lines, Cristobal	154,244.00
Aids to navigation	6,159.28
Gatun Locks, services	84.62
Pedro Miguel Locks, services	7.15
Gatun Dam, services	685.80
Dredging division, services	14,482.40
Electric current	316,904.78
Electric work	108,269.10
Telephone, telegraph, and signal work	205,059.70
Sale of water	250,733.13
Municipal engineering work	150,251.92
Water rentals, Panama	158,603.14
Water rentals, Colon	104,187.98
Shop work	1,703,646.47
Dry dockage, Balboa	61,043.83
Dry dockage, Cristobal	20,389.15
Dockage and wharfage	99,101.10
Handling fuel oil	618,290.12
Fuel-oil sales	32,712.61
Fuel-oil tank and tank-site rentals	18,330.84
Business store sales	1,184,087.87
Animal and motor transportation	129,680.36
Motor car repair shop work	42,980.82
Building repairs and construction	779,082.61
Panama Canal press services	96,995.09
Gold quarters rentals	412,537.43
Silver quarters rentals	197,436.35
Garage rentals	40,514.49
Boathouse rentals	389.40
Restaurant rentals	9,808.35
Building and building site rentals	13,420.55
Building sites and rentals, Las Cascadas	3,262.53
Market rentals	2,607.03
Sale of fuel	2,422.04
Sale of gasoline	92,363.99
Sale of general supplies	11,644.75
Exchange of furniture	8,474.31
Exchange of mattresses	4,579.32
Mattress factory sales	25,501.29
Janitor service	26,194.35
Crank-case service	332.25
Hotel Tivoli	215,752.08
Farm produce sales by agronomist	1,521.27
Land rentals	40,262.06
Marine salvage section	49,604.15
Sales of sand and gravel	22,644.30
Sales of nautical charts and publications	2,475.85
Fortification division services	330,924.00
Collections credited to expenses:	
Alhajuela Dam	2,998.15
Commissary coupons honored by the Panama Canal	2,699.07
Electric work	8.31
Telephone and telegraph work	13.75
Municipal engineering work	43.08
Shops and dry docks	15.99
Fuel-oil plants	1.04
Animal and motor transportation	41.56
Building repairs and construction	12,223.29
Gold quarters	64.44
Rented buildings	80.94
District quartermaster supplies	28.99

MAINTENANCE AND OPERATION, PANAMA CANAL—continued	
Collections credited to expenses—Con.	
Hotel Tivoli	$107.77
Marine salvage section	116.09
Fortification division	1,265.70
Claims against carriers and contractors	251.38
Surplus and obsolete property for sale	51,091.00
Surplus and obsolete property sold	13,609.03
Balboa store services	2.79
District quartermaster, Balboa	17.50
Port captain, Balboa	3,808.01
Port captain, Cristobal	2,072.07
Lighthouse subdivision	565.09
Atlantic locks	.92
Pacific locks	144.84
Dredging division	15,062.89
General accounts	11,246.41
Recruiting and repatriating employees	292.50
Total, maintenance and operation	9,228,096.57

SANITATION, CANAL ZONE, PANAMA CANAL	
Deduction certificates for medical services	$23,370.55
Chief health office	337.09
Gorgas hospital fees	315,671.33
Gorgas hospital mess	20,617.11
Gorgas hospital burials	7,598.54
Gorgas hospital miscellaneous	5,534.01
Colon hospital fees	38,806.17
Colon hospital mess	3,874.18
Colon hospital miscellaneous	1,220.09
Line dispensaries	17,439.73
Corozal farm produce	30,730.14
Corozal farm pasturage	13.00
Corozal hospital fees	122,099.93
Corozal hospital miscellaneous	3,960.50
Palo Seco colony	21,445.50
Quarantine subsistence	7,259.98
Quarantine miscellaneous	20,372.04
Sanitation, Panama	7,367.02
Street cleaning and garbage collection, Panama	30,856.07
Sanitation, Colon	1,656.15
Street cleaning and garbage collection, Colon	26,130.14
Sanitation, Canal Zone	19,715.27
Refunds	2,018.35
Total, sanitation	728,092.89

CIVIL GOVERNMENT, PANAMA CANAL AND CANAL ZONE	
Civil affairs	$2.00
Customs	287.75
Postal service	4,349.31
School tuition	9,034.40
Sale of school books	617.80
Miscellaneous school credits	675.61
Fire protection	116.85
Police and prisons	46,255.74
District court	43.90
Refunds	1,198.55
Total, civil government	62,581.91

MISCELLANEOUS RECEIPTS	
Public works, Panama, amortization and interest	$79,392.71
Public works, Colon, amortization and interest	47,990.02
Tolls	26,943,513.11
Postal receipts	148,218.14
Licenses, motor-vehicle	33,084.39

TABLE NO. 8.—*Statement of collections made by collector repaid to appropriations and to individuals and companies, and collections deposited to miscellaneous receipts during fiscal year ended June 30, 1928*—Continued

MISCELLANEOUS RECEIPTS—continued

Licenses, other	$1,046.50
Permits, personal	6,262.00
Permits, corporate	2,553.20
Fees, district court	2,822.54
Fees, magistrates' courts	369.40
Fees, other	2,294.68
Fines, district court	2,860.00
Fines, magistrates' courts	22,995.29
Interest on money-order funds	10,000.00
Miscellaneous	15.00
Total, miscellaneous receipts	27,303,416.98

INDIVIDUALS AND COMPANIES

Panama Railroad	$162.99
Other individuals and companies	127.45
Total, individuals and companies	290.44

RECAPITULATION

Maintenance and operation, Panama Canal	$9,228,096.57
Sanitation, Canal Zone, Panama Canal	728,092.89
Civil government, Panama Canal and Canal Zone	62,581.91
Total repaid to appropriations	10,018,771.37
Miscellaneous receipts	27,303,416.98
Individuals and companies	290.44
Grand total	37,322,478.79

TABLE NO. 9.—*Statement of collections in the collector's special deposit account*

	Fiscal year 1927			Fiscal year 1928		
	United States	Isthmus	Total	United States	Isthmus	Total
On hand July 1	$21,556.63	$311,990.93	$333,547.56	$6,796.20	$460,542.81	$467,339.01
Deposits	342,583.38	31,220,085.66	31,562,669.04	42,427.62	34,279,369.01	34,321,796.63
Total	364,140.01	31,532,076.59	31,896,216.60	49,223.82	34,739,911.82	34,789,135.64
Disposition:						
Panama Canal bills applied	337,935.29	26,308,947.12	26,646,882.41	38,985.60	29,623,204.35	29,662,189.95
Payments to individuals and companies	5,185.47	4,668,455.88	4,673,641.35	4,257.98	4,597,744.13	4,602,002.11
Refunds	14,223.05	94,130.78	108,353.83	5,980.24	40,287.43	46,267.67
Total	357,343.81	31,071,533.78	31,428,877.59	49,223.82	34,261,235.91	34,310,459.73
Balance on hand, June 30	6,796.20	460,542.81	467,339.01	----------	478,675.91	478,675.91

TABLE NO. 11.—*Statement of accounts receivable registered*

	Fiscal year 1927	Fiscal year 1928
Repaid to appropriations:		
Panama R. R. Co	$2,517,937.98	$2,912,756.28
Other departments of the United States	1,395,397.62	1,660,778.28
Individuals and companies	3,900,384.35	3,951,425.00
Total	7,813,719.95	8,524,959.56
Miscellaneous receipts:		
Tolls	24,230,065.29	26,945,609.11
Miscellaneous	1,205.00	1,217.00
Total	24,231,270.29	26,946,826.11
Grand total	32,044,990.24	35,471,785.67
Number of bills registered	41,009	45,695

TABLE NO. 12.—*Comparative statement of accounts receivable outstanding as of June 30, 1928*

	Fiscal year 1927	Fiscal year 1928
Audited bills	$617,347.07	$774,483.03
Hospital certificates	24,694.12	27,196.14
Injury compensation	9,555.97	3,614.26
Cement bags returned to contractors	[1] 23.86	9,515.00
Commissary coupon books	86.80	105.08
Total	651,660.10	814,913.51

[1] Credit.

TABLE NO. 13.—*Comparative statement of accounts payable outstanding as of June 30, 1928*

	Fiscal year, 1927	Fiscal year 1928
United States invoices	$506,948.03	$458,488.17
Isthmus vouchers	121,057.48	148,955.77
Current pay rolls	974,280.09	1,014,885.41
Unpaid salaries and wages	21,320.58	5,517.27
Drums, carboys, and reels	6,044.30	3,282.58
Local purchases	2,725.56	[1] 1,201.37
Total	1,632,376.04	1,629,927.83

[1] Credit.

TABLE NO. 14.—*Defense capital expenditures to June 30, 1928*

Balance June 30, 1927 (for detail see Table 14, annual report, 1927)	$113,122,892.83
Protective fence for locks (completion)	4,444.92
Total	113,127,337.75

TABLE NO. 15.—*Detail of canal fixed property, fiscal year 1928*

	Balance July 1, 1927	Additions	Withdrawals	Balance June 30, 1928
Channels:				
Cristobal to Gatun	$11,636,700.00			$11,636,700.00
Gatun to Pedro Miguel	104,926,542.00			104,926,542.00
Pedro Miguel to Balboa	18,032,612.00			18,032,612.00
Locks:				
Gatun	34,948,625.01			34,948,625.01
Pedro Miguel	15,389,503.80			15,389,503.80
Miraflores	22,744,811.92			
Towing locomotives (2)		$82,352.26		22,827,164.18
Spillways:				
Gatun	3,982,199.00			3,982,199.00
Miraflores	1,231,256.00			1,231,256.00
Floating caisson	326,996.00			326,996.00
Dams:				
Gatun	9,626,678.00			9,626,678.00
Gatun-Mindi Levee	137,822.00			137,822.00
Trinidad River	65,057.00			65,057.00
Pedro Miguel	423,070.00			423,070.00
Miraflores	1,136,594.00			1,136,594.00
Alhajuela	243,585.84	2,774.83		246,360.67
Breakwaters:				
Colon-West	4,189,810.00			4,189,810.00
Naos Island	995,337.00			995,337.00
Aids to navigation	878,829.77			
Purchase of land, Punta Mala		500.00		879,329.77
Roads, streets, and sidewalks	1,060,318.36			
New quarters, New Cristobal		35,126.97		
Miscellaneous		31,252.55		1,126,697.88
Storm sewers	208,161.13			
New quarters, New Cristobal		4,003.89		
Miscellaneous		9,660.56		221,825.58
Street-lighting system	102,921.01			
New quarters, New Cristobal		1,584.35		
Miscellaneous		3,474.96		107,980.32

TABLE NO 15.—*Detail of canal fixed property, fiscal year 1928*—Continued

	Balance July 1, 1927	Additions	Withdrawals	Balance June 30, 1928
General buildings:				
Office buildings	$1,049,046.66			
Administration, Cristobal (part)		$167,436.37		$1,216,483.03
Telephone building, Cristobal	35,600.00			35,600.00
Storehouses	423,650.53			
Dynamite magazine, Summit		10,234.17		433,884.70
Weather and hydrographic structures	12,872.00			12,872.00
Health department buildings:				
Gorgas Hospital	1,305,975.00			1,305,975.00
Colon Hospital	191,630.00			191,630.00
Dispensaries	120,910.00			120,910.00
Asylums	361,129.49			
Female ward, Corozal (completion)		22,553.81		
Mess hall, Corozal (completion)		27,745.92		
Mess hall and kitchen, Palo Seco		14,091.99		
Old buildings, demolished			$15,340.00	410,181.21
Quarantine stations	40,129.00			
Old buildings demolished			8,432.00	31,697.00
Other health department buildings	58,507.00			58,507.00
Cristobal incinerator	88,474.55			88,474.55
Civil government buildings:				
Schoolhouses	443,044.00			
Silver School, Gatun		10,250.68		453,294.68
Post offices	8,995.00			8,995.00
Fire stations	21,644.00			21,644.00
Police stations and prisons	19,870.00			19,870.00
Courthouses	74,896.00			74,896.00
Clubs and playgrounds	131,098.00			131,098.00
Grand total	236,674,901.07	423,043.31	23,772.00	237,074,172.38

TABLE NO. 16.—*Detail of canal equipment, fiscal year 1928*

	Balance July 1, 1927	Additions	Withdrawals	Balance June 30, 1928
Floating equipment:				
Tugs	$818,115.03			
Siri, rebuilt		$12,606.25		
Chagres, built		310,000.00		
Trinidad, built		310,000.00		$1,450,721.28
Supply boats	51,544.48			51,544.48
Launches	232,700.09			
Launch "G," surveyed			$2,929.00	
Hyacinth, surveyed			1,711.29	
Dorothy, improvements		1,450.00		
Heron, built		14,566.42		
Jacana, built		7,019.99		
Porpoise, built		11,333.83		
Tarpon, built		11,307.02		273,737.06
Dredges	1,186,516.60			
No. 83, sold			61,850.00	1,124,666.60
Barges	1,282,743.76			
No. 116, rebuilt		17,686.20		1,300,429.96
Floating cranes	659,524.29			659,524.29
Crane boats	30,000.00			30,000.00
Graders	28,690.30			28,690.30
Drill barges	110,000.00			110,000.00
Air-compressor barge	20,848.00			20,848.00
Relay barges	50,000.00			50,000.00
Other equipment:				
Road rollers	13,786.00			
No. 3, sold			2,750.00	
No. 13, purchased		5,539.02		16,575.02
Automobiles	2,651.23			2,651.23
Excavators	17,370.00			17,370.00
Total	4,504,489.78	701,508.73	69,240.29	5,136,758.22

TABLE NO. 17.—*Business property, by divisions*

	Total	Fixed property	Equipment	Stores	Cash	Work in process	Suspense	Undistributed business capital
Electric light and power system	$7,713,059.61	$7,531,949.66	$10,056.51	$16,053.44			[1] $15,000.00	$170,000.00
Electric work	102,868.92		22,793.42	10,650.84		$4,347.31	77.35	65,000.00
Telephone, telegraph, and signal work	17,315.33		7,226.40	10,088.93				
Water system	3,629,464.53	3,467,398.53	22,325.18	14,392.97			347.85	125,000.00
Municipal engineering work	245,657.06		101,634.03	70,749.05		19,586.89	[1] 41,312.91	95,000.00
Public works, Panama		1,469,266.45						
Repayments		[1] 567,247.23						
Balance	902,019.22	902,019.22						
Public works, Colon		1,249,502.71						
Repayments		[1] 494,967.21						
Balance	754,535.50	754,535.50						
Shops and dry docks	1,555,374.60	264,783.98	343,581.60	30,259.47		470,107.55	[1] 3,358.00	450,000.00
Steamships	1,200,000.00	1,200,000.00						
Docks, wharves, and piers	2,368,200.26	2,368,200.26						
Coaling plants	500,000.00	500,000.00						
Colliers and coal barges	3,629,232.00	3,629,232.00						
Fuel-oil plants	1,574,206.57	1,306,256.42	5,678.93	182,271.22				80,000.00
Business storehouses	800,000.00	300,000.00						500,000.00
Animal and motor transportation	495,050.23	14,085.00	435,965.23					45,000.00
Motor-car repair shop	57,469.29	16,358.32	14,347.07	13,763.90				13,000.00
Building repairs and construction	326,598.86	11,690.00	37,630.05	27,793.45		5,038.18	[1] 5,552.82	250,000.00
Panama Canal press	144,060.10		17,939.68	97,977.09		13,143.33		15,000.00
Gold quarters	4,244,053.45	4,244,053.45						
Silver quarters	631,175.13	639,218.27					[1] 8,043.14	
Rented buildings	421,313.04	393,633.17	27,679.87					
District quartermasters' supplies	7,905.12		5,494.61	591.81			1,818.70	
Hotel Tivoli	257,270.82	162,054.40	74,185.00	4,684.39	$3,552.85	8,049.73	[1] 255.55	5,000.00
Farm bureau	[1] 2,767.74		2,232.26				[1] 5,000.00	
Marine salvage section	24,061.77		23,077.77	984.00				
Sand and gravel	157,652.00			157,652.00				
Nautical charts and publications	579.17			1,984.80		14.67	[1] 1,420.30	
Fortification division	5,760.11						5,760.11	
Total business property	31,762,114.95	27,705,468.18	1,151,847.61	639,897.36	3,552.85	520,287.66	[1] 71,938.71	1,813,000.00

[1] Credit.

TABLE NO. 17.—*Business property by divisions*—Continued

UNDISTRIBUTED BUSINESS CAPITAL BY DIVISIONS

Divisions	Accounts receivable	Working cash	Stores	Total
Electric light and power system	$50,000	$20,000	$100,000	$170,000
Electric work	5,000	10,000	50,000	65,000
Water system	45,000	30,000	50,000	125,000
Municipal engineering work	25,000	20,000	50,000	95,000
Shops and dry docks	100,000	100,000	250,000	450,000
Fuel-oil plants	75,000	5,000	----------	80,000
Business storehouse	250,000	----------	250,000	500,000
Animal and motor transportation	15,000	10,000	20,000	45,000
Motor-car repair shop	----------	3,000	10,000	13,000
Building repairs and construction	25,000	25,000	200,000	250,000
Panama Canal press	10,000	5,000	----------	15,000
Hotel Tivoli	1,000	4,000	----------	5,000
Total	601,000	232,000	980,000	1,813,000

TABLE NO. 18.—*Detail of business fixed property, fiscal year 1928*

	Balance July 1, 1927	Additions	Withdrawals	Balance June 30, 1928
Hydroelectric plant, Gatun	$1,662,456.79	----------	----------	$1,662,456.79
Miraflores power plant	1,443,563.25	$80,853.67	----------	1,524,416.92
Substations	1,860,574.35	----------	----------	1,860,574.35
Transmission system	1,355,733.38	----------	----------	1,355,733.38
Distribution lines	1,114,925.76	----------	----------	----------
New quarters, New Cristobal	----------	9,201.11	----------	----------
Miscellaneous	----------	4,641.35	----------	1,128,768.22
Total, electrical division	7,437,253.53	94,696.13	----------	7,531,949.66
Zone-Panama water system	1,842,509.46	----------	----------	1,842,509.46
Zone-Colon water system	819,487.36	----------	----------	819,487.36
Zone water system	751,589.38	----------	----------	----------
Filter plant, Gamboa	----------	5,449.55	----------	----------
Plant improvements, Mount Hope	----------	8,862.46	----------	----------
12-inch line, New Cristobal to docks	----------	9,920.27	----------	----------
Cross connection 20-inch main to New Cristobal	----------	3,598.67	----------	----------
Clear-water well, Agua Clara	----------	6,474.01	----------	----------
20-inch main, Mount Hope to New Cristobal	----------	14,739.44	----------	----------
Water system to new quarters, New Cristobal	----------	4,767.93	----------	805,401.71
Total, municipal engineering division	3,413,586.20	53,812.33	----------	3,467,398.53
Water works and sewers, Panama	876,353.22	----------	----------	876,353.22
Pavements	592,913.23	----------	----------	592,913.23
Total, public works, Panama	1,469,266.45	----------	----------	1,469,266.45
Less repayments	536,542.94	----------	$30,704.29	567,247.23
Balance	932,723.51	----------	30,704.29	902,019.22
Waterworks and sewers, Colon	623,883.68	----------	----------	623,883.68
Pavements	625,619.03	----------	----------	625,619.03
Total public works, Colon	1,249,502.71	----------	----------	1,249,502.71
Less repayments	469,283.19	----------	25,684.02	494,967.21
Balance	780,219.52	----------	25,684.02	754,535.50
Cristobal Dry Dock	50,000.00	----------	----------	50,000.00
Balboa roundhouse, sand house, water tank	111,500.00	----------	----------	111,500.00
Balboa car and paint shop	95,000.00	----------	----------	95,000.00
Miscellaneous buildings	8,283.98	----------	----------	8,283.98
Total shops and dry docks	264,783.98	----------	----------	264,783.98
Steamships:				
Ancon	600,000.00	----------	----------	600,000.00
Cristobal	600,000.00	----------	----------	600,000.00
Total, steamships	1,200,000.00	----------	----------	1,200,000.00

TABLE No. 18.—*Detail of business fixed property, fiscal year 1928*—Continued

	Balance July 1, 1927	Additions	Withdrawals	Balance June 30, 1928
Pier 18, Balboa	$1,168,200.26			$1,168,200.26
Pier 6, Cristobal	1,200,000.00			1,200,000.00
Total, docks, wharves, and piers	2,368,200.26			2,368,200.26
Cristobal coaling plant	500,000.00			500,000.00
Colliers	2,029,232.00			2,029,232.00
Coal barges	1,600,000.00			1,600,000.00
Total colliers and barges	3,629,232.00			3,629,232.00
Fuel-oil plant, Balboa	511,803.32			
Additional pipe lines		$60,360.39		572,163.71
Fuel-oil plant, Cristobal	734,092.71			734,092.71
Total, fuel-oil plants	1,245,896.03	60,360.39		1,306,256.42
Business storehouses	300,000.00			300,000.00
Animal and motor transportation	14,085.00			14,085.00
Motor-car repair shop	16,633.32			
Building 551, sold			$275.00	16,358.32
Building repairs and construction	11,690.00			11,690.00
Gold quarters	3,862,889.57			
87 houses at New Cristobal (completion)		388,363.88		
Houses 34 and 38, Gaillard, removed			2,200.00	
Houses 602 and 604, Cristobal, sold			5,000.00	4,244,053.45
Silver quarters	626,391.00			
House 3353, Camp Bierd, built		14,127.27		
Houses 432 and 434, Paraiso, demolished			450.00	
House 3014, Camp Bierd, demolished			150.00	
Houses 218 and 324, Colon, demolished			700.00	639,218.27
Rented buildings	372,629.41			
Additional garage stalls		21,003.76		393,633.17
Hotel Tivoli	162,054.40			162,054.40
Grand total	27,138,267.73	632,363.76	65,163.31	27,705,468.18

TABLE No. 19.—*Detail of business equipment, fiscal year 1928*

	Balance July 1, 1927	Additions	With-drawals	Balance June 30, 1928
Electric light and power system: Machinery and tools	$10,056.51			$10,056.51
Electric work:				
Machinery and tools	17,934.57			17,934.57
Automobiles	7,652.29		$2,793.44	4,858.85
Telephone, telegraph, and signal work: Machinery and tools	7,226.40			7,226.40
Water system: Machinery and tools	22,325.18			22,325.18
Municipal engineering work: Machinery and tools	86,220.82	$20,952.23	5,539.02	101,634.03
Shops and dry docks: Machinery and tools	343,581.60			343,581.60
Fuel-oil plants: Machinery and tools	5,678.93			5,678.93
Animal and motor transportation:				
Machinery and tools	10,408.27			10,408.27
Automobiles	406,465.75	32,400.25	16,110.25	422,755.75
Mules	2,801.21			2,801.21
Motor-car repair shop: Machinery and tools	14,347.07			14,347.07
Building repairs and construction: Machinery and tools	37,629.83	2,147.08	2,146.86	37,630.05
Panama Canal press: Machinery and tools	17,939.68			17,939.68
Rented buildings: Restaurants—Machinery and tools	27,679.87			27,679.87
District quartermasters' supplies: Machinery and tools		5,494.61		5,494.61
Hotel Tivoli: Machinery and tools	74,185.00			74,185.00
Farm bureau:				
Machinery and tools	1,145.50			1,145.50
Mules	1,086.76			1,086.76
Marine salvage section:				
Machinery and tools	17,927.77			17,927.77
Barges	5,277.50		127.50	5,150.00
Grand total	1,117,570.51	60,994.17	26,717.07	1,151,847.61

TABLE NO. 20.—*Status of public works in cities of Panama and Colon, June 30, 1928*

	Total	Panama	Colon
Construction cost:			
Waterworks and sewers	$1,500,236.90	$876,353.22	$623,883.68
Pavements	1,218,532.26	592,913.23	625,619.03
Total	2,718,769.16	1,469,266.45	1,249,502.71
Maintenance, operation, and repairs (including proportion of zone system)	3,614,739.62	2,099,306.45	1,515,433.17
Interest at 2 per cent per annum:			
Waterworks and sewers	468,197.17	261,225.78	206,971.39
Pavements	379,819.64	199,305.49	180,514.15
Zone system	275,849.32	185,573.78	90,275.54
Total	1,123,866.13	646,105.05	477,761.08
Total payable from water rentals	7,457,374.91	4,214,677.95	3,242,696.96
Water rentals and deficit payments:			
Maintenance, operation, and repairs	3,614,739.62	2,099,306.45	1,515,433.17
Interest	1,123,866.13	646,105.05	477,761.08
Proportion of capital cost	1,017,483.17	522,515.96	494,967.21
Total	5,756,088.92	3,267,927.46	2,488,161.46
Unpaid deficit bills (to be applied to capital cost)	44,731.27	44,731.27	----------
Capital cost reimbursable June 30, 1928 (in addition to unpaid deficit bills):			
Waterworks and sewers	931,406.15	543,946.51	387,459.64
Pavements	725,148.57	358,072.71	367,075.86
Total	1,656,554.72	902,019.22	754,535.50
Total payable from water rentals	7,457,374.91	4,214,677.95	3,242,696.96

TABLE NO. 21.—*Canal material and supplies on hand*

	Fiscal year 1927	Fiscal year 1928
Balboa store	$2,676,132.61	$3,056,834.87
Medical store	67,427.78	75,797.18
Administration building store	18,881.82	18,811.55
Paraiso store	608,111.85	592,276.88
Cristobal store	528,681.44	561,929.44
Locks store	438,740.91	477,927.95
District quartermasters' stores:		
Balboa	4,429.21	1,725.10
Pedro Miguel	151.43	126,27
Gatun	240.90	100.00
Cristobal	326.58	151.44
Total	5.148.12	2,102.81
Invoices in suspense	10,334.60	[1] 11,543,35
Material drawn by divisions not yet charged to work	29,250.58	22,216,59
Total	4,382,709.71	4,806,353.92
Less reserve for stores adjustments	412,517.06	356,157.32
Book value of stores on hand	3,970,192.65	4,450,196.60

[1] Credit.

TABLE NO. 22.—*Statement of material and supplies received, issued, and sold, all stores, during fiscal year ended June 30, 1928*

Stock on hand July 1, 1927:			
Standard stock		$4,742,715.93	
Scrap and obsolete		97,952.98	
			$4,840,668.91
Received during the year:			
By purchase	$4,944,457.69		
Direct to divisions	2,028,639.59		
		6,973,097.28	
By manufacture—Mechanical division		315,250.28	
			7,288,347.56
Total			12,129,016.47
Issued and sold during the year:			
Issued—			
To business divisions	$3,117,778.55		
To transit divisions	2,449,177.41		
		$5,566,955.96	
Sold		1,169,792 79	
Empty containers returned, etc		63,110.72	
Net inventory adjustments		105,576.01	
			6,905,435.48
On hand July 1, 1928:			
Standard stock		5,122,553.66	
Scrap and obsolete		101,027.33	
			5,223,580.99
Drawn by divisions not yet charged to work:			
Business divisions		201,997.05	
Transit divisions		22,216.59	
			224,213.64
Grand total			5,447,794.63

TABLE NO. 23.—*Statement of canal earnings, expenses, and net expenses*

	Fiscal year 1928		Net canal expenses
	Canal expenses	Earnings	
Executive department:			
Executive offices	$343,637.92	$122,323.26	$221,314.66
Cables and radiograms	555.77	103.03	452.74
General executive expenses	643.52		643.52
Shipping commissioner	42,145.13		42,145.13
Canal record	12,797.43	201.90	12,595.53
Land office	2,400.00		2,400.00
Law books	433.64		433.64
Railroad motor cars	440.39		440.39
Clubs and playgrounds	209,094.14	89,094.14	120,000.00
Total	612,147.94	211,722.33	400,425.61
Accounting department:			
Accounting office	427,280.10	278,610.31	148,669.79
Paymaster's office	46,466.42	27,660.00	18,806.42
Collector's office	51,639.39	32,272.50	19,366.89
Total	525,385.91	338,542.81	186,843.10
Washington office:			
Chief of office	45,550.74	3.33	45,547.41
Purchasing bureau	187,587.66	40,730.75	146,856.91
Assistant auditor's office	28,140.69		28,140.69
Disbursing clerk's office	8,457.94		8,457.94
Total	269,737.03	40,734.08	229,002.95
Civil government:			
Civil affairs	18,611.29	2.00	18,609.29
Customs	27,780.59	287.75	27,492.84
Posts	168,312.07	11,299.31	157,012.76
Schools	319,739.61	10,325.59	309,414.02
Fire protection	143,194.23	295.23	142,899.00
Police and prisons	411,328.38	48,330.88	362,997.50
District court	32,307.89	43.90	32,263.99
District attorney	12,877.64		12,877.64
Marshal	9,711.22		9,711.22
Magistrate's courts	17,055.94		17,055.94
Total	1,160,918.86	70,584.66	1,090,334.20

TABLE NO. 23.—*Statement of canal earnings, expenses, and net expenses*—Continued

	Fiscal year 1928		Net canal expenses
	Canal expenses	Earnings	
Health department:			
Chief health office	$27,827.88	$457.09	$27,370.79
Gorgas Hospital	698,296.51	452,056.77	246,239.74
Colon Hospital	104,879.47	56,739.87	48,139.60
Dispensaries	54,925.63	17,990.85	36,934.78
Corozal Hospital	205,927.85	167,066.16	38,861.69
Palo Seco Colony	42,310.69	21,410.25	20,900.44
Medical store	8,046.45		8,046.45
Quarantine service	67,592.03	28,108.32	39,483.71
Sanitation, Panama	55,437.47	7,754.89	47,682.58
Street cleaning and garbage collection, Panama	68,642.37	55,793.21	12,849.16
Sanitation, Colon	21,232.75	1,599.02	19,633.73
Street cleaning and garbage collection, Colon	56,182.87	46,087.12	10,095.75
Sanitation, Zone	159,099.41	45,950.96	113,148.45
Total	1,570,401.38	901,014.51	669,386.87
Technical divisions:			
Office engineer	75,773.80	59,715.66	16,058.14
Meteorology and hydrography	34,688.06	231.00	34,457.06
Surveys	42,699.80	13,283.81	29,415.99
Total	153,161.66	73,230.47	79,931.19
Storehouses, general:			
Balboa store	383,221.21	235,532.39	147,688.82
Administration building store	6,535.98		6,535 98
Paraiso store	29,688.24	4,508.00	25,180.24
Cristobal store	150,292.83	29,825.92	120,466.91
Total	569,738.26	269,866.31	299,871.95
Public buildings and grounds:			
Chief quartermaster's office	48,705.62	41,846.83	6,858.79
District quartermaster, Balboa	219,862.76	107,261.57	112,601.19
District quartermaster, Pedro Miguel	48,302.20	38,603.11	9,699.09
District quartermaster, Gatun	30,762.43	22,240.94	8,521.49
District quartermaster, Cristobal	76,376.81	31,130.50	45,246.31
Total	424,009.82	241,082.95	182,926.87
Municipal expenses:			
Street lighting	19,969.21		19,969.21
Water for municipal purposes	23,400.00		23,400.00
Roads, streets, and sidewalks	131,164.61		131,164.61
Storm sewers	12,795.69		12,795.69
Operation Pedro Miguel Ferry	32,201.91		32,201.91
Total	219,531.42		219,531.42
Miscellaneous general expense:			
Railroad tracks maintenance	29,295.72		29,295.72
Recruiting and repatriating employees	14,029.68		14,029.68
Transportation, employees on Isthmus	120,000.00		120,000.00
Compensation injured employees	250.00		250.00
Maintenance, laborers' quarters	94,923.06		94,923.06
Total	258,498.46		258,498.46
Marine division:			
Marine superintendent	9,476.59		9,476.59
Port captain, Balboa	132,751.54	7,214.52	125,537.02
Port captain, Cristobal	58,025.74	385.75	57,639.99
Admeasurement of vessels	43,986.66	4,550.00	39,436.66
Inspection of vessels	7,279.26	3,839.85	3,439.41
Pilotage—			
Balboa	177,275.57	103,610.76	73,664.81
Cristobal	202,260.39	233,114.00	[1] 30,853.61
Tugs, launches, and other floating equipment—			
Balboa	259,425.16	238,378.40	21,046.76
Cristobal	234,481.54	250,036.93	[1] 15,555.39
Handling lines—			
Balboa	145,684.91	150,295.87	[1] 4,610.96
Cristobal	150,135.54	154,356.00	[1] 4,220.46
Aids to navigation	230,966.51	8,470.05	222,496.46
Total	1,651,749.41	1,154,252.13	497,497.28

[1] Earnings exceeded expenses.

TABLE NO. 23.—*Statement of canal earnings, expenses, and net expenses*—Continued

	Fiscal year 1928		Net canal expenses
	Canal expenses	Earnings	
Locks operation and maintenance:			
Gatun locks—			
Superintendence	$41,830.94		
Operation	306,234.19		
Maintenance	131,989.36		
Total, Gatun locks	480,054.49	$405.02	$479,649.47
Pedro Miguel locks—			
Superintendence	19,957.63		
Operation	244,833.05		
Maintenance	113,464.70		
Total, Pedro Miguel locks	378,255.38	660.50	377,594.88
Miraflores locks—			
Superintendence	31,122.92		
Operation	279,505.01		
Maintenance	285,048.02		
Total, Miraflores locks	595,675.95		595,675.95
Miraflores spillway	1,247.14		1,247.14
Locks store, Miraflores	9,866.70		9,866.70
Total locks	1,465,099.66	1,065.52	1,464,034.14
Gatun Dam, maintenance	61,181.64	7,826.91	53,354.73
Gatun spillway	3,394.10		3,394.10
Damage to vessels in locks	8,120.45		8,120.45
Damage to vessels in canal	5,578.75		5,578.75
Channel maintenance:			
Atlantic entrance	86,700.49		
Gatun Lake	18,768.46		
Gaillard cut	930,083.75		
Miraflores Lake	331.94		
Pacific entrance	695,849.08		
Cristobal Harbor	36,330.55		
Balboa Harbor	459,482.83		
Removal of floating obstructions	38,522.40		
Floating cranes, maintenance	45,871.70		
Dredging division work	63,621.88	58,452.09	
Total, channel maintenance	2,375,563.08	58,452.09	2,317,110.99
Total	11,334,217.83	3,368,374.77	7,965,843.06
Amortization	350,000.00		350,000.00
Depreciation	635,357.76		635,357.76
Grand total	12,319,575.59	3,368,374.77	8,951,200.82

TABLE NO. 24.—*Detail of canal revenues*

	Fiscal year 1927	Fiscal year 1928
Tolls	$24,217,185.32	$26,943,513.11
Postal receipts	146,099.74	148,218.14
Licenses, fees, fines, etc	67,356.25	74,288.00
Interest	10,000.00	10,000.00
Sale of Government property	167,970.28	
Miscellaneous	197.23	26.43
Total	24,608,808.82	27,176,045.68

TABLE NO. 25.—*Statement of business expenses, revenues, and profit and loss, fiscal year 1928*

	Fiscal year 1928		Profit or loss	Fixed capital charge, 3 per cent per annum
	Expenses	Revenues		
Electric light and power system	$474,777.31	$719,757.34	$244,980.03	$230,246.66
Electrical work	727,989.32	741,387.43	13,398.11	3,693.19
Water system	474,100.93	523,159.68	49,058.75	86,328.21
Municipal engineering work	1,000,938.61	1,040,275.42	39,336.81	9,571.38
Public works, Panama	188,536.08	222,189.60	33,653.52	[2] 33,653.52
Public works, Colon	138,146.33	160,296.40	22,150.07	[2] 22,150.07
Shops and dry docks	3,483,680.18	3,539,812.54	56,132.36	56,667.73
Docks, wharves, and piers	204,975.86	79,001.12	[1] 125,974.74	71,046.00
Handling fuel oil	384,682.55	663,712.75	279,030.20	43,959.08
Business storehouses, including fuel oil	4,350,681.66	4,400,575.81	49,894.15	24,007.57
Animal and motor transportation	410,177.01	441,898.92	31,721.91	14,730.70
Motor-car repair shop	184,823.73	193,368.47	8,544.74	1,701.89
Building repairs and construction	2,137,272.75	2,217,397.83	80,125.08	12,040.85
Panama Canal press	270,162.08	285,656.84	15,494.76	3,994.69
Gold quarters	447,692.69	417,823.08	[1] 29,869.61	123,270.25
Silver quarters	198,988.74	198,988.74	----------	18,536.85
Rented buildings	49,596.79	70,534.71	20,937.92	12,224.17
District quartermasters' supplies	198,968.13	193,771.61	[1] 5,196.52	----------
Hotel Tivoli	217,020.16	237,934.89	20,914.73	7,540.22
Farm bureau	41,481.02	40,907.97	[1] 573.05	67.00
Marine salvage section	118,963.83	51,083.68	[1] 67,880.15	748.09
Sand and gravel	95,588.53	95,418.05	[1] 170.48	5,572.72
Nautical charts and publications	1,426.96	2,437.80	1,010.84	13.31
Fortification division	391,856.56	391,856.56	----------	----------
Grand total	16,192,527.81	16,929,247.24	[3] 736,719.43	781,864.15

[1] Denotes loss.
[2] Figured at 2 per cent in accordance with contract.
[3] Profits on public works, Panama and Colon, amounting to $55,803.59, have been included in quarterly remittances to the United States Treasurer, covering interest and amortization collections from the Republic of Panama. The balance of the $736,719.43, net profits above, after deducting the $55,803.59 already remitted, which balance amounts to $680,915.84, will be immediately covered into the United States Treasury as miscellaneous receipts, United States revenues, in accordance with regulations.

TABLE NO. 26.—*Comparison of expenses, revenues, and surplus to date*

CANAL OPERATIONS

	Tolls	Licenses, fees, postal receipts, etc.	Total transit revenues	Net canal transit expenses	Net revenues (surplus)
1914	$14,618.68	----------	$14,618.68	$166,030.91	[1] $151,412.23
1915	4,343,383.69	----------	4,343,383.69	4,123,128.09	220,255.60
1916	2,399,830.42	$158,711.96	2,558,542.38	6,999,750.15	[1] 4,441,207.77
1917	5,631,781.66	176,617.04	5,808,398.70	6,788,047.60	[1] 979,648.90
1918	6,264,765.71	147,077.57	6,411,843.28	5,920,342.94	491,500.34
1919	6,156,118.95	197,898.03	6,354,016.98	6,112,194.77	241,822.21
1920	8,493,082.56	442,789.01	8,935,871.57	6,548,272.43	2,387,599.14
1921	11,261,919.31	778,197.39	12,040,116.70	9,328,300.14	2,711,816.56
Total	44,565,500.98	1,901,291.00	46,466.791.98	45,986,067.03	480,724.95
To business surplus	----------	480,724.95	480,724.95	----------	480,724.95
	44,565,500.98	1,420,566.05	45,986,067.03	45,986,067.03	----------
1922	11,193,383.47	192,208.85	11,385,592.32	7,919,017.63	3,466,574.69
1923	17,507,630.52	184,213.54	17,691,844.06	7,690,777.56	10,001,066.50
1924	24,289,603.16	392,250.73	24,681,853.89	8,373,905.39	16,307,948.50
1925	21,374,664.12	207,954.04	21,582,618.16	8,116,693.44	13,465,924.72
1926	22,927,456.03	217,680.50	23,145,136.53	7,993,468.47	15,151,668.06
1927	24,217,185.32	391,623.50	24,608,808.82	8,997,715.02	15,611,093.80
1928	26,943,513.11	232,532.57	27,176,045.68	8,951,200.82	18,224,844.86
Total	193,018,936.71	3,239,029.78	196,257,966.49	104,028,845.36	92,229,121.13

[1] Indicates deficit.

TABLE NO. 26—*Comparison of expenses, revenues, and surplus to date*—Contd.

BUSINESS OPERATIONS

	Business revenues	Business expenses	Net revenues (surplus)
1914	$690, 298. 32	$695, 720. 71	[1] $5, 422. 39
1915	2, 135, 074. 92	2, 191, 475. 70	[1] 56, 400. 78
1916	6, 488, 521. 61	6, 476, 623. 17	11, 898. 44
1917	7, 579, 588. 44	7, 540, 160. 78	39, 427. 66
1918	10, 324, 071. 91	10, 317, 912. 35	6, 159. 56
1919	13, 684, 881. 18	13, 623, 853. 92	61, 027. 26
1920	14, 705, 371. 82	14, 465, 685. 69	239, 686. 13
1921	15, 232, 317. 08	14, 668, 105. 88	564, 211. 20
Total	70, 840, 125. 28	69, 979, 538. 20	860, 587. 08
Expense carried in transit operation above		379, 862. 13	[1] 379, 862. 13
Net revenues carried to surplus	70, 840, 125. 28	70, 359, 400. 33	480, 724. 95
Interest on public works, Panama and Colon, etc., not included in net revenues in prior years	619, 584. 59		619, 584. 59
Adjustment status June 30, 1921	71, 459, 709. 87	70. 359, 400. 33	1, 100, 309. 54
1922	7, 747, 227. 57	7, 423, 968. 41	323, 259. 16
1923	10, 872, 843. 36	9, 732, 200. 86	1, 140, 642. 50
1924	12, 968, 777. 29	12, 067, 153. 17	901, 624. 12
1925	14, 564, 114. 93	13, 798, 198. 08	765, 916. 85
1926	15, 874, 478. 01	15, 033, 167. 72	841, 310. 29
1927	15, 878, 654. 57	15, 002, 117. 77	876, 536. 80
1928	16, 929, 247. 24	16, 192, 527. 81	736, 719. 43
Total	166, 295, 052. 84	159, 608, 734. 15	6, 686, 318. 69

[1] Indicates deficit.

COMBINED OPERATIONS

	Revenues	Expenses	Surplus
Canal transit operations	$196, 257, 966. 49	$104, 028, 845. 36	$92, 229, 121. 13
Canal business operations	166, 295, 052. 84	159, 608, 734. 15	6, 686, 318. 69
Total	362, 553, 019. 33	263, 637, 579. 51	98, 915, 439. 82

TABLE NO. 28.—*Detail of replacement reserves*

	Fiscal year 1927	Fiscal year 1928
Canal transit property:		
Equipment—		
Tugs	$491, 674. 59	$176, 947. 62
Supply boats	25, 131. 60	27, 531. 60
Launches	108, 767. 66	112, 272. 78
Dredges	616, 608. 12	49, 950. 15
Barges	422, 455. 14	466, 218. 96
Crane boat	7, 280. 00	8, 960. 00
Graders	25, 923. 60	28, 659. 60
Drill barges	24, 010. 25	35, 260. 17
Air compressor barge	12, 952. 28	14, 285. 72
Relay barges	9, 375. 12	12, 500. 16
Road rollers	11, 308. 04	9, 350. 11
Automobiles	1, 351. 17	1, 555. 72
Excavators	5, 211. 00	6, 948. 00
Reserve equipment	175. 20	175. 20
Total canal transit property	1, 762, 223. 77	950, 615. 79
Business property:		
Fixed property—		
Electric light and power system	249, 456. 94	361, 275. 97
Water system	230, 432. 70	276, 956. 14
Dry docks	25, 000. 00	29, 166. 67
Fuel oil plants	280, 874. 33	322, 415. 94
Animal and motor transportation	7, 042. 66	8, 451. 34
Motor-car repair shop	5, 729. 67	6, 534. 98
Building repairs and construction	5, 720. 70	6, 889. 86
Panama Canal press	15, 000. 00	15, 000. 00
Gold quarters	112, 430. 45	146, 252. 38
Rented buildings	37, 782. 40	38, 681. 06
Hotel Tivoli	80, 323. 37	96, 528. 77
Total fixed property	1, 049, 793. 22	1, 308, 153. 11

TABLE NO. 28.—*Detail of replacement reserves*—Continued

	Fiscal year 1927	Fiscal year 1928
Business property—Continued.		
Equipment, machinery and tools—		
Electric light and power system	$2,721.23	$5,657.39
Electric work	7,117.52	5,990.39
Telephone, telegraph, and signal work	103.74	1,852.58
Water system	2,375.38	1,478.70
Municipal engineering work	44,223.58	54,866.45
Shops and dry docks	36,779.56	56,848.07
Fuel-oil plants	3,286.99	4,522.37
Business storehouses	19,242.37	----------
Animal and motor transportation	30,189.11	38,921.31
Motor-car repair shop	1,574.46	3,504.65
Building repairs and construction	25,253.88	28,992.20
Panama Canal press	14,138.70	9,154.83
Rented buildings	5,063.63	7,781.30
District quartermasters' supplies	----------	220.00
Hotel Tivoli	4,411.01	997.57
Farm bureau	315.91	678.90
Marine salvage section	14,978.33	18,485.70
Total equipment, machinery and tools	211,775.40	239,952.41
Total business property	1,261,568.62	1,548,105.52
Grand total	3,023,792.39	2,498,721.31

TABLE NO. 29.—*Detail of repair reserves*

	Fiscal year 1927	Fiscal year 1928
Canal transit property:		
Equipment—		
Tugs	$502,742.03	$24,822.27
Supply boats	5,560.58	4,394.93
Launches	68,652.11	72,203.12
Dredges	267,857.78	92,658.08
Barges	190,754.78	148,276.38
Crane boat	11,646.44	[1] 13,626.86
Graders	4,568.90	4,903.52
Drill barges	[1] 3,103.13	[1] 10,498.10
Air compressor barge	7,273.90	6,164.31
Relay barges	[1] 32,340.53	[1] 28,595.50
Road rollers	[1] 1,909.60	[1] 1,682.73
Total equipment	1,021,703.26	299,019.42
Business property:		
Fixed property—		
Electric light and power system	18,430.83	23,492.97
Dry docks	298,491.30	284,095.61
Fuel oil plants	413,154.96	117,471.60
Business storehouses	109,123.91	136,015.81
Hotel Tivoli	3,357.16	2,307.25
Farm bureau	4,375.00	1,387.38
Total fixed property	846,933.16	564,770.62
Equipment—		
Shops and dry docks	106,866.26	116,503.30
Building repairs and construction	5,923.19	6,272.67
Marine salvage section	6,085.70	29,987.02
Total equipment	118,875.15	152,762.99
Total business property	965,808.31	717,533.61
Grand total	1,987,511.57	1,016,553.03

[1] Denotes debit.

TABLE NO. 30.—*Detail of gratuity reserves*

	Fiscal year 1927	Fiscal year 1928
Electrical division	$105,033.43	$104,386.28
Municipal engineering work	49,688.85	50,736.69
Mechanical division—shops and dry docks	318,911.37	287,457.74
Building repairs and construction division	34,189.36	42,135.63
Fortification division	11,334.11	18,963.30
Total	519,157.12	503,679.64

TABLE NO. 31.—*Detail of cost of production and distribution of electric current*

	Fiscal year 1927	Fiscal year 1928
Gatun hydroelectric generating station:		
Operation and maintenance	$40,087.40	$45,395.64
Division and general expense	13,092.62	16,080.15
Reserve for depreciation	24,959.40	24,959.40
Reserve for repairs	2,400.00	2,400.00
Total cost	80,539.42	88,835.19
Net kilowatt-hours generated	59,003,218	57,623,973
Unit cost	$0.0014	$0.0015
Miraflores steam electric generating station (old plant): [1]		
Operation and maintenance	$46,643.45	----------
Division and general expense	4,484.12	----------
Reserve for depreciation	2,312.04	----------
Reserve for repairs	660.00	----------
Total cost	54,099.61	----------
Miraflores Diesel electric generating station (new plant): [1]		
Operation and maintenance	33,025.88	36,739.05
Division and general expense	4,131.77	11,882.83
Reserve for depreciation	10,420.95	22,184.07
Total cost	47,578.60	70,805.95
Net kilowatt-hours generated	----------	72,700
Operation of substations:		
Balboa	17,229.31	17,660.26
Cristobal	25,197.98	18,567.75
Gatun	23,121.90	21,981.81
Miraflores	25,345.74	23,171.51
Summit	----------	11,136.62
Gamboa	2,420.13	4,936.78
Division and general expense	26,972.37	29,266.20
Reserve for depreciation	27,615.72	27,615.72
Reserve for repairs	1,500.00	1,500.00
Total cost	149,403.15	155,836.65
Transmission lines:		
Inspection and maintenance	18,975.49	19,858.32
Division and general expense	5,312.87	5,905.81
Reserve for depreciation	20,336.04	20,336.04
Reserve for repairs	4,980.00	4,980.00
Total cost	49,604.40	51,080.17
Distribution lines:		
Inspection and maintenance	79,667.16	90,419.35
Division and general expense	1,232.51	1,076.20
Reserve for depreciation	16,723.80	16,723.80
Total cost	97,623.47	108,219.35
Grand total cost of distributed power	478,848.65	474,777.31
Total net kilowatt-hours (including line loss) [2]	57,861,918	57,696,673
Unit cost exclusive of capital charges	$0.0083	$0.0082

[1] The Miraflores generating station is operated as a reserve station and for stand-by service. On Dec. 31, 1926, the old steam generating station was abandoned and the new Diesel station placed in service. During the fiscal year 1927 the plant was required to carry load on 46 occasions, while during the fiscal year 1928 it was operated for a total of 1,003 engine-hours to care for peak loads and reserve service.

[2] In fiscal year 1927 the old steam plant used 1,141,300 kilowatt-hours in excess of production, but the new Diesel plant produced 72,700 net kilowatt-hours.

TABLE NO. 33.—*Dredging operations (channel maintenance)*

	Atlantic entrance	Gatun Lake	Gaillard Cut	Pacific entrance	Cristobal Harbor	Balboa Harbor	Total
YARDAGE							
Quantities excavated:							
Dipper dredges—							
Earth			201,350	204,150		130,600	536,100
Rock			1,205,200	556,300		36,100	1,797,600
Total			1,406,550	760,450		166,700	2,333,700
Suction dredges, earth	464,550	121,850		407,050	201,500	1,565,900	2,760,850
Total	464,550	121,850		407,050	201,500	1,565,900	2,760,850
Total yardage	464,550	121,850	1,406,550	1,167,500	201,500	1,732,600	5,094,550
COST							
Operation:							
Dredging, dipper—							
Dipper dredges			$225,498.24	$162,689.30		$28,844.88	$417,032.42
Tugs and barges			353,609.54	135,598.60		27,072.88	516,281.02
Hydraulic graders			13,411.81				13,411.81
Drill barges			8,748.10	201,799.54		65,136.44	275,684.08
Drilling			55,627.33				55,627.33
Blasting			459.43				459.43
Sluicing			17,391.73				17,391.73
Channel lights			1,783.07				1,783.07
General expense			146,912.12	63,175.55		5,841.93	215,929.60
Total, dipper dredging			823,441.37	563,262.99		126,896.13	1,513,600.49
Cost per cubic yard			0.5854	0.7407		0.7612	0.6486
Dredging, suction—							
Suction dredges	$43,953.66	$7,560.71		24,498.77	$18,930.17	126,443.41	221,386.72
Tugs and barges	15,427.13						15,427.13
Relay pumps						37,554.33	37,554.33
Pipe lines	8,733.89	9,157.50		3,179.48	7,018.15	64,692.63	92,781.65
Dikes				625.53		2,800.23	3,425.76
General expense	12,591.93	1,473.79		33,816.30	6,464.66	54,876.27	109,222.95
Total, suction dredging	80,706.61	18,192.00		62,120.08	32,412.98	286,366.87	479,798.54
Cost per cubic yard	0.1737	0.1493		0.1526	0.1609	0.1829	0.1738
Total, dredging expense	80,706.61	18,192.00	823,441.37	625,383.07	32,412.98	413,263.00	1,993,399.03
Total cost per cubic yard	0.1737	0.1493	0.5854	0.5357	0.1609	0.2385	0.3913
Expenses, idle equipment	5,993.88	576.46	90,144.39	69,563.29	3,917.57	42,901.43	213,097.02
Drainage projects			16,497.99				16,497.99
Miscellaneous operation							94,116.95
Total channel maintenance	86,700.49	18,768.46	930,083.75	694,946.36	36,330.55	456,164.43	2,317,110.99

TABLE NO. 35.—*Postal service—Statement showing the monthly money-order business of the Canal Zone postal service during the fiscal year ended June 30, 1928*

Month	Money orders issued including deposit money orders		Interest paid on deposit money orders	Money orders paid by Canal Zone post offices			Canal Zone money orders paid by—		
	Number	Amount		United States	Costa Rica	Canal Zone [1]	Martinique	Costa Rica	United States
1927									
July	10,383	$201,184.99	$1,738.51	$18,517.30	$52.46	$99,235.11	----------	----------	$154,120.38
August	8,893	197,344.74	731.84	18,989.89	163.35	71,672.85	$3.00	----------	129,359.89
September	8,439	199,800.03	863.03	19,878.42	74.00	65,098.89	----------	$2,291.28	125,817.87
October	8,714	190,580.37	726.81	15,417.47	64.25	57,752.29	----------	----------	119,534.63
November	9,835	202,414.32	774.47	17,468.50	80.90	52,348.02	----------	----------	109,332.16
December	11,599	221,922.44	865.19	26,470.42	48.98	66,045.30	----------	2,239.83	101,150.01
1928									
January	8,545	180,273.15	807.96	16,515.71	165.12	52,430.43	----------	----------	185,929.27
February	9,550	210,911.36	1,031.91	20,012.40	242.99	59,843.39	----------	----------	101,685.23
March	10,119	214,577.16	679.09	18,340.76	83.05	53,069.22	----------	2,111.52	129,369.95
April	9,163	202,579.42	1,247.48	18,506.69	35.21	80,914.08	----------	----------	160,067.49
May	9,145	194,622.75	1,433.98	20,849.13	40.36	93,855.36	----------	----------	152,186.50
June	9,100	195,928.36	1,476.13	18,265.11	97.09	98,857.69	----------	1,909.53	76,295.57
Total	113,485	2,412,139.09	12,376.40	229,231.80	1,147.76	851,122.63	3.00	8,552.16	1,544,848.95

[1] Including deposit money orders.

TABLE NO. 36.—*Postal service—Statement of postal revenues, fiscal year ended June 30, 1928*

Month	Receipts						Interest on money order funds
	Miscellaneous	Money-order fees	Stamp sales	Box rent	Newspaper postage	Total revenue	
1927							
July	$100.00	$949.65	$8,721.25	$1,475.00	$269.99	$11,515.89	$2,455.80
August	100.00	839.62	9,522.51	157.60	230.68	10,850.41	926.69
September	100.00	787.66	8,161.81	1,242.95	231.66	10,524.08	1,089.27
October	100.00	798.63	8,702.69	1,730.35	236.91	11,568.58	904.38
November	100.00	925.82	9,633.07	148.70	236.92	11,044.51	4,900.27
December	100.00	1,067.87	15,848.44	1,346.35	247.52	18,610.18	905.13
1928							
January	100.00	776.78	9,202.02	1,739.90	264.18	12,082.88	2,524.71
February	100.00	872.61	10,473.19	85.75	225.49	11,757.04	1,015.71
March	100.00	934.74	10,724.14	1,473.50	287.48	13,519.86	898.07
April	100.00	850.08	10,393.13	1,577.10	263.87	13,184.18	4,470.90
May	254.00	847.78	9,891.13	142.85	243.52	11,379.28	1,077.73
June	100.00	852.28	9,663.22	1,374.90	246.49	12,236.89	1,181.03
Totals, 1928	1,354.00	10,503.52	120,936.60	12,494.95	2,984.71	148,273.78	22,349.69
Totals, 1907–1927	19,535.58	311,928.62	1,850,941.54	121,951.30	25,470.37	2,329,827.41	271,167.36
Totals, 1907–1928	20,889.58	322,432.14	1,971,878.14	134,446.25	28,455.08	2,478,101.19	293,517.05

TABLE NO. 42.—*Number of deaths and injuries on the Panama Canal and Panama Railroad Co. and expenditures for account of the United States Employees' Compensation Commission*

PANAMA CANAL DEPARTMENTS AND DIVISIONS ONLY

	Marine	Locks	Dredging	Mechanical	Municipal engineering	Electrical	Construction quartermaster	Health	Civil government	Forts	All other Panama Canal departments and divisions	Grand total, Panama Canal departments and divisions
Classification of payments made during the fiscal year ending June 30, 1928:												
Lump sums	$121.49	$3,330.80	$1,359.88	$3,330.80	$3,357.02	$7,062.40	$7,147.56					$25,709.95
Monthly payments	1,348.85	2,707.96	4,405.81	8,676.35	2,944.47	2,410.99	3,981.76	$405.84	$1,804.47	$1,039.15	$941.27	30,666.92
Total payments	1,470.34	6,038.76	5,765.69	12,007.15	6,301.49	9,473.39	11,129.32	405.84	1,804.47	1,039.15	941.27	56,376.87
Classification of payments made during the fiscal year ending June 30, 1927:												
Lump sums		1,085.43	2,855.50		234.69		3,330.80					7,506.42
Monthly payments	582.34	2,974.25	3,401.42	6,777.63	2,187.00	1,438.62	2,537.93	689.26	814.00	627.33	748.19	22,777.97
Total payments	582.34	4,059.68	6,256.92	6,777.63	2,421.69	1,438.62	5,868.73	689.26	814.00	627.33	748.19	30,284.39
Classification of payments made during the fiscal year ending June 30, 1926:												
Lump sums					618.70		4,556.80			2,458.68		7,634.18
Monthly payments	626.81	2,860.12	2,440.71	4,366.98	1,538.84	988.02	2,430.86	534.26	1,049.67	179.24	1,111.84	18,127.35
Total payments	626.81	2,860.12	2,440.71	4,366.98	2,157.54	988.02	6,987.66	534.26	1,049.67	2,637.92	1,111.84	25,761.53
Injuries incurred during:												
Fiscal year 1928	290	410	441	968	456	118	580	227	37	177	344	4,048
Fiscal year 1927	244	644	400	784	313	104	417	127	16	38	266	3,353
Fiscal year 1926	156	476	285	612	280	111	266	139	13	48	224	2,610
Deaths occurred during:												
Fiscal year 1928	1		1	2						2		6
Fiscal year 1927			1	2	2		3	1				9
Fiscal year 1926	1	1	2	1					1	1	1	8
Time lost account injuries during fiscal year 1928:												
3 days or less	247	386	383	831	380	101	498	186	30	112	296	3,450
4 to 7 days	17	6	20	60	27	7	38	12	4	29	13	233
8 to 14 days	5	9	13	43	20	7	29	9	2	17	20	174
15 to 28 days	7	5	12	21	16	3	7	11		11	10	103
Over 28 days	14	4	12	12	13		8	9	1	8	5	86
Permanent disability			1	1								2
Total time lost	290	410	441	968	456	118	580	227	37	177	344	4,048

TABLE NO. 42.—*Number of deaths and injuries on the Panama Canal and Panama Railroad Co. and expenditures for account of the United States Employees' Compensation Commission*—Continued

DEPARTMENTS AND DIVISIONS AND GRAND TOTALS PANAMA CANAL AND PANAMA RAILROAD CO.

	Panama Railroad			All other Panama Railroad departments and divisions	Total Panama Railroad departments and divisions	Grand total Panama Canal and Panama Railroad	Amount chargeable current fiscal year 1928	Amount chargeable to previous fiscal years, 1916–1927	Total payments
	Harbor terminals	Commissary	Coaling						
Classification of payments made during the fiscal year ending June 30, 1928:									
Lump sums						$25,709.95		$25,709.95	
Monthly payments	$4,217.38	$1,819.00	$672.88	$5,073.00	$11,782.26	42,449.18	$14,877.86	27,571.32	
Total payments	4,217.38	1,819.00	672.88	5,073.00	11,782.26	68,159.13	14,877.86	53,281.27	$68,159.13
Classification of payments made during the fiscal year ending June 30, 1927:									
Lump sums	2,647.51				2,647.51	10,153.93		10,153.93	
Monthly payments	3,971.07	989.64	841.64	3,565.92	9,368.27	32,146.24		32,146.24	
Total payments	6,618.58	989.64	841.64	3,565.92	12,015.78	42,300.17		42,300.17	42,300.17
Classification of payments made during the fiscal year ending June 30, 1926:									
Lump sums	2,536.34		2,237.52	3,112.88	7,886.74	15,520.92		15,520.92	
Monthly payments	5,538.06	1,168.76	1,310.01	2,241.08	10,257.91	28,385.26		28,385.26	
Total payments	8,074.40	1,168.76	3,547.53	5,353.96	18,144.65	43,906.18		43,906.18	43,906.18
Injuries incurred during:									
Fiscal year 1928	534	304	167	194	1,199	5,247	5,247		
Fiscal year 1927	418	213	123	189	943	4,296		4,296	
Fiscal year 1926	355	171	94	141	761	3,371		3,371	
Deaths occurred during:	2			1	3	9			
Fiscal year 1928			2	1	3	12			
Fiscal year 1927	1		1	1	3	11			
Fiscal year 1926									

	Grand totals fiscal years			
	1928	1927	1926	
Time lost account injuries during fiscal year 1928:				
3 days or less	4,306	3,560	2,747	
4 to 7 days	355	242	195	
8 to 14 days	288	226	195	
15 to 28 days	163	154	138	
Over 28 days	131	98	88	
Permanent disability	4	16	8	
Total time lost	5,247	4,296	3,371	

	Panama Railroad			All other Panama Railroad departments and divisions	Total Panama Railroad departments and divisions
	Harbor terminals	Commissary	Coaling		
Time lost account injuries during fiscal year 1928:					
3 days or less	331	253	140	132	856
4 to 7 days	74	17	14	17	122
8 to 14 days	76	12	9	17	114
15 to 28 days	33	9	4	14	60
Over 28 days	20	11		14	45
Permanent disability		2			2
Total time lost	534	304	167	194	1,199

TABLE NO. 58.—*Statement showing the origin and destination of cargo passing through the canal, Atlantic to Pacific*

Origin of cargo	Total cargo tonnage	Tonnage destined for—			
		West coast of North America	West coast of South America	Asia	Australasia
East Coast of United States:					
Fiscal year 1928	5,325,883	2,649,166	356,929	1,682,085	637,703
Fiscal year 1927	5,783,266	2,953,836	391,302	1,628,186	809,942
Fiscal year 1926	5,366,433	2,890,442	383,572	1,357,186	735,233
Fiscal year 1925	4,815,528	2,478,067	378,249	1,237,109	722,103
Fiscal year 1924	5,467,255	2,907,899	347,659	1,545,622	666,075
East coast of North America (other than United States):					
Fiscal year 1928	390,649	204,076	77,951	----------	108,622
Fiscal year 1927	729,975	229,373	84,982	204,070	211,550
Fiscal year 1926	540,282	179,865	97,719	103,959	158,739
Fiscal year 1925	536,703	200,799	190,090	47,016	98,798
Fiscal year 1924	528,837	126,596	300,000	21,808	80,433
Europe:					
Fiscal year 1928	2,126,987	815,461	761,567	----------	549,959
Fiscal year 1927	1,896,140	784,279	605,361	6,902	499,598
Fiscal year 1926	2,047,939	768,053	756,225	743	522,918
Fiscal year 1925	1,978,969	741,705	760,006	8,800	468,458
Fiscal year 1924	1,773,162	703,349	620,503	----------	449,310
East coast of South America and miscellaneous:					
Fiscal year 1928	466,615	466,615	----------	----------	----------
Fiscal year 1927	173,946	152,357	6,009	15,580	----------
Fiscal year 1926	82,443	70,792	7,396	4,255	----------
Fiscal year 1925	67,197	54,060	9,805	3,332	----------
Fiscal year 1924	90,846	62,047	11,404	17,395	----------
Grand totals:					
Fiscal year 1928	8,310,134	4,135,318	1,196,447	1,682,085	1,296,289
Fiscal year 1927	8,583,327	4,119,845	1,087,654	1,854,738	1,521,090
Fiscal year 1926	8,037,097	3,909,152	1,244,912	1,466,143	1,416,890
Fiscal year 1925	7,398,397	3,474,631	1,338,150	1,296,257	1,289,359
Fiscal year 1924	7,860,100	3,799,891	1,279,566	1,584,825	1,195,818

TABLE NO. 59.—*Statement showing the origin and destination of cargo passing through the canal, Pacific to Atlantic*

Origin of cargo	Total cargo tonnage	Tonnage destined for—			
		East coast of United States	Other North America	Europe	Africa, South America, and miscellaneous
West coast of North America:					
Fiscal year 1928	14,701,573	8,153,607	1,236,638	5,163,573	147,755
Fiscal year 1927	13,722,868	8,544,489	1,172,178	3,815,829	190,372
Fiscal year 1926	12,151,661	8,324,410	685,680	3,013,254	128,317
Fiscal year 1925	11,059,409	7,875,201	498,161	2,586,321	99,726
Fiscal year 1924	14,453,405	11,157,946	774,359	2,488,149	32,951
West coast of South America:					
Fiscal year 1928	5,440,000	2,822,886	487,300	2,128,737	1,077
Fiscal year 1927	4,420,091	2,498,445	455,466	1,316,050	150,130
Fiscal year 1926	4,889,695	2,805,631	381,957	1,603,211	98,896
Fiscal year 1925	4,714,243	2,651,266	274,304	1,688,087	100,586
Fiscal year 1924	3,989,078	2,317,537	236,469	1,360,607	74,465
Australasia:					
Fiscal year 1928	683,662	106,678	24,421	552,563	----------
Fiscal year 1927	571,939	80,269	15,747	475,923	----------
Fiscal year 1926	622,609	67,010	11,812	543,787	----------
Fiscal year 1925	480,539	54,543	17,013	407,583	1,400
Fiscal year 1924	360,193	59,559	3,431	297,203	----------
Asia:					
Fiscal year 1928	495,340	495,340	----------	----------	----------
Fiscal year 1927	449,990	370,109	58,843	21,038	----------
Fiscal year 1926	336,386	314,767	11,069	10,550	----------
Fiscal year 1925	306,248	240,423	37,434	28,391	----------
Fiscal year 1924	331,934	278,610	48,324	4,500	500
Grand totals:					
Fiscal year 1928	21,320,575	11,578,511	1,748,359	7,844,873	148,832
Fiscal year 1927	19,164,888	11,493,312	1,702,234	5,628,840	340,502
Fiscal year 1926	18,000,351	11,511,818	1,090,518	5,170,802	227,213
Fiscal year 1925	16,560,439	10,821,433	826,912	4,710,382	201,712
Fiscal year 1924	19,134,610	13,813,652	1,062,583	4,150,459	107,916

TABLE 60.—*Statement showing, by nationality, the number of transits of vessels, aggregate Panama Canal net tonnage, tolls assessed, and tons of cargo carried through the Panama Canal by fiscal years from the opening of the canal, August 15, 1914, to June 30, 1928*

Nationality and fiscal year	Number of ships	Panama Canal net tonnage	Tolls	Tons of cargo
Argentine:				
1916	1	2,335	$1,167.50	
1918	1	(1)	1,093.50	
1923	1	(1)	1,240.00	
1925	2	4,727	16,887.44	
1927	1	(1)	1,200.00	
Total	6	7,062	21,588.44	
Belgian:				
1919	1	265	3,943.75	464
1920	1	266	338.75	406
1921	2	8,092	7,886.25	12,700
1923	3	13,524	13,958.75	23,952
1925	4	12,825	13,907.50	23,259
1926	19	81,774	78,052.62	87,829
1927	16	79,214	75,245.31	82,558
1928	13	61,293	57,407.25	67,411
Total	59	257,253	250,740.18	298,579
Brazilian:				
1920	3	19,164	19,217.88	8,916
1921	1	4,566	4,388.75	6,700
Total	4	23,730	23,606.63	15,616
British:				
1915	465	1,630,833	1,847,341.10	2,200,514
1916	358	1,161,097	1,140,395,07	1,570,660
1917	780	2,663,250	2,595,158.60	3,393,750
1918	702	2,529,203	2,498,596.49	2,615,675
1919	607	1,915,744	1,954,715.87	1,876,939
1920	753	2,760,188	2,805,018.50	2,830,268
1921	972	3,978,329	3,989,281.58	3,738,257
1922	935	3,795,526	3,728,007.80	3,329,861
1923	1,065	4,892,338	4,736,221.04	4,929,317
1924	1,265	6,097,611	5,814,983.83	6,051,842
1925	1,211	5,949,391	5,734,039.19	5,917,058
1926	1,423	7,039,542	6,569,712.05	6,750,843
1927	1,351	6,942,555	6,452,527.30	6,436,785
1928	1,842	8,976,960	8,073,815.68	8,075,022
Total	13,729	60,332,567	57,939,814.10	59,716,791
Chilean:				
1915	35	94,638	101,275.95	50,879
1916	33	91,243	80,192.25	53,573
1917	99	265,210	236,588.20	184,446
1918	96	254,841	223,146.30	153,259
1919	93	253,561	212,511.90	161,340
1920	79	212,000	169,472.55	104,738
1921	63	159,727	147,023.75	61,737
1922	53	150,398	115,757.90	46,182
1923	62	201,411	158,182.50	76,670
1924	47	176,472	157,035.25	107,147
1925	29	129,183	121,699.25	96,369
1926	26	121,901	113,603.75	82,695
1927	27	114,427	106,899.60	86,960
1928	32	124,959	118,862.95	81,678
Total	774	2,349,971	2,062,252.10	1,347,673
Chinese:				
1918	2	7,799	33,842.60	13,417
1919	4	15,204		13,421
1920	2	7,799		13,700
1921	4	12,098	13,187.10	14,400
Total	12	42,900	47,029.70	54,938

[1] War vessel, displacement tonnage.

TABLE 60.—*Statement showing, by nationality, the number of transits of vessels, aggregate Panama Canal net tonnage, tolls assessed, and tons of cargo carried through the Panama Canal by fiscal years from the opening of the canal, August 15, 1914, to June 30, 1928*—Continued

Nationality and fiscal year	Number of ships	Panama Canal net tonnage	Tolls	Tons of cargo
Colombian:				
1919	1	66	$49.50	----------
1920	1	95	105.00	27
1923	18	6,030	7,109.60	7,054
1924	22	5,767	6,612.11	5,897
1925	23	1,752	1,758.77	1,563
1926	46	4,897	5,195.40	5,378
1927	52	21,500	22,592.25	20,917
1928	99	39,162	41,194.42	33,909
Total	262	79,269	84,617.05	74,745
Costa Rican:				
1917 to 1920	55	4,506	5,394.95	6,297
1921	16	2,784	2,952.78	2,112
1922	1	18	18.75	----------
1923	1	45	53.75	5
1927	2	138	103.50	----------
1928	2	138	103.50	----------
Total	77	7,629	8,627.23	8,414
Cuban:				
1917	6	9,292	9,847.50	7,370
1921	1	702	722.50	1,200
Total	7	9,994	10,570.00	8,570
Danish:				
1915	24	92,537	110,680.30	116,603
1916	18	68,011	66,938.80	94,950
1917	43	163,882	141,461.44	242,567
1918	100	272,946	249,761.14	420,063
1919	79	213,534	207,404.47	325,277
1920	9	32,221	43,528.35	42,533
1921	60	236,512	241,411.86	322,059
1922	53	227,473	222,146.65	272,779
1923	65	240,053	221,569.36	307,876
1924	65	245,929	229,205.17	317,274
1925	42	160,299	152,641.74	201,577
1926	63	234,753	223,595.27	295,530
1927	46	198,432	187,640.36	261,543
1928	69	285,396	271,851.95	380,240
Total	736	2,671,978	2,569,836.86	3,600,871
Danzig:				
1924	11	88,276	72,498.00	54,764
1925	10	80,164	61,920.53	54,607
1926	15	105,460	89,852.25	95,604
1927	29	192,947	166,959.26	159,362
1928	29	190,947	163,504.90	154,597
Total	94	657,794	554,734.94	518,934
Dutch:				
1915	7	21,075	24,103.58	26,402
1916	15	39,642	43,910.44	61,959
1917	74	260,500	270,321.78	314,203
1918	48	197,627	214,211.46	233,063
1919	19	88,299	97,467.75	119,297
1920	29	152,535	126,868.98	128,442
1921	50	248,801	229,248.94	216,488
1922	66	293,428	260,138.38	290,573
1923	109	510,970	450,356.36	487,957
1924	102	551,761	489,807.74	573,929
1925	102	531,251	484,614.29	619,017
1926	93	530,652	489,405.80	552,741
1927	105	575,065	542,023.19	571,700
1928	137	644,390	561,044.93	637,178
Total	956	4,645,996	4,283,523.62	4,832,949

TABLE 60.—*Statement showing, by nationality, the number of transits of vessels, aggregate Panama Canal net tonnage, tolls assessed, and tons of cargo carried through the Panama Canal by fiscal years from the opening of the canal, August 15, 1914, to June 30, 1928*—Continued

Nationality and fiscal year	Number of ships	Panama Canal net tonnage	Tolls	Tons of cargo
Ecuadorian:				
1919	1	66	$82.50	72
1924	1	36	27.00	
1926	3	453	477.90	340
1927	6	1,210	1,322.46	1,638
1928	1	307	368.40	500
Total	12	2,072	2,278.26	2,550
Finnish:				
1921	2	4,281	5,137.20	7,101
1924	3	4,798	5,757.60	7,500
1925	3	8,145	8,974.00	12,892
1926	2	3,632	4,358.40	6,600
1927	2	3,722	3,644.55	3,100
1928	3	8,128	8,922.60	9,544
Total	15	32,706	36,794.35	46,737
French:				
1915	3	10,703	12,843.60	13,600
1916	1	4,343	4,782.50	7,176
1917	9	38,889	39,446.42	36,680
1918	52	147,805	152,028.03	159,859
1919	104	253,774	283,971.06	286,812
1920	60	114,664	127,818.17	125,249
1921	44	155,889	164,575.94	132,836
1922	51	190,171	216,475.40	139,463
1923	56	252,333	258,360.69	230,175
1924	83	386,640	428,571.60	407,249
1925	105	489,806	491,042.27	481,526
1926	90	421,752	414,556.96	398,393
1927	116	535,719	518,419.78	530,026
1928	127	580,769	576,627.46	600,421
Total	901	3,583,257	3,689,519.88	3,549,465
German:				
1920	17	52,755	49,953.38	59,239
1921	19	67,334	62,908.95	73,837
1922	37	122,893	120,087.25	121,888
1923	90	336,149	312,395.35	330,134
1924	150	660,156	604,085.65	737,103
1925	163	723,067	660,896.34	830,512
1926	163	726,340	658,858.12	885,007
1927	212	779,812	707,510.22	973,741
1928	316	995,629	892,511.39	1,185,421
Total	1,167	4,464,135	4,069,206.65	5,196,882
Greek:				
1918 to 1919	5	14,575	12,040.59	14,042
1922	5	18,618	19,293.40	11,956
1923	6	23,526	20,328.93	30,533
1924	1	4,038	3,958.75	6,562
1925	3	11,545	11,810.00	18,823
1926	8	32,076	28,996.52	35,432
1927	1	4,047	4,010.00	6,124
1928	12	46,040	40,233.42	66,554
Total	41	154,465	140,671.61	190,026
Honduran:				
1915	3	606	561.00	321
1916	3			
1926	20	28,443	25,541.40	6,126
1927	1	425	306.00	
1928	1	991	1,189.20	552
Total	28	30,465	27,597.60	6,999
Irish: 1925	8	29,176	25,833.36	24,286

TABLE 60.—*Statement showing, by nationality, the number of transits of vessels, aggregate Panama Canal net tonnage, tolls assessed, and tons of cargo carried through the Panama Canal by fiscal years from the opening of the canal, August 15, 1914, to June 30, 1928*—Continued

Nationality and fiscal year	Number of ships	Panama Canal net tonnage	Tolls	Tons of cargo
Italian:				
1915	2	4,158	$3,992.40	900
1916	1	3,861	2,779.92	----------
1917	2	6,430	6,029.80	5,700
1918	4	17,218	16,875.70	13,793
1920	26	98,692	98,959.79	63,441
1921	25	102,783	103,206.60	47,988
1922	20	73,393	75,511.30	38,851
1923	29	117,782	119,329.58	75,258
1924	43	164,448	170,565.90	125,156
1925	57	241,054	257,881.25	180,062
1926	90	379,990	405,031.30	322,236
1927	74	344,491	363,168.32	308,050
1928	118	580,721	567,807.85	498,807
Total	491	2,135,021	2,191,139.71	1,680,242
Japanese:				
1915	6	24,897	30,260.40	42,600
1916	24	81,818	88,229.68	117,780
1917	72	291,500	305,702.63	446,358
1918	54	238,814	248,063.30	407,399
1919	87	341,064	364,622.57	503,427
1920	118	515,243	543,936.93	726,338
1921	136	613,245	655,176.51	758,617
1922	189	872,466	953,949.00	1,044,515
1923	163	753,219	815,638.48	943,400
1924	171	815,468	844,976.31	935,245
1925	172	823,869	853,199.19	946,916
1926	131	649,028	671,071.35	667,982
1927	165	818,310	862,699.61	1,036,786
1928	188	909,232	949,424.69	1,041,166
Total	1,676	7,748,173	8,186,950.65	9,618,529
Mexican:				
1917 to 1919	15	24,788	24,626.95	22,940
1921	4	5,032	4,354.36	3,785
1922	6	2,219	1,780.77	10
1923	2	2,292	2,661.75	----------
1924	1	192	138.24	----------
1925	2	4,291	4,056.25	2,400
1926	1	2,025	2,111.25	1,064
1927	1	2,159	1,961.25	2,145
Total	32	42,998	41,690.82	32,344
Nicaraguan:				
1915 to 1917	3	1,644	1,205.76	6
1925	1	425	306.00	----------
Total	4	2,069	1,511.76	6
Norwegian:				
1915	42	130,776	141,066.91	166,522
1916	44	172,459	149,357.56	229,368
1917	145	490,534	448,948.53	597,581
1918	296	876,024	823,748.57	1,090,823
1919	128	497,555	460,057.68	577.679
1920	106	397,632	371,408.79	404,323
1921	140	548,227	523,311.94	637,887
1922	113	385,007	374,870.62	408,268
1923	147	597,359	558,839.74	704,292
1924	136	546,633	496,876.96	539,101
1925	192	672,663	619,403.58	842,708
1926	306	987,040	875,812.99	1,051,276
1927	265	907,675	808,621.74	1,052,453
1928	313	1,181,189	1,052,127.36	1,268,124
Total	2,373	8,390,773	7,704,452.97	9,570,405

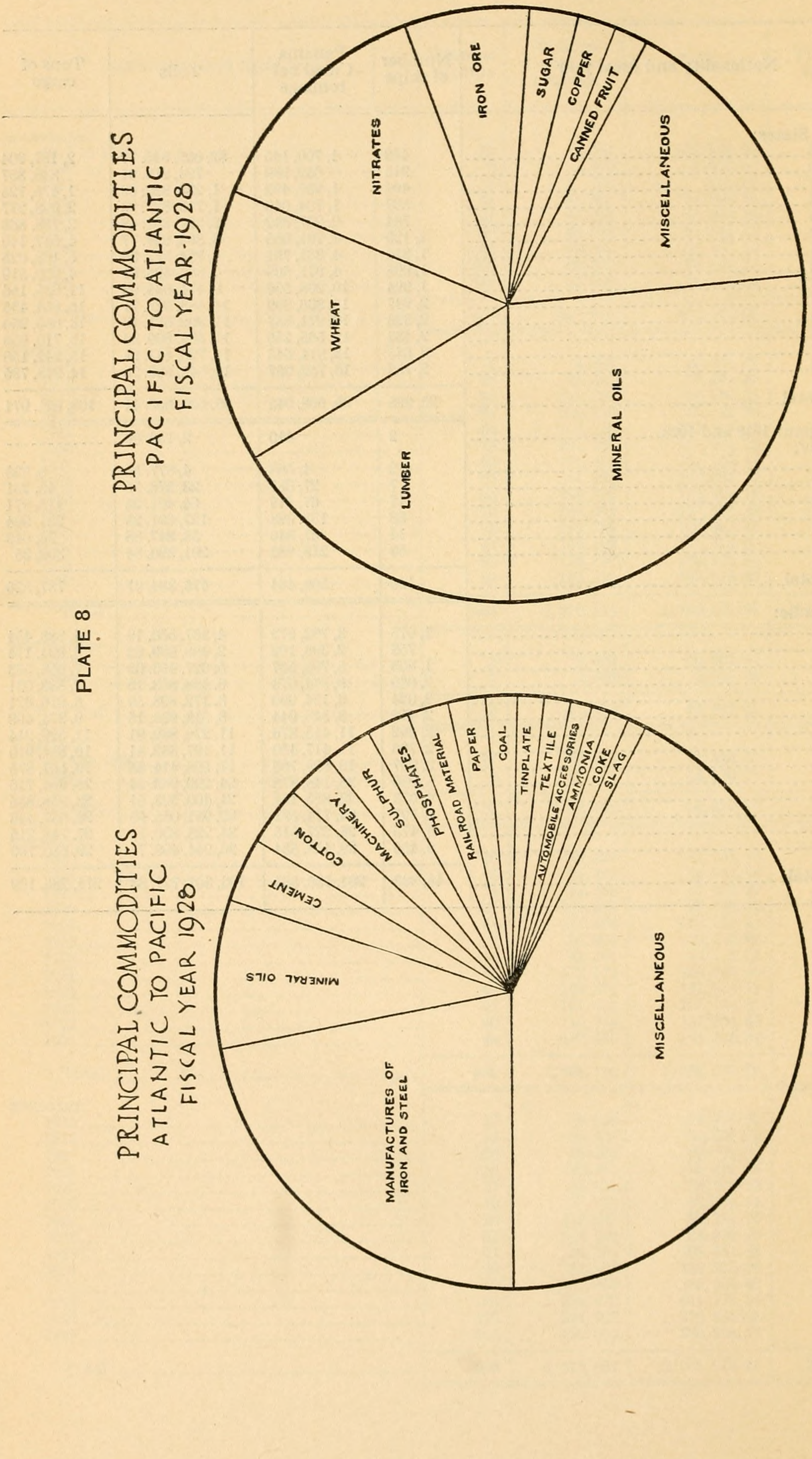
TABLE 60.—*Statement showing, by nationality, the number of transits of vessels, aggregate Panama Canal net tonnage, tolls assessed, and tons of cargo carried through the Panama Canal by fiscal years from the opening of the canal, August 15, 1914, to June 30, 1928*—Continued

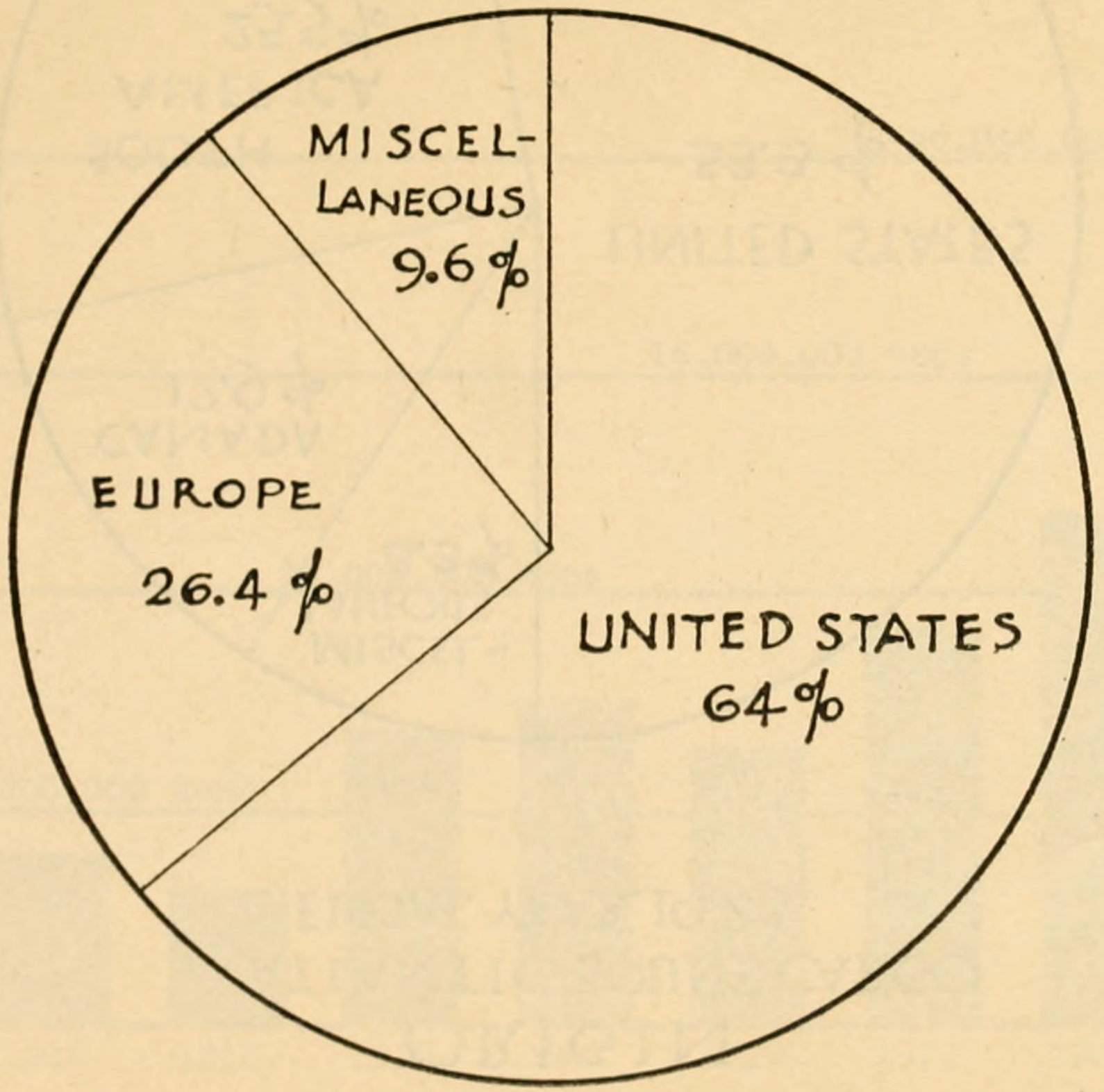
Nationality and fiscal year	Number of ships	Panama Canal net tonnage	Tolls	Tons of cargo
Panaman:				
1915 to 1920	15	1,681	$1,144.90	1,007
1921	8	1,370	1,463.50	1,500
1922	8	700	611.30	526
1923	31	61,828	59,259.86	40,589
1924	21	43,056	40,804.19	35,719
1925	36	68,656	51,844.12	53,627
1926	53	84,295	64,187.40	63,922
1927	105	85,374	66,844.25	87,776
1928	138	82,650	64,370.53	65,559
Total	415	429,610	350,530.05	350,225
Peruvian:				
1915	4	9,403	10,034.30	8,202
1916	30	74,429	67,691.30	62,210
1917	86	218,593	199,860.25	159,609
1918	83	208,958	177,732.30	143,344
1919	64	166,956	133,243.12	121,524
1920	75	191,689	161,964.75	119,418
1921	60	157,495	107,160.64	105,322
1922	60	161,930	103,035.30	64,370
1923	80	216,829	152,620.10	111,519
1924	70	189,046	127,183.38	102,136
1925	73	188,784	126,985.45	101,005
1926	64	149,162	111,618.67	94,778
1927	63	143,157	123,125.70	107,997
1928	53	140,323	107,576.65	96,175
Total	865	2,216,754	1,709,831.91	1,397,609
Portuguese:				
1920	2	9,002	10,802.40	10,775
1926	1	2,360	2,645.00	4,500
Total	3	11,362	13,447.40	15,275
Russian:				
1915 to 1920	17	45,913	44,826.02	52,550
1921	4	11,279	12,156.25	11,343
Total	21	57,192	56,982.27	63,893
Spanish:				
1917	20	49,124	47,731.15	71,080
1918	11	24,469	24,032.78	35,394
1919	5	11,066	11,092.29	10,047
1920	41	106,651	98,228.02	101,563
1921	44	117,400	118,548.41	143,076
1922	9	27,264	32,712.88	23,701
1923	14	41,201	38,102.75	32,178
1924	45	172,572	160,336.90	67,903
1925	43	159,579	147,985.73	72,011
1926	31	121,461	117,786.81	49,956
1927	30	110,544	107,904.65	47,576
1928	46	157,465	151,375.32	104,606
Total	339	1,098,796	1,055,837.69	759,091
Swedish:				
1915	17	50,824	58,174.76	53,292
1916	13	41,537	35,892.70	47,236
1917	18	69,202	56,793.78	94,515
1918	26	80,191	74,621.25	132,521
1919	27	95,684	88,572.73	143,516
1920	19	76,825	62,268.74	74,244
1921	25	113,661	93,331.25	128,919
1922	35	124,446	105,939.90	141,448
1923	31	130,361	108,151.33	181,810
1924	39	161,993	130,935.00	220,517
1925	49	225,593	186,404.82	282,447
1926	84	369,272	311,174.14	636,266
1927	106	394,907	329,804.98	652,173
1928	111	480,006	396,908.28	705,154
Total	600	2,414,502	2,038,973.66	3,494,058

TABLE 60.—*Statement showing, by nationality, the number of transits of vessels, aggregate Panama Canal net tonnage, tolls assessed, and tons of cargo carried through the Panama Canal by fiscal years from the opening of the canal, August 15, 1914, to June 30, 1928*—Continued

Nationality and fiscal year	Number of ships	Panama Canal net tonnage	Tolls	Tons of cargo
United States:				
1915	459	1,700,145	$2,002,845.77	2,187,904
1916	213	652,989	724,219.01	848,857
1917	404	1,239,492	1,238,322.63	1,475,725
1918	567	1,704,040	1,713,827.23	2,098,277
1919	784	2,257,342	2,327,261.48	2,758,886
1920	1,129	3,791,088	3,805,924.77	4,547,140
1921	1,210	4,861,761	4,784,577.35	5,163,025
1922	1,095	4,971,509	4,867,495.81	4,950,519
1923	1,994	10,208,536	9,474,034.93	11,055,156
1924	2,947	15,806,899	14,483,327.71	16,654,435
1925	2,326	12,271,387	11,302,031.19	13,080,200
1926	2,432	12,565,255	11,539,809.38	13,710,956
1927	2,685	13,914,645	12,720,447.95	15,242,156
1928	2,753	13,752,957	12,645,880.20	14,248,735
Total	20,998	99,698,045	93,630,005.41	108,021,971
Uruguayan: 1919 and 1920	2	410	2,136.00	----------
Yugoslav:				
1921	2	4,508	4,877.50	8,325
1924	7	27,087	23,276.25	45,231
1925	17	67,519	64,401.25	115,971
1926	33	133,028	127,601.25	231,994
1927	14	57,340	53,847.88	76,649
1928	53	218,982	201,390.84	309,35
Total	126	508,464	475,394.97	787,526
Total traffic:				
1915	1,075	3,792,572	4,367,550.19	4,888,454
1916	758	2,396,162	2,408,089.62	3,094,114
1917	1,803	5,798,557	5,627,463.05	7,058,563
1918	2,069	6,574,073	6,438,853.15	7,532,031
1919	2,024	6,124,990	6,172,828.59	6,916,621
1920	2,478	8,546,044	8,513,933.15	9,374,499
1921	2,892	11,415,876	11,276,889.91	11,599,214
1922	2,736	11,417,459	11,197,832.41	10,884,910
1923	3,967	18,605,786	17,508,414.85	19,567,875
1924	5,230	26,148,878	24,290,963.54	26,994,710
1925	4,673	22,855,151	21,400,523,51	23,958,836
1926	5,197	24,774,591	22,931,055.98	26,037,448
1927	5,475	26,227,815	24,228,830.11	27,748,215
1928	6,456	29,458,634	26,944,499.77	29,630,709
Total	46,833	204,136,588	193,307,727.83	215,286,199

PLATE 8


PRINCIPAL COMMODITIES
PACIFIC TO ATLANTIC
FISCAL YEAR-1928
WHEAT
LUMBER
NITRATES
IRON ORE
SUGAR
COPPER
CANNED FRUIT
MISCELLANEOUS
MINERAL OILS
PRINCIPAL COMMODITIES
ATLANTIC TO PACIFIC
FISCAL YEAR 1928
MINERAL OILS
CEMENT
COTTON
MACHINERY
SULPHUR
PHOSPHATES
RAILROAD MATERIAL
PAPER
COAL
TINPLATE
TEXTILE
AUTOMOBILE ACCESSORIES
AMMONIA
COKE
SLAG
MANUFACTURES OF IRON AND STEEL
MISCELLANEOUS


ORIGIN
PACIFIC BOUND CARGO
FISCAL YEAR 1928
MISCEL-
LANEOUS
9.6%
EUROPE
26.4%
UNITED STATES
64%

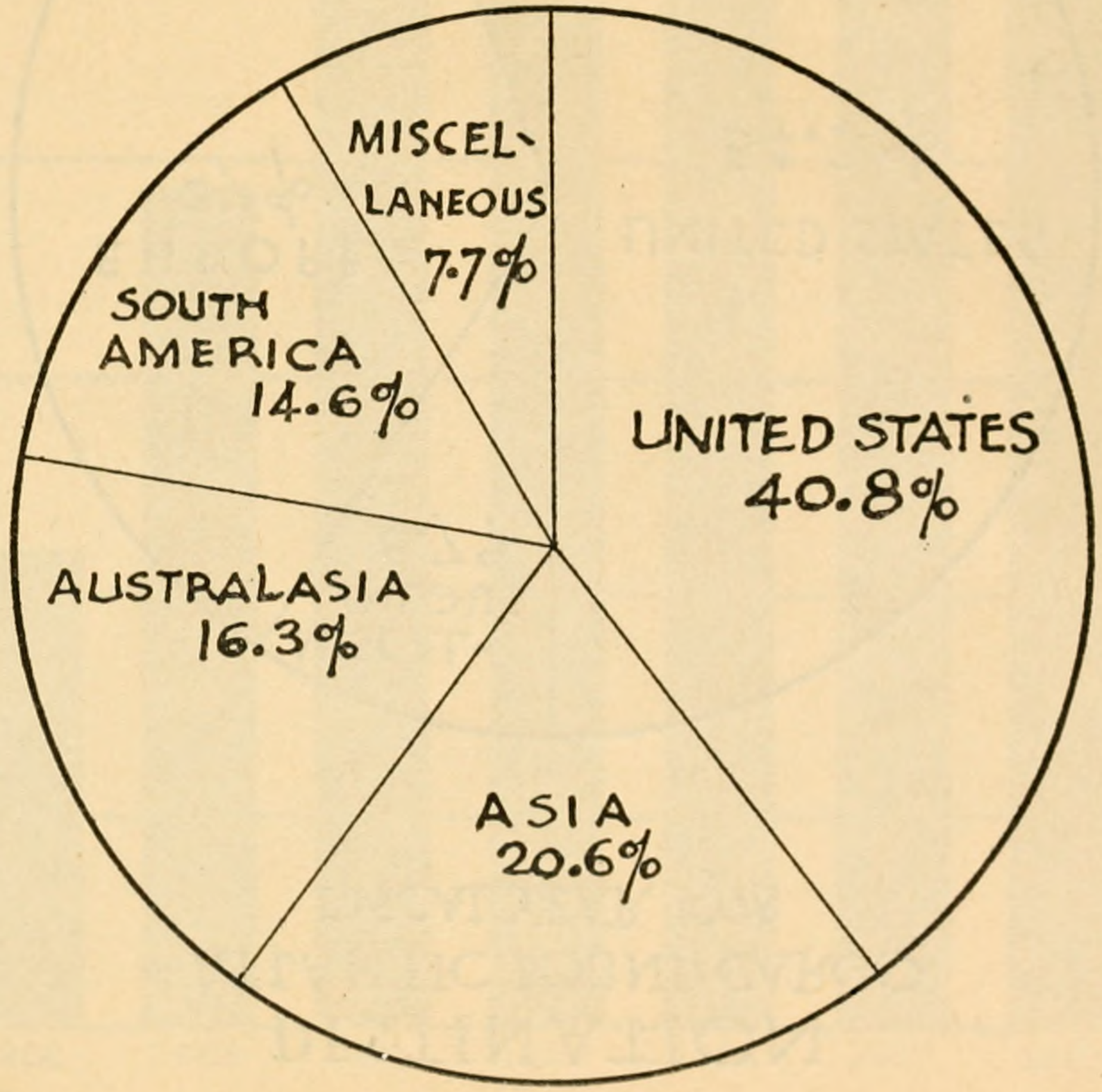
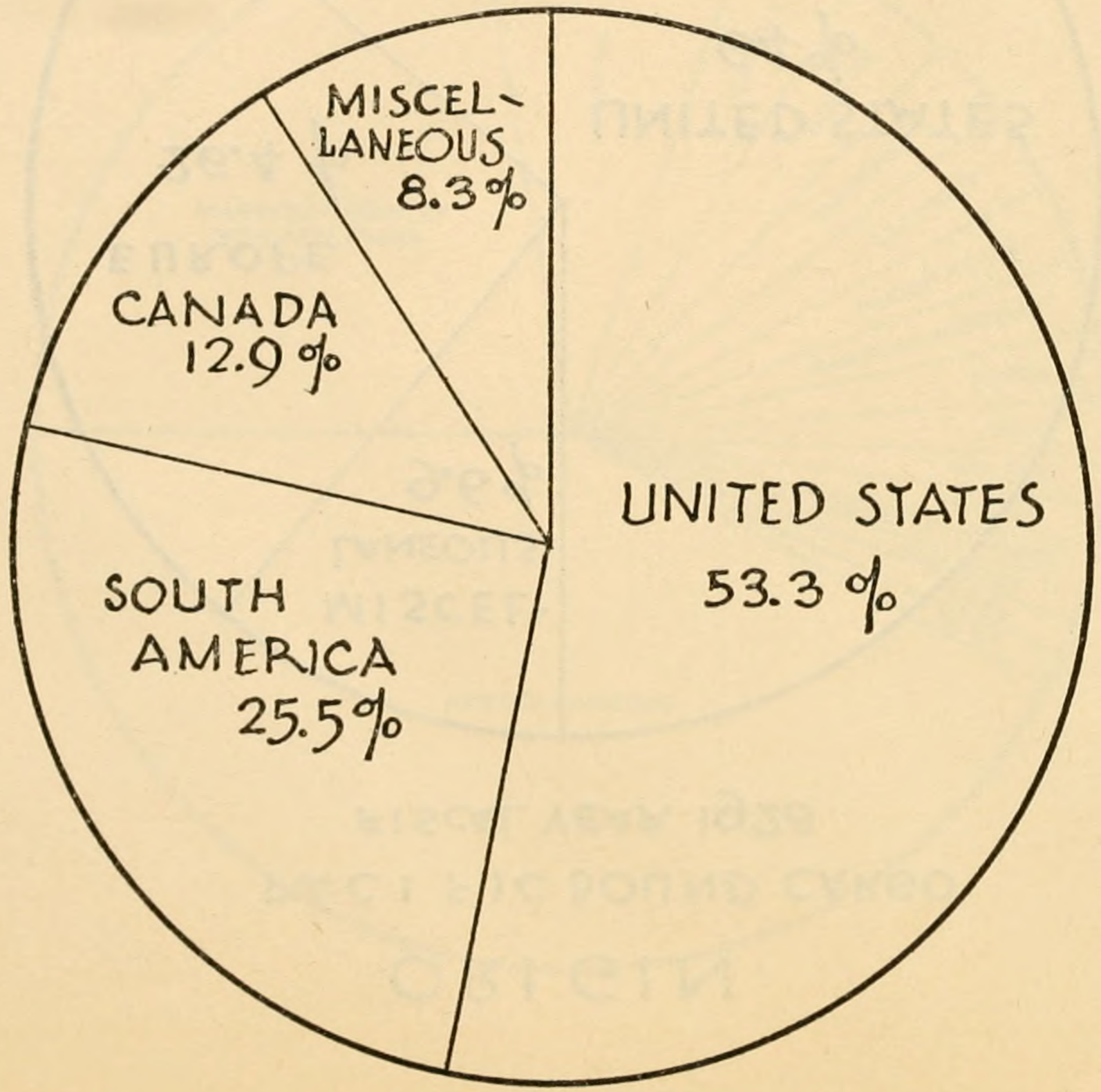

DESTINATION
PACIFIC BOUND CARGO
FISCAL YEAR 1928
MISCEL-
LANEOUS
7.7%
SOUTH
AMERICA
14.6%
UNITED STATES
40.8%
AUSTRALASIA
16.3%
ASIA
20.6%

PLATE 10

ORIGIN
ATLANTIC BOUND CARGO
FISCAL YEAR 1928



DESTINATION
ATLANTIC BOUND CARGO
FISCAL YEAR 1928

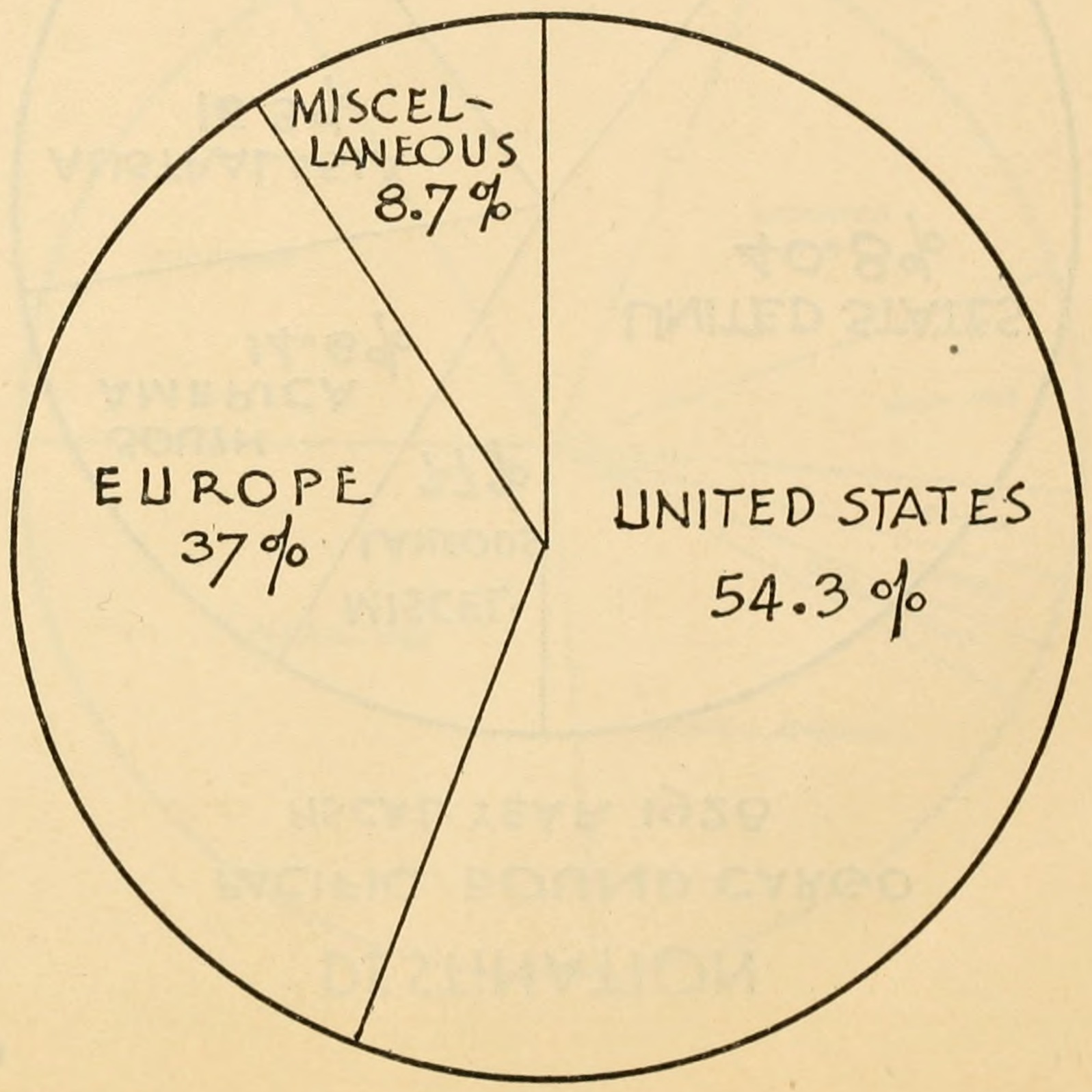
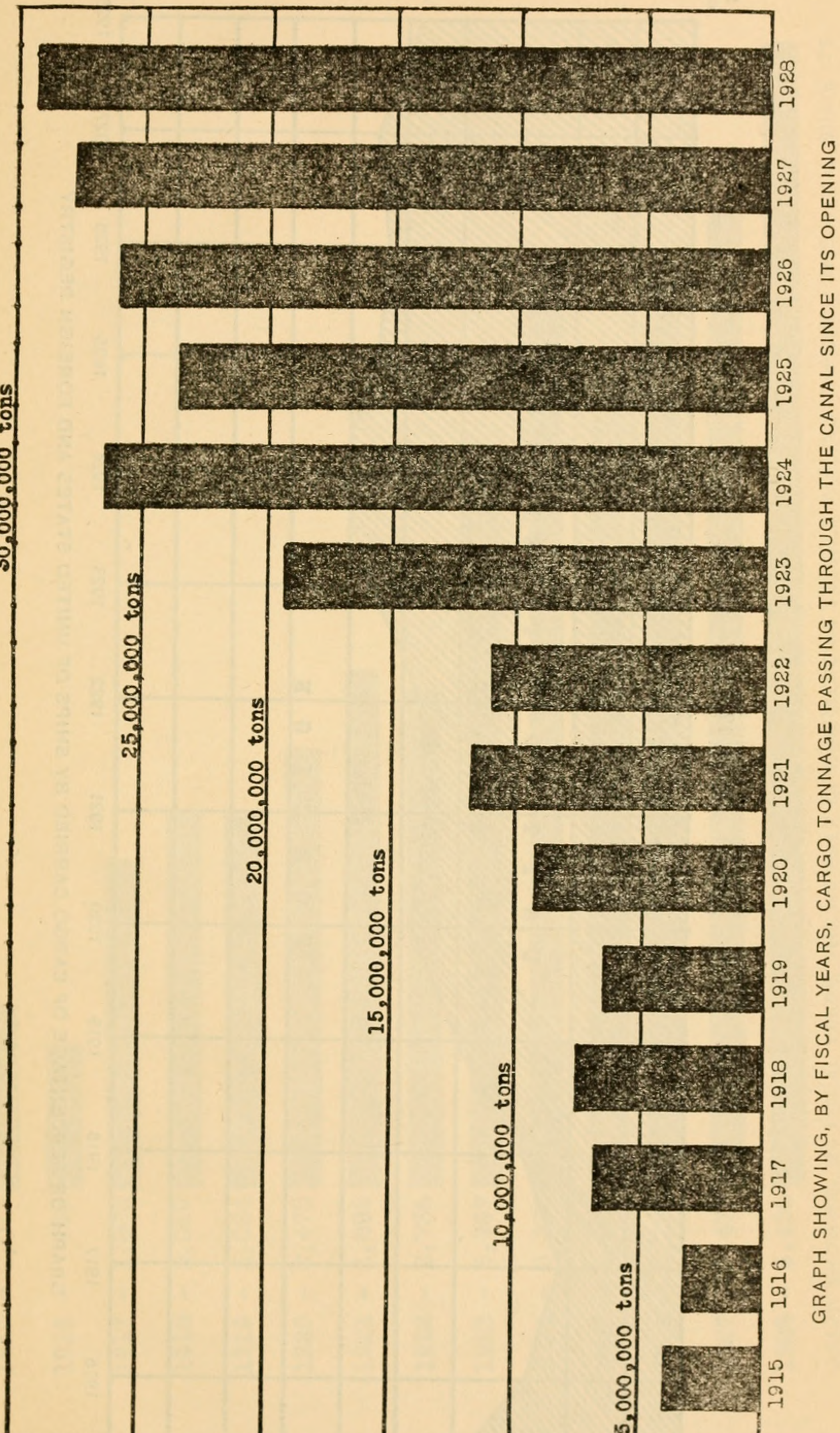


PLATE 11



GRAPH SHOWING, BY FISCAL YEARS, CARGO TONNAGE PASSING THROUGH THE CANAL SINCE ITS OPENING

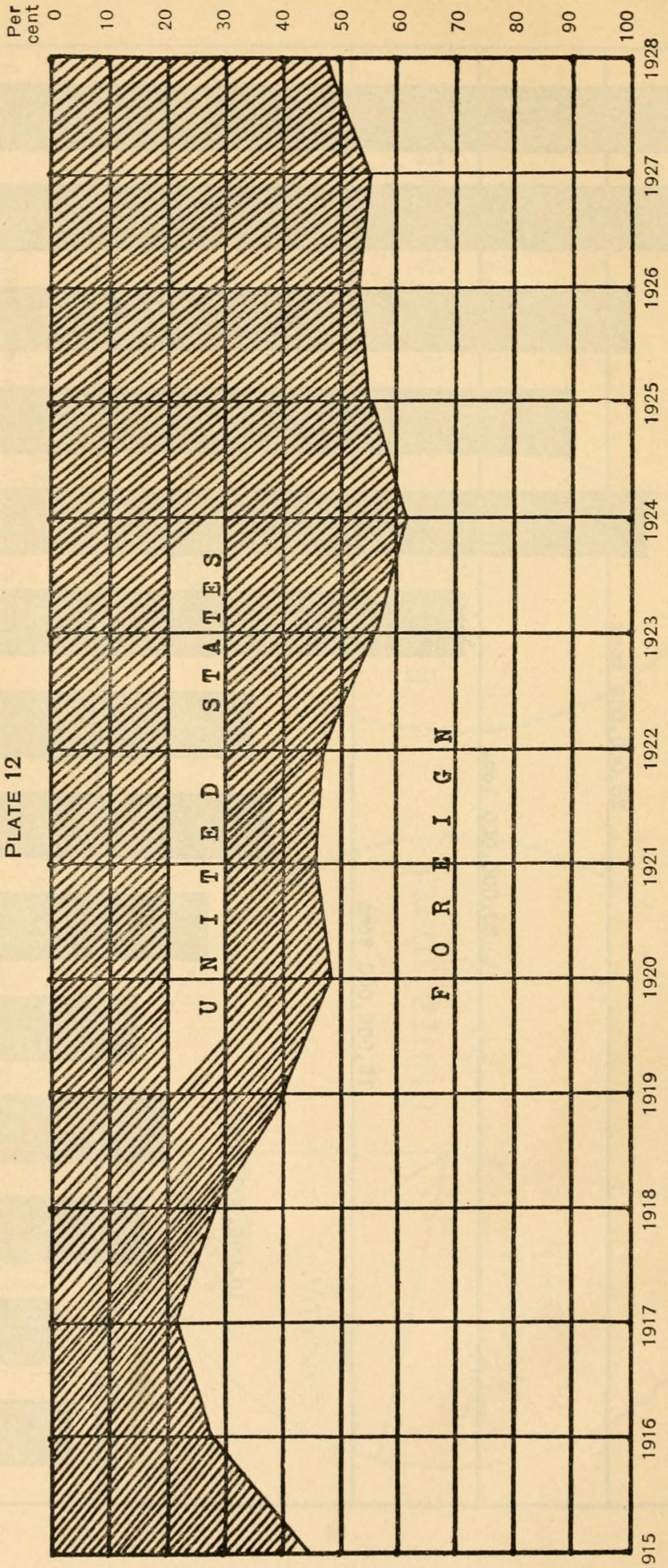


PLATE 12

GRAPH OF PERCENTAGE OF CARGO CARRIED BY SHIPS OF UNITED STATES AND FOREIGN REGISTRY

GRAPH SHOWING, BY FISCAL YEARS, THE NUMBER OF COMMERCIAL VESSELS PASSING THROUGH THE CANAL SINCE ITS OPENING

PLATE 14

GRAPH SHOWING TOLLS COLLECTED BY FISCAL YEARS SINCE OPENING OF CANAL

UNIVERSITY OF FLORIDA
3 1262 08229 072 6
SCI-HSSL
386
P187