PANAMA CANAL TRAFFIC AND TOLLS

BY

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LETTER OF SUBMITTAL.

WASHINGTON, D. C., *August 7, 1912.*

SIR: I have the honor to submit herewith a report upon Panama Canal Traffic and Tolls. The report is made pursuant to your instructions of September 1, 1911, which were to bring "up to as late a date as practicable the data contained in the Report of the Isthmian Canal Commission for 1899–1901, and also to formulate rules and regulations governing the measurement of ships going through the canal, and to make an investigation and recommendation regarding the tolls to be charged."

It was deemed advisable to prepare two reports, one upon Traffic and Tolls and another upon The Measurement of Vessels. The latter report, which is in course of preparation, will explain the regulations governing the measurement of vessels in the United States, Great Britain, and Germany, and at the Suez Canal. The report will also include a set of rules recommended for the measurement of vessels that are required to pay tolls for using the Panama Canal.

The conclusions reached as the result of the investigation and the recommendations that follow from the conclusions reached are presented in Chapters XII and XIII of the following report. It is recommended that merchant vessels be required to pay tolls upon net tonnage so measured as to express their actual earning capacity, and that warships be charged tolls based upon displacement tonnage. The rates of toll recommended are $1.20 per net ton for merchant vessels carrying cargo or passengers, with a reduction of 40 per cent in the rate for vessels in ballast, and 50 cents per displacement ton for warships. It is recommended that no tolls be levied upon passengers.

In submitting this report I wish gratefully to acknowledge the aid I have received from my assistant, Grover G. Huebner, Ph. D., University of Pennsylvania. Without his help the task would have been more laborious and would have taken more time.

Very respectfully,

EMORY R. JOHNSON,
Special Commissioner on Panama Traffic and Tolls.

The SECRETARY OF WAR.

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CHAPTER I.

DISTANCES VIA THE PANAMA CANAL AND ALTERNATIVE ROUTES.

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DISTANCES VIA THE PANAMA CANAL AND ALTERNATIVE ROUTES.

The Panama Canal is being constructed to shorten ocean routes. Relative distances via Panama and other routes will mainly determine the use made of the canal and the tolls that may be charged without limiting its traffic; hence this study of Panama tonnage and tolls should start with the tabulation and comparison of distances by way of the Isthmian Canal and other routes between Atlantic and Pacific ports. The economy resulting from the shortening of ocean routes is measured by the saving in the time vessels take to carry freight or passengers from one port to another. Tolls will be paid by ocean carriers to reduce the time and expense of performing specific transportation services; and, theoretically, the tolls charged for the use of the canal may be made equal, or nearly equal, to the saving effected by the canal.

Distance and time of voyage between the ports of departure and destination are not the only factors determining the selection of routes. The longer of two routes may be the more profitable one if there be a larger volume of desired traffic to and from intermediate ports. Of two competing routes, the longer one may be selected if it has the larger number of coaling stations and the lower costs for fuel. When the choice is between the Panama and Suez routes, the relative tolls charged by the competing canals may determine the direction of traffic. Lower insurance rates may influence carriers to select the route that exposes the ship or cargo to the least risk.

In calculating the volume of traffic that will use the Panama Canal, and particularly in discussing the effects which tolls may have in diverting shipping from the canal, due consideration will be given to the forces, other than length and steaming time of alternative ocean routes, that give direction to the currents of ocean commerce. The factors other than distance and time are merely mentioned in this connection to indicate that they are not to be overlooked, although this chapter is devoted solely to a comparison of the Panama and other routes as regards distances and the time required for ocean voyages.

The Hydrographic Office in the Department of the Navy courteously supplied all figures for distances contained in the following tables. A blank form for each of the first 10 tables was submitted to the Hydrographic Office which compiled the figures and checked them up with special care. The distances as stated may be accepted as reliable and as revised to date—the end of 1911.

The 14 tables presented in this chapter are intended to show three things:

(*a*) The distances in nautical miles for full-powered steamers, between large commercial ports, including calls en route at designated points. The purpose has been to give the length not of the shortest navigable course, but of a route by way of one or more of the commercially important ports at which vessels ordinarily call. No attempt has been made to include all intermediate ports and coaling stations at which steamers call. Some ships stop at many, some at but few places on the way between distant ports. In the case of each route, the tables state what, if any, intermediate ports are included.

(*b*) The net reduction (stated in nautical miles) effected by the Panama Canal in the length of ocean routes. The comparison, in each instance, is between the Panama and the shortest alternative route; but when a course longer than the most direct one is largely used by commerce—as that from Europe to Australasia around the Cape of Good Hope instead of the one via Suez—the discussion accompanying the table compares the distances by way of each possible traffic highway.

(*c*) The net saving in days of steaming time that vessels of different speeds can make by using the Panama Canal. Having calculated the number of days a vessel can save by taking the canal route and having ascertained how many dollars a day's reduction in the time of a voyage is worth to the owners or operators of a vessel, it is possible to determine the maximum tolls that may be levied without preventing the ship from using the canal. The tables in this chapter, showing the number of days that vessels can save by using the canal are made the basis of much of the reasoning in Chapter XI upon "The relation of tolls to the volume of traffic through the canal."

In the tables of distances all figures are for nautical miles (6,080 feet) and not in statute or land miles (5,280 feet). For routes via Panama the length of the canal—41 nautical miles—is included. The Suez Canal is reckoned at 87 nautical miles, that being the distance via the canal and lakes between the Mediterranean and the Red Sea.

The figures for distances, as given in this section, do not quite agree with those in the report of the Isthmian Canal Commission of 1901, upon "The Industrial and Commercial Value of the Isthmian Canal," which is reprinted as Appendix I of this report. In the report of 1901, the length of the Panama Canal was taken to be 43 nautical miles, and of the Suez Canal 88 miles. However, the length of an ocean route does not necessarily remain constant from year to year. The dredging of a new harbor entrance—as the Ambrose Channel at New York—may slightly shorten a route; or experience in navigation may cause steamers to modify their regular course from one port to another. The distance from New York to San Francisco via Panama, for instance, was stated upon the Hydrographic Office charts in 1899 to be 5,299 miles, while the 1911 edition of the chart makes the distance 5,262 miles, and both figures are undoubtedly correct for their time.

On Plate 1, in the pocket at end of this report, the most important routes via the Panama Canal are charted and the distances via these and the alternative routes are stated. The map contains less information than is to be found in the tables, but may well be consulted in connection with the tables.

TABLE 1.—DISTANCES (IN NAUTICAL MILES) VIA PANAMA CANAL AND STRAITS OF MAGELLAN BETWEEN EASTERN PORTS OF THE UNITED STATES AND PORTS OF THE WEST COASTS OF NORTH, CENTRAL, AND SOUTH AMERICA.

From—	Via—	Panama and Magellan.	To— Sitka 1,302 via San Francisco 3,245 6,188	Port Townsend 770 via San Francisco 3,245 6,188	Portland 650 via San Francisco 3,245 6,188	San Francisco 3,245 6,188	San Diego 2,843 5,796	Acapulco 1,426 4,577	San Jose de Guatemala 886 4,291	Honolulu 4,685 6,365	Guayaquil 793 3,268	Callao 1,346 2,666	Iquique 1,987 2,196	Valparaiso 2,616 1,433	Coronel 2,822 1,188
Portland, Me	Panama	2,229	6,776	6,244	6,124	5,474	5,072	3,655	3,115	6,914	3,022	3,575	4,216	4,845	5,051
	Magellan	6,949	14,439	13,907	13,787	13,137	12,745	11,526	11,240	13,314	10,217	9,615	9,145	8,382	8,137
Boston	Panama	2,185	6,732	6,200	6,080	5,430	5,028	3,611	3,071	6,870	2,978	3,531	4,172	4,801	5,007
	Magellan	6,918	14,408	13,876	13,756	13,106	12,714	11,495	11,209	13,283	10,186	9,584	9,114	8,351	8,106
New York	Panama	2,017	6,564	6,032	5,912	5,262	4,860	3,443	2,903	6,702	2,810	3,363	4,004	4,633	4,839
	Magellan	6,947	14,437	13,905	13,785	13,135	12,743	11,524	11,238	13,312	10,215	9,613	9,143	8,380	8,135
Philadelphia	Panama	1,989	6,536	6,004	5,884	5,234	4,832	3,415	2,875	6,674	2,782	3,335	3,976	4,605	4,811
	Magellan	6,994	14,484	13,952	13,832	13,182	12,790	11,571	11,285	13,359	10,262	9,660	9,190	8,427	8,182
Baltimore	Panama	1,944	6,491	5,959	5,839	5,189	4,787	3,370	2,830	6,629	2,737	3,290	3,931	4,560	4,766
	Magellan	7,021	14,511	13,979	13,859	13,209	12,817	11,598	11,312	13,386	10,289	9,687	9,217	8,454	8,209
Norfolk	Panama	1,822	6,369	5,837	5,717	5,067	4,665	3,248	2,708	6,507	2,615	3,168	3,809	4,438	4,644
	Magellan	6,899	14,389	13,857	13,737	13,087	12,695	11,476	11,190	13,264	10,167	9,565	9,095	8,332	8,087
Charleston	Panama	1,607	6,154	5,622	5,502	4,852	4,450	3,033	2,493	6,292	2,400	2,953	3,594	4,223	4,429
	Magellan	6,898	14,388	13,856	13,736	13,086	12,694	11,475	11,189	13,263	10,166	9,564	9,094	8,331	8,086
Savannah	Panama	1,606	6,153	5,621	5,501	4,851	4,449	3,032	2,492	6,291	2,399	2,952	3,593	4,222	4,428
	Magellan	6,930	14,420	13,888	13,768	13,118	12,726	11,507	11,221	13,295	10,198	9,596	9,126	8,363	8,118
Jacksonville	Panama	1,559	6,106	5,574	5,454	4,804	4,402	2,985	2,445	6,244	2,352	2,905	3,546	4,175	4,381
	Magellan	6,917	14,407	13,875	13,755	13,105	12,713	11,494	11,208	13,282	10,185	9,583	9,113	8,350	8,105
Port Tampa	Panama	1,260	5,807	5,275	5,155	4,505	4,103	2,686	2,146	5,945	2,053	2,606	3,247	3,876	4,082
	Magellan	7,065	14,555	14,023	13,903	13,253	12,861	11,642	11,356	13,430	10,333	9,731	9,261	8,498	8,253
Pensacola	Panama	1,392	5,939	5,407	5,287	4,637	4,235	2,818	2,278	6,077	2,185	2,738	3,379	4,008	4,214
	Magellan	7,270	14,760	14,228	14,108	13,458	13,066	11,847	11,561	13,635	10,538	9,936	9,466	8,703	8,458
Mobile	Panama	1,419	5,966	5,434	5,314	4,664	4,262	2,845	2,305	6,104	2,212	2,765	3,406	4,035	4,241
	Magellan	7,310	14,800	14,268	14,148	13,498	13,106	11,887	11,601	13,675	10,578	9,976	9,506	8,743	8,498
New Orleans	Panama	1,438	5,985	5,453	5,333	4,683	4,281	2,864	2,324	6,123	2,231	2,784	3,425	4,054	4,260
	Magellan	7,363	14,853	14,321	14,201	13,551	13,159	11,940	11,654	13,728	10,631	10,029	9,559	8,796	8,551
Galveston	Panama	1,542	6,089	5,557	5,437	4,787	4,385	2,968	2,428	6,227	2,335	2,888	3,529	4,158	4,364
	Magellan	7,559	15,029	14,497	14,377	13,727	13,335	12,116	11,830	13,904	10,807	10,205	9,735	8,972	8,727

The first table states the distances in nautical miles, via the Panama Canal and the Straits of Magellan, from 14 representative ports of the Atlantic and Gulf seaboards of the United States—Portland, Me., to Galveston, Tex., inclusive—to the Hawaiian Islands and to 12 commercial centers on the Pacific coast of North and South America. The west coast cities selected include Sitka, the chief port of Alaska, Port Townsend, at the gateway to Puget Sound, Portland, the port of the Columbia Valley, San Francisco and San Diego for central and southern California, Acapulco, an important Mexican port, Guayaquil and Callao, the chief trade centers of Equador and Peru, Iquique, one of the two large nitrate shipping points in northern Chile, Valparaiso, the main seaport of the central agricultural portion of Chile, and Coronel (Talcahuano), the only station on the west coast of South America at which large quantities of local coal can be obtained.

Coronel is located at 36° 42′ south latitude. About 200 miles farther south, a little less than 40° from the Equator and nearly 1,000 miles from the Straits of Magellan is Valdivia, at the southern margin of the commercially important part of western South America. Little, if any, trade can be developed along the Chilian coast south of 40°. Punta Arenas on the Straits of Magellan is now, and may after the opening of the Panama Canal continue to be, an export city and a transfer and supply station of some importance, but the commercial centers of western South America will always be north of 40° south latitude.

A comparison of distances via Panama and the Straits of Magellan between the Atlantic-Gulf seaboard of the United States and the Pacific coast of North and South America can be more readily made from Table II, which states the number of miles, by the alternative routes, from New York, Norfolk, New Orleans, and Galveston—four important commercial foci—to six representative Pacific ports:

TABLE II.—DISTANCES (IN NAUTICAL MILES) FROM ATLANTIC AND GULF PORTS OF THE UNITED STATES TO PORTS ON THE WEST COASTS OF NORTH, CENTRAL, AND SOUTH AMERICA.

To—	From—							
	New York via—		Norfolk via—		New Orleans via—		Galveston via—	
	Panama.	Magellan.	Panama.	Magellan.	Panama.	Magellan.	Panama.	Magellan.
Port Townsend via San Francisco	6,032	13,905	5,837	13,837	5,453	14,321	5,557	14,497
San Francisco	5,262	13,135	5,067	13,067	4,683	13,551	4,787	13,727
San Jose de Guatemala	2,903	11,238	2,708	11,170	2,324	11,654	2,428	11,830
Iquique	4,004	9,143	3,809	9,075	3,425	9,559	3,529	9,735
Valparaiso	4,633	8,380	4,438	8,312	4,054	8,796	4,158	8,972
Coronel	4,839	8,135	4,644	8,067	4,260	8,551	4,364	8,727

The reduction effected by the Panama Canal in the length of all-water routes between the Atlantic-Gulf seaboard of the United States and Pacific ports is shown below in detail in Table XI. The distance from New York to San Francisco, by way of the Straits of Magellan, is 13,135 nautical miles, by way of Panama 5,262 miles, the canal route being 7,873 miles shorter. The saving between New Orleans and San Francisco is greater—8,868 nautical miles—the Magellan route being longer and the canal route shorter from New Orleans than from New York. The canal will reduce the distance from New York to the Chilian nitrate port, Iquique, 5,139 nautical miles, to Valparaiso 3,747 miles, to Coronel 3,296, and Valdivia about 2,900 miles. For New Orleans and other Gulf ports, the reduction is greater.

Since the beginning of 1907, traffic between New York and Pacific ports of the United States (including Hawaii) has been handled in increasing volume by way of the Isthmus of Tehuantepec. The American Hawaiian Steamship Co. operates a fleet of vessels between New York and Puerto Mexico and another fleet between Salina Cruz and San Francisco and Puget Sound, and between Salina Cruz and Hawaii. A railroad 192 statute miles (167 nautical miles) in length connects Puerto Mexico and Salina Cruz. The Tehuantepec route and its railroad now compete with the route via the Isthmus of Panama and the railroad from Colon to the Port of Balboa (Panama). Both of these trans-Isthmian railways are now handling a relatively large tonnage of through traffic. After the canal is opened, the Tehuantepec route will be a possible, though not a probable, competitor of the Panama Canal. The comparative distances via the two routes from New York and New Orleans to San Francisco and Honolulu are shown in Table III.

TABLE III.—DISTANCES (IN NAUTICAL MILES) FROM NEW YORK AND NEW ORLEANS TO SAN FRANCISCO AND HONOLULU VIA THE ISTHMUS OF TEHUANTEPEC AND VIA PANAMA.

From—	To—			
	San Francisco via—		Honolulu via—	
	Isthmus of Tehuantepec. 167	Panama.	Isthmus of Tehuantepec. 167	Panama.
New York	4,246	5,262	5,691	6,702
New Orleans	3,110	4,683	4,555	6,123

The distance from New York to San Francisco is 1,016 nautical miles less via Tehuantepec than by way of Panama, and from New Orleans 1,573 miles shorter. To Honolulu, the distance via Tehuantepec is 1,011 nautical miles less from New York and 1,568 miles less from New Orleans. These differences in distance will not enable the Tehuantepec route to compete with the Panama Canal. The average cost of transferring freight from the hold of a ship on one side of the Isthmus of Tehuantepec to the hold of a ship on the other side could hardly be brought below $2.50 per cargo ton—the present costs are said to be more than this. A toll at Panama of $1.20 per vessel-ton, net register, would amount to about $0.60 a ton on cargo; and, thus, the cost of getting cargo from ocean to ocean would be about $2 per ton greater at Tehuantepec than at Panama. The double handling of commodities, with the unavoidable breakage and damage incident thereto, would further place the Tehuantepec route at a disadvantage in competing for traffic against the through service without breaking bulk, by way of the canal. Moreover, the time required to handle freight from New York to San Francisco would be but little less via Tehuantepec than via the canal. As vessels require about two days to discharge and two to load, the average detention of traffic, due to transfer from ocean to ocean across the Isthmus of Tehuantepec, will be about four days. At Panama, a ship can pass through the canal in less than half a day; and, should another half day be taken for coaling, the total detention will not exceed one day.

The Tehuantepec Railway may possibly have a fair volume of traffic after the canal is opened. Coastwise trade for some distance up and down the two seaboards will center at Salina Cruz and Puerto Mexico, and goods will be transferred across the Isthmus, in part for sale in nearby markets and in part for shipment across the sea. The Tehuantepec Railway will assist the development of southern Mexico and northern Central America, and the railroad will, in consequence, handle an increasing tonnage.

TABLE IV.—DISTANCES (IN NAUTICAL MILES) FROM EUROPEAN PORTS TO PACIFIC PORTS OF AMERICA VIA PANAMA AND STRAITS OF MAGELLAN.

To—	From—									
	Liverpool via—		Hamburg via—		Antwerp via—		Bordeaux via—		Gibraltar via—	
	Panama. 4,591	Magellan. 7,314	Panama. 5,110	Magellan. 7,695	Panama. 4,848	Magellan. 7,433	Panama. 4,641	Magellan. 7,074	Panama. 4,376	Magellan. 6,383
Sitka via San Francisco	9,138	14,804	9,657	15,185	9,395	14,923	9,188	14,564	8,923	13,873
Port Townsend via San Francisco	8,606	14,272	9,125	14,653	8,863	14,391	8,656	14,032	8,391	13,341
Portland via San Francisco	8,486	14,152	9,005	14,533	8,743	14,271	8,536	13,912	8,271	13,221
San Francisco	7,836	13,502	8,355	13,883	8,093	13,621	7,886	13,262	7,621	12,571
San Diego	7,434	13,110	7,953	13,491	7,691	13,229	7,484	12,870	7,219	12,179
Acapulco	6,017	11,891	6,536	12,272	6,274	12,010	6,067	11,651	5,802	10,960
San Jose de Guatemala	5,477	11,605	5,996	11,986	5,734	11,724	5,527	11,365	5,262	10,674
Honolulu	9,276	13,679	9,795	14,060	9,533	13,798	9,326	13,439	9,061	12,748
Guayaquil	5,384	10,582	5,903	10,963	5,641	10,701	5,434	10,342	5,169	9,651
Callao	5,937	9,980	6,456	10,361	6,194	10,099	5,987	9,740	5,722	9,049
Iquique	6,578	9,510	7,097	9,891	6,835	9,629	6,628	9,270	6,363	8,579
Valparaiso	7,207	8,747	7,726	9,128	7,464	8,866	7,257	8,507	6,992	7,816
Coronel	7,413	8,502	7,932	8,883	7,670	8,621	7,463	8,262	7,198	7,571

The relative distances via the Panama Canal and the Straits of Magellan from Europe to the 13 selected American Pacific ports are indicated in Table IV. Instead of giving distances from Plymouth, as is customary in compiling such tables, the figures state the number of miles from four important ports so located that distances from them represent the distances from the leading commercial districts of northwestern Europe. The effect of the canal upon the length of the routes from southern Europe to Pacific America is illustrated by stating the distances from Gibraltar, the sentinel at the Mediterranean gateway.

The reductions which the Panama Canal will make in the length of ocean routes from Europe to Hawaii and the west coast of North and South America are stated in Table XII. The canal will bring San Francisco Portland, and Puget Sound ports, and British Columbia, 5,666 nautical miles nearer to Liverpool, 5,528 miles closer to Antwerp and Hamburg, and will make Gibraltar 4,950 miles less distant. To Iquique, the principal shipping point for nitrate—the tonnage of which is and will be larger than that of any other single item of traffic—the canal route will be shorter than the Magellan route by 2,932 nautical miles for Liverpool, 2,794 miles for Hamburg and Antwerp, 2,642 miles for Bordeaux, and 2,216 miles for Gibraltar and the Mediterranean ports generally. To Valparaiso, the canal reduces the distance from Liverpool 1,540 miles; from Hamburg and Antwerp, 1,402 miles; from Bordeaux, 1,250 miles; and from Gibraltar, 824 miles. Valparaiso and Coronel are on the margin of the canal's zone of influence. The forces that will determine whether the traffic between central Chile and Europe will move by way of the canal or through the Straits of Magellan are analyzed in Chapter XI in connection with the discussion of the tolls the Panama traffic will bear.

Table V.—DISTANCES (IN NAUTICAL MILES) FROM ATLANTIC PORTS OF THE UNITED STATES TO YOKOHAMA, SHANGHAI, AND HONGKONG VIA PANAMA AND SUEZ.

From—	To—											
	Panama.	Gibraltar.	Yokohama via—			Shanghai via—			Hongkong via—			
			Panama, San Francisco, and Great Circle. 7,781	Panama, and Honolulu. 8,079	Suez, Colombo, Singapore, Hongkong, and Shanghai. 10,371	Panama, San Francisco, and Great Circle. 8,632	Panama, Honolulu, and Yokohama. 9,120	Suez, Colombo, Singapore, and Hongkong. 9,330	Panama, San Francisco, Yokohama, and Shanghai. 9,674	Panama, Honolulu, Yokohama, and Shanghai. 9,972	Panama, Honolulu, Guam, and Manila. 10,159	Suez, Colombo, and Singapore. 8,478
Portland	2,229	2,992	10,010	10,308	13,363	10,861	11,349	12,322	11,903	12,201	12,388	11,470
Boston	2,185	3,030	9,966	10,264	13,401	10,817	11,305	12,360	11,859	12,157	12,344	11,508
New York	2,017	3,195	9,798	10,096	13,566	10,649	11,137	12,525	11,691	11,989	12,176	11,673
Philadelphia	1,989	3,337	9,770	10,068	13,708	10,621	11,109	12,667	11,663	11,961	12,148	11,815
Baltimore	1,944	3,470	9,725	10,023	13,841	10,576	11,064	12,800	11,618	11,916	12,103	11,948
Norfolk	1,822	3,348	9,603	9,901	13,719	10,454	10,942	12,678	11,496	11,794	11,981	11,826
Charleston	1,607	3,592	9,388	9,686	13,963	10,239	10,727	12,922	11,281	11,579	11,766	12,070
Savannah	1,606	3,665	9,387	9,685	14,036	10,238	10,726	12,995	11,280	11,578	11,765	12,143
Jacksonville	1,559	3,740	9,340	9,638	14,111	10,191	10,679	13,070	11,233	11,531	11,718	12,218
Port Tampa	1,260	4,255	9,041	9,339	14,626	9,892	10,380	13,585	10,934	11,232	11,419	12,733
Pensacola	1,392	4,460	9,173	9,471	14,831	10,024	10,512	13,790	11,066	11,364	11,551	12,938
Mobile	1,419	4,500	9,200	9,498	14,871	10,051	10,539	13,830	11,093	11,391	11,578	12,978
New Orleans	1,438	4,553	9,219	9,517	14,924	10,070	10,558	13,883	11,112	11,410	11,597	13,031
Galveston	1,542	4,729	9,323	9,621	15,100	10,174	10,662	14,059	11,216	11,514	11,701	13,207

The distances by way of the Panama Canal and alternative routes between the North Atlantic and the ports of eastern Asia and of Australasia are stated in a series of six tables, V to X. The tables are of especial significance, because in Australasia and the countries along the Pacific coast of Asia, the traffic zones of the Suez and Panama Canals touch or overlap. It is in these countries that the two great highways will compete for the commerce of the eastern part of the United States and, to some extent, for the trade of Europe with the Orient, the East Indies, and Australasia.

Table V states the distances via the two canals from the 14 selected ports of the Atlantic-Gulf coast of the United States to Yokohama, Shanghai, and Hongkong, i. e., to Japan and China. The table is so constructed as to state, first, the number of nautical miles from each of the 14 ports to Panama and to Gibraltar;

second, the distances from those points to Yokohama, Shanghai, and Hongkong via designated routes; and, third, the through distances from the several 14 ports to Yokohama, Shanghai, and Hongkong via designated ports of call. Distances are given for two courses from Balboa across the Pacific, one via San Francisco and the Great Circle, so modified as to keep the course south of the Aleutian Islands, the other via Honolulu. The route from Balboa (Panama) to Yokohama by way of San Francisco and the Great Circle, it will be observed, is 298 miles shorter. The lengths are given for three routes from Panama to Hongkong, one via San Francisco, Yokohama, and Shanghai (which is the shortest of the three named), another via Honolulu, Yokohama, and Shanghai, and a third by way of Honolulu, Guam, and Manila, the third course being 485 miles longer than the one by way of San Francisco, Yokohama, and Shanghai.

The routes for which distances are given in Table V, and also in succeeding tables, are by way of the larger ports at which vessels regularly call. While not all of the ports at which vessels may, or frequently do, stop are included, enough intermediate ports are designated to make the distances, as stated in the tables, considerably greater than the lengths of the shortest possible routes between the ports of departure and ultimate destination. Commercial, rather than theoretical, routes have been chosen, both via the Suez Canal and via Panama.

The differences in the distances by way of Panama and via Suez from the Atlantic-Gulf seaboard of the United States and Yokohama, Shanghai, and Hongkong are stated in Table XI. Yokohama and Shanghai are well within the Panama traffic zone. The distance from New York to Yokohama is 3,768, and to Shanghai 1,876, miles less via Panama than via Suez. In the case of cities south of New York the advantages of the Panama route are still greater, New Orleans being 5,705 miles nearer Yokohama, and 3,813 miles nearer Shanghai via the Panama route. Hongkong is almost equally distant from New York via the Panama and Suez routes as designated in the tables; and for the Atlantic ports of the United States south of New York the advantage of the Panama over the Suez course is relatively slight. For the Gulf ports, however, the saving by the American Canal to Hongkong is substantial—1,919 miles for New Orleans and nearly 2,000 miles for Galveston.

Table VI.—DISTANCES (IN NAUTICAL MILES) FROM THE ATLANTIC PORTS OF THE UNITED STATES TO MANILA VIA THE PANAMA AND SUEZ ROUTES.

From—	To Manila via—				
	Panama, San Francisco, and Yokohama. 9,531	Panama, Honolulu, and Yokohama. 9,829	Panama, Honolulu, Yokohama, Shanghai, and Hongkong. 10,603	Panama, Honolulu, and Guam. 9,528	Suez, Colombo, and Singapore. 8,394
Portland	11,760	12,058	12,832	11,757	11,386
Boston	11,716	12,014	12,788	11,713	11,424
New York	11,548	11,846	12,620	11,545	11,589
Philadelphia	11,520	11,818	12,592	11,517	11,731
Baltimore	11,475	11,773	12,547	11,472	11,864
Norfolk	11,353	11,651	12,425	11,350	11,742
Charleston	11,138	11,436	12,210	11,135	11,986
Savannah	11,137	11,435	12,209	11,134	12,059
Jacksonville	11,090	11,388	12,162	11,087	12,134
Port Tampa	10,791	11,089	11,863	10,788	12,649
Pensacola	10,923	11,221	11,995	10,920	12,854
Mobile	10,950	11,248	12,022	10,947	12,894
New Orleans	10,969	11,267	12,041	10,966	12,947
Galveston	11,073	11,371	12,145	11,070	13,123

The distances from the Atlantic-Gulf seaboard of the United States to Manila via Panama and Suez are stated in Table VI. Manila, like Hongkong, is about the same distance from New York by each of the competing canals, the advantage being slightly in favor of the Panama route. New Orleans and Galveston are about 2,000 miles nearer Manila via the Panama than via the Suez Canal. Four routes across the Pacific from Panama to Manila are designated in the table; and it will be noted that the distances via San Francisco and Yokohama and by way of Honolulu and Guam are practically equal. Probably the route most followed by lines of freight vessels bound for Manila will be by way of San Francisco, Yokohama, Shanghai, and Hongkong, the distance from New York to Manila by this route being 12,055 miles.

Table VII.—DISTANCES (IN NAUTICAL MILES) FROM THE ATLANTIC AND GULF PORTS OF THE UNITED STATES TO AUSTRALIA AND NEW ZEALAND VIA PANAMA, THE CAPE OF GOOD HOPE, AND THE STRAITS OF MAGELLAN.

From—	To—									
		Adelaide via—		Melbourne via—		Sydney via—		Wellington via—		
	St. Vincent.	Panama, Tahiti, Sydney, and Melbourne. 8,887	St. Vincent and Cape of Good Hope. 9,736	Panama, Tahiti, and Sydney. 8,375	St. Vincent, Cape of Good Hope, and Adelaide. 10,248	Panama and Tahiti. 7,794	St. Vincent, Cape of Good Hope, Adelaide, and Melbourne. 10,829	Panama, and Tahiti. 6,834	St. Vincent, Cape of Good Hope, and Melbourne. 11,527	Straits of Magellan. 4,397
Portland	2,804	11,116	12,540	10,604	13,052	10,023	13,633	9,063	14,331	11,346
Boston	2,819	11,072	12,555	10,560	13,067	9,979	13,648	9,019	14,346	11,315
New York	2,914	10,904	12,650	10,392	13,162	9,811	13,743	8,851	14,441	11,344
Philadelphia	3,013	10,876	12,749	10,364	13,261	9,783	13,842	8,823	14,540	11,391
Baltimore	3,095	10,831	12,831	10,319	13,343	9,738	13,924	8,778	14,622	11,418
Norfolk	2,973	10,709	12,709	10,197	13,221	9,616	13,802	8,656	14,500	11,296
Charleston	3,110	10,494	12,846	9,982	13,358	9,401	13,939	8,441	14,637	11,295
Savannah	3,169	10,493	12,905	9,981	13,417	9,400	13,998	8,440	14,696	11,327
Jacksonville	3,199	10,446	12,935	9,934	13,447	9,353	14,028	8,393	14,726	11,314
Port Tampa	3,549	10,147	13,285	9,635	13,797	9,054	14,378	8,094	15,076	11,462
Pensacola	3,754	10,279	13,490	9,767	14,002	9,186	14,583	8,226	15,281	11,667
Mobile	3,794	10,306	13,530	9,794	14,042	9,213	14,623	8,253	15,321	11,707
New Orleans	3,847	10,325	13,583	9,813	14,095	9,232	14,676	8,272	15,374	11,760
Galveston	4,023	10,429	13,759	9,917	14,271	9,336	14,852	8,376	15,550	11,936

Vessels from the Atlantic-Gulf seaboard of the United States to Australia now round the Cape of Good Hope, the distance by that route being about the same as the one via the Suez Canal. After the Panama Canal is opened, the choice will be between the Good Hope and Panama routes. Table VII states the distance from the 14 selected Atlantic-Gulf ports of the United States to the three principal ports of Australia—Adelaide, Melbourne, and Sydney. These three Australian ports are located on the southern and southeastern coasts of the continent and vessels from the United States (and also from Europe, whether the approach be via the Cape of Good Hope or via the Suez Canal) pass along the southern coast of Australia. Line vessels regularly call at Adelaide and Melbourne, and are certain to proceed to Sydney, which is the largest city of Australia and is near the Newcastle coal fields. Sydney is also visited by most chartered vessels engaged in the Australian trade. Thus, the effect of the Panama Canal upon the length of the commercial routes from the eastern part of the United States to Australia is to be measured mainly by comparing the distances via the Cape of Good Hope and by way of Panama to Sydney. As is shown below in Table XI, the Panama Canal will bring Sydney about 4,000 miles nearer New York and the other north Atlantic ports of the United States, somewhat more than 4,500 miles nearer to Charleston and other southern Atlantic cities, and 5,500 miles closer to New Orleans and Galveston. The distance from New York to Melbourne is 2,770 miles less, and to Adelaide 1,746 miles less, by way of Panama and Tahiti and Sydney than via St. Vincent and the Cape of Good Hope. For the Gulf ports the difference in favor of the Panama route is about 1,500 miles greater.

At present the shortest all-water route to New Zealand from the eastern part of the United States is through the Straits of Magellan. The distance from New York to Wellington via the straits is 11,344 miles, as compared with 14,441 miles via St. Vincent, the Cape of Good Hope, and Melbourne. By way of the Panama Canal and Tahiti the distance from New York to Wellington will be 8,851 miles, or, as shown in Table XI, practically 2,500 miles less than by way of the cape. From New Orleans and Galveston the Panama route to Wellington will be 3,500 miles shorter than the Magellan route.

Table VIII.—DISTANCES (IN NAUTICAL MILES) FROM LIVERPOOL VIA THE PANAMA AND SUEZ ROUTES TO AUSTRALIA, NEW ZEALAND, THE PHILIPPINE ISLANDS, CHINA, AND JAPAN.

To—	From Aden.	From Liverpool via—				
		Suez route. (To Aden 4,608.)	Distance.	Panama route. (To Panama 4,591.)	Distance.	In favor of Suez —, Panama +.
Adelaide	6,534	Aden, Colombo, and King George Sound.	11,142	Panama, Tahiti, Sydney, and Melbourne.	13,478	−2,336
Melbourne	7,046	Aden, Colombo, King George Sound, and Adelaide.	11,654	Panama, Tahiti, and Sydney	12,966	−1,312
Sydney	7,627	Aden, Colombo, King George Sound, Adelaide, and Melbourne.	12,235	Panama and Tahiti	12,385	− 150
Wellington	8,381	Aden, Colombo, King George Sound, and Melbourne.	12,989	do	11,425	+1,564
Manila	5,093	Aden, Colombo, and Singapore	9,701	Panama, San Francisco, and Yokohama.	14,122	−4,421
Hongkong	5,177	do	9,785	do	13,957	−4,172
Tientsin	6,769	Aden, Colombo, Singapore, Hongkong, and Shanghai.	11,377	do	13,822	−2,445
Yokohama	7,070	do	11,678	Panama and San Francisco	12,372	− 694

All of Asia and all of Australasia, with the exception of New Zealand, will be nearer Europe by way of the Suez Canal than by way of the Panama route. The distances from Liverpool via alternative routes to Australia, New Zealand, the Philippines, China, and Japan are stated in Table VIII. The table is so constructed as to show (1) the distances from Aden to each of the eight designated Pacific ports, (2) the distances from Liverpool to Aden, (3) from Liverpool to Panama, (4) the entire distance from Liverpool to the designated Pacific ports via the Suez Canal, (5) the through distances from Liverpool via Panama to each of the trans-Pacific destinations, and (6) the difference in the distance via the Suez and Panama routes. In the case of each route the intermediate ports of call are designated.

It will be noted that while all of Australia is nearer Europe via the Suez Canal, the distance from Liverpool to Sydney, the principal port of Australia, is but slightly greater via Panama than via the Suez Canal. A line connecting all points in the Pacific equally distant from Liverpool via alternative canal routes runs somewhat east of Australia, well to the east of the Philippines, and passes east and slightly north of the island of Nippon, Japan.

Wellington, New Zealand, is 1,564 miles nearer Liverpool via Panama than via Suez; however, the competition for the trade of Europe with New Zealand will not be mainly between the Panama and the Suez routes. At the present time most freight vessels outbound from Europe to Australia and New Zealand go via the Cape of Good Hope, while passenger and express steamers take the Suez route. Vessels leaving New Zealand with full cargoes for Europe regularly proceed via the Straits of Magellan which route to Liverpool is 1,014 miles shorter than the route via Melbourne, Colombo, and Suez. After the Panama Canal is opened there will be active competition between the Panama and Magellan routes for much of the traffic between Europe and New Zealand. The distance between Liverpool and New Zealand via the Straits of Magellan will be only 500 miles greater than via the American Isthmus.

From Liverpool and Europe generally to the Philippine Islands, to China and Japan, the Suez route will be much shorter than the Panama route. From Liverpool to Manila and Hongkong, the Suez route will be over 4,000 miles shorter than the route via Panama. Northern China via the Suez Canal will be 2,500 miles nearer to Europe, and Yokohama about 700 miles nearer. For European ports south of the English Channel the advantages of the Suez route are still greater.

TABLE IX.—COMPARATIVE DISTANCES (IN NAUTICAL MILES) FROM NEW YORK AND LIVERPOOL TO NEW ZEALAND, AUSTRALIA, PHILIPPINES, CHINA, AND JAPAN, VIA SUEZ AND PANAMA CANALS.

To—	New York via Panama Canal. 2,017		Liverpool via Suez Canal. 4,608		Difference in favor of Suez −, Panama +.
	Ports of call.	Distance.	Ports of call.	Distance.	
Wellington	Panama and Tahiti	8,851	Aden, Colombo, King George Sound, and Melbourne.	12,989	+4,138
Sydney	do	9,811	Aden, Colombo, King George Sound, Adelaide, and Melbourne.	12,235	+2,424
Adelaide	Panama, Tahiti, Sydney, and Melbourne.	10,904	Aden, Colombo, and King George Sound.	11,142	+ 238
Manila	Panama, San Francisco, and Yokohama.	11,548	Aden, Colombo, and Singapore	9,701	−1,847
Hongkong	do	11,383	do	9,785	−1,598
Shanghai	do	10,839	Aden, Colombo, Singapore, and Hongkong.	10,637	− 202
Tientsin	do	11,248	Aden, Colombo, Singapore, Hongkong, and Shanghai.	11,377	+ 129
Yokohama	Panama and San Francisco	9,798	do	11,678	+1,880

The conditions under which American and European merchants will compete for the trade of Australasia, the Philippines, China, and Japan, after the opening of the Panama Canal, are indicated in Table IX, which compares the distances from New York via the Panama Canal with the distances from Europe via the Suez Canal to the eight most important Pacific ports of Australasia and Asia. The Panama Canal will bring Australasia much nearer to New York than to Liverpool. The distance from Liverpool to Sydney via Suez, Colombo, King George Sound, Adelaide, and Melbourne will be 2,424 miles greater than from New York to Sydney via Panama and Tahiti. Liverpool will be 4,138 miles farther than New York will be from Wellington, New Zealand. In the Philippine Islands and in southern and central China, however, the situation will be the reverse. The Philippine Islands, after the opening of the Panama Canal, will still be 2,000 miles nearer to northwestern Europe than to the eastern part of the United States. Northern China will be slightly nearer to the north Atlantic seaboard of the United States than to northwestern Europe, while Yokohama will be 1,880 miles nearer New York than Liverpool.

Plate 2, in the pocket at end of this report, locates the points equally distant from New York and from Liverpool via the Panama and Suez routes. In discussing the probable movement of traffic after the Panama Canal has been put into operation, attention will be called to the fact that the line equally distant from a European port via the eastern and western canal routes will not necessarily be the boundary between the Suez and Panama Canal traffic zones. For reasons that are discussed at length in succeeding chapters of this Report there will be much overlapping of traffic routes on the Pacific shore of Asia.

TABLE X.—DISTANCES (IN NAUTICAL MILES) FROM ATLANTIC (AMERICAN AND EUROPEAN) PORTS TO PACIFIC PORTS.

From—	Via Panama Canal to—								
	San Francisco. 3,245	Iquique. 1,987	Valparaiso. 2,616	Honolulu. 4,685	Yokohama. 7,660	Hongkong. 9,173	Manila. 9,370	Sydney via Tahiti. 7,794	Wellington via Tahiti. 6,834
New York	5,262	4,004	4,633	6,702	9,677	11,190	11,387	9,811	8,851
Charleston	4,852	3,594	4,223	6,292	9,267	10.780	10,977	9,401	8,441
New Orleans	4,683	3,425	4,054	6,123	9,098	10,611	10,808	9,232	8,272
Liverpool	7,836	6,578	7,207	9,276	12,251	13,764	13,961	12,385	11,425
Hamburg	8,355	7,097	7,726	9,795	12,770	14,283	14,480	12,904	11,944
Gibraltar	7,624	6,366	6,995	9,064	12,039	13,552	13,749	12,173	11,213

For convenience of reference, the distances from three ports of the United States located in the northern, middle, and southern parts of the Atlantic-Gulf seaboard and from three European points of commanding location to nine selected ports on the eastern and western shores of the Pacific are stated in summary form in Table X. The table gives, first, the distances from Panama to the Pacific ports; and, second, the through distances from the six Atlantic American and European commercial centers to the nine designated Pacific termini.

From the foregoing tables, the saving in ocean distances that can be made by using the Panama Canal instead of the shortest alternative commercial routes has been calculated. Table XI states the reduction, in nautical miles, effected by the Panama Canal in the length of all-water routes between ports of the Atlantic-Gulf seaboard of the United States and ports on both sides of the Pacific Ocean. Table XII gives the reduction, in nautical miles, effected by the Panama Canal in distances from five distributed European ports to fourteen important Pacific commercial centers. As has already been pointed out, New Zealand is the only trans-Pacific country from which distances to Europe will be shortened by the Panama Canal. In the columns headed "remarks," the routes contrasted in Tables XI and XII are designated and the intermediate ports of call included in each route are named.

TABLE XI.—REDUCTION (IN NAUTICAL MILES) EFFECTED BY THE PANAMA CANAL IN LENGTH OF ALL-WATER ROUTES BETWEEN PORTS OF THE ATLANTIC-GULF SEABOARD OF THE UNITED STATES AND PACIFIC PORTS, AMERICAN AND FOREIGN.

To—	From—														Remarks.
	Portland (Me.).	Boston.	New York.	Philadelphia.	Baltimore.	Norfolk.	Charleston.	Savannah.	Jacksonville.	Port Tampa.	Pensacola.	Mobile.	New Orleans.	Galveston.	
Sitka	7,663	7,676	7,873	7,948	8,020	8,020	8,234	8,267	8,301	8,748	8,821	8,834	8,868	8,940	Via San Francisco. Difference between Panama and Magellan routes.
Port Townsend	7,663	7,676	7,873	7,948	8,020	8,020	8,234	8,267	8,301	8,748	8,821	8,834	8,868	8,940	Do.
Portland, Oreg	7,663	7,676	7,873	7,948	8,020	8,020	8,234	8,267	8,301	8,748	8,821	8,834	8,868	8,940	Do.
San Francisco	7,663	7,676	7,873	7,948	8,020	8,020	8,234	8,267	8,301	8,748	8,821	8,834	8,868	8,940	Do.
San Diego	7,673	7,686	7,883	7,958	8,030	8,030	8,244	8,277	8,311	8,758	8,831	8,844	8,878	8,950	Do.
Acapulco	7,871	7,884	8,081	8,156	8,228	8,228	8,442	8,475	8,509	8,956	9,029	9,042	9,076	9,148	Do.
San Jose de Guatemala	8,125	8,138	8,335	8,410	8,482	8,482	8,696	8,729	8,763	9,210	9,283	9,296	9,330	9,402	Do.
Honolulu	6,400	6,413	6,610	6,685	6,757	6,757	6,971	7,004	7,038	7,485	7,558	7,571	7,605	7,677	Do.
Guayaquil	7,195	7,208	7,405	7,480	7,552	7,552	7,766	7,799	7,833	8,280	8,353	8,366	8,400	8,472	Do.
Callao	6.040	6,053	6,250	6,325	6,397	6,397	6,611	6,644	6,678	7,125	7,198	7.211	7,245	7,317	Do.
Iquique	4,929	4,942	5,139	5,214	5,286	5,286	5,500	5,533	5,567	6,014	6,087	6,100	6,134	6,206	Do.
Valparaiso	3,537	3,550	3,747	3,822	3,894	3,894	4,108	4,141	4,175	4,622	4,695	4,708	4,742	4,814	Do.
Coronel	3,086	3,099	3,296	3,371	3,443	3,443	3,657	3,690	3,724	4,171	4,244	4.257	4,291	4,363	Do.
Yokohama	3,353	3,435	3,768	3,938	4,116	4,116	4,575	4,649	4,771	5,585	5,658	5,671	5,705	5,777	Difference between routes via Panama, San Francisco, and Great Circle, and via Suez, Colombo, Singapore, Hongkong, and Shanghai.
Shanghai	1,461	1,543	1,876	2,046	2,224	2,224	2,683	2,757	2,879	3,693	3,766	3,779	3,813	3,885	Difference between routes via Panama, San Francisco, Yokohama, and via Suez, Colombo, Singapore, and Hongkong.
Hongkong	[1]—433	[1]—351	[1]— 18	152	330	330	789	863	985	1,799	1,872	1,885	1,919	1,991	Difference between routes via Panama, San Francisco, Yokohama, and Shanghai, and via Suez, Colombo, and Singapore.
Manila	[1]—374	[1]—292	41	211	389	389	848	922	1,044	1,858	1,931	1,944	1,978	2,050	Difference between routes via Panama, San Francisco, and Yokohama, and via Suez, Colombo, and Singapore.
Adelaide	1,424	1,483	1,746	1,873	2,000	2,000	2,352	2,412	2,489	3,138	3,211	3,224	3,258	3,330	Difference between rontes via Panama, Tahiti, Sydney, and Melbourne, and via St. Vincent and Cape of Good Hope.

[1] Distance less via Suez.

TABLE XI.—REDUCTION (IN NAUTICAL MILES) EFFECTED BY THE PANAMA CANAL IN LENGTH OF ALL-WATER ROUTES BETWEEN PORTS OF THE ATLANTIC-GULF SEABOARD OF THE UNITED STATES AND PACIFIC PORTS, AMERICAN AND FOREIGN—Continued.

To—	From—														Remarks.
	Portland (Me.).	Boston.	New York.	Philadelphia.	Baltimore.	Norfolk.	Charleston.	Savannah.	Jacksonville.	Port Tampa.	Pensacola.	Mobile.	New Orleans.	Galveston.	
Melbourne	2,448	2,507	2,770	2,897	3,024	3,024	3,376	3,436	3,513	4,162	4,235	4,248	4,282	4,354	Difference between routes via Panama Tahiti, and Sydney, and via St. Vincent, Cape of Good Hope, and Adelaide.
Sydney	3,610	3,669	3,932	4,059	4,186	4,186	4,538	4,598	4,675	5,324	5,397	5,410	5,444	5,516	Difference between routes via Panama and Tahiti and via St. Vincent, Cape of Good Hope, Adelaide, and Melbourne
Wellington	2,283	2,296	2,493	2,568	2,640	2,640	2,854	2,887	2,921	3,368	3,441	3,454	3,488	3,560	Difference between routes via Panama and Tahiti and via Straits of Magellan.

TABLE XII.—REDUCTION (IN NAUTICAL MILES) EFFECTED BY THE PANAMA CANAL IN DISTANCES FROM EUROPEAN PORTS TO THE PORTS OF THE WEST COAST OF AMERICA AND TO NEW ZEALAND.

To—	Via—	From—										Remarks.
		Liverpool.		Hamburg.		Antwerp.		Bordeaux.		Gibraltar.		
		Distance.	Less via Panama.	Distance.	Less via Panama.	Distance.	Less via Panama.	Distance.	Less via Panama.	Distance.	Less via Panama.	
Sitka	Magellan	14,804	5,666	15,185	5,528	14,923	5,528	14,564	5,376	13,873	4,950	Via San Francisco.
	Panama	9,138		9,657		9,395		9,188		8,923		
Port Townsend	Magellan	14,272	5,666	14,653	5,528	14,391	5,528	14,032	5,376	13,341	4,950	Do.
	Panama	8,606		9,125		8,863		8,656		8,391		
Portland, Oreg	Magellan	14,152	5,666	14,533	5,528	14,271	5,528	13,912	5,376	13,221	4,950	Do.
	Panama	8,486		9,005		8,743		8,536		8,271		
San Francisco	Magellan	13,502	5,666	13,883	5,528	13,621	5,528	13,262	5,376	12,571	4,950	
	Panama	7,836		8,355		8,093		7,886		7,621		
San Diego	Magellan	13,110	5,676	13,491	5,538	13,229	5,538	12,870	5,386	12,179	4,960	
	Panama	7,434		7,953		7,691		7,484		7,219		
Acapulco	Magellan	11,891	5,874	12,272	5,736	12,010	5,736	11,651	5,584	10,960	5,158	
	Panama	6,017		6,536		6,274		6,067		5,802		
San Jose de Guatemala	Magellan	11,605	6,128	11,986	5,990	11,724	5,990	11,365	5,838	10,674	5,412	
	Panama	5,477		5,996		5,734		5,527		5,262		
Honolulu	Magellan	13,679	4,403	14,060	4,265	13,798	4,265	13,439	4,113	12,748	3,687	
	Panama	9,276		9,795		9,533		9,326		9,061		
Guayaquil	Magellan	10,582	5,198	10,963	5,060	10,701	5,060	10,342	4,908	9,651	4,482	
	Panama	5,384		5,903		5,641		5,434		5,169		
Callao	Magellan	9,980	4,043	10,361	3,905	10,099	3,905	9,740	3,753	9,049	3,327	
	Panama	5,937		6,456		6,194		5,987		5,722		
Iquique	Magellan	9,510	2,932	9,891	2,794	9,629	2,794	9,270	2,642	8,579	2,216	
	Panama	6,578		7,097		6,835		6,628		6,363		
Valparaiso	Magellan	8,747	1,540	9,128	1,402	8,866	1,402	8,507	1,250	7,816	824	
	Panama	7,207		7,726		7,464		7,257		6,992		
Coronel	Magellan	8,502	1,089	8,883	951	8,621	951	8,262	799	7,571	373	
	Panama	7,413		7,932		7,670		7,463		7,198		
Wellington	Suez	12,989	1,564	13,353	1,409	13,091	1,409	12,732	1,257	11,702	489	Suez route via Aden, Colombo, King George Sound, and Melbourne.
	Panama	11,425		11,944		11,682		11,475		11.213		Panama route via Tahitl.

The time and fuel costs which vessels can save by using the Panama Canal instead of some other route are the measure of the canal's service to commerce. The saving in time of voyage resulting from the reduction which the canal may make in the length of an ocean route will depend upon the speed of the vessel and upon the number of hours required to make the passage through the canal. In Tables XIII and XIV the number of days that may be saved by using the Panama Canal is calculated for vessels of five different speeds—for steamers of 9, 10, and 12 knots, which are the speeds at which freight vessels are operated, and for ships of 14 and 16 knots, the speed of most passenger vessels. A half day is deducted in each instance to allow for the detention of the vessel in making the transit through the canal. When the comparison is between Panama and Suez, it is assumed that the passage through the Suez Canal will delay a vessel a half day. It will be understood that the length of each route through the Panama or Suez Canal (as from New York via Panama to San Francisco or from New York via Suez to Hongkong) includes the length of the canal—41 nautical miles for the Panama Canal and 87 miles for the Suez—and that the half-day taken from the "number of days saved," as stated in the following tables, is the deduction made to allow for the longer time required to make the distance between the canal terminals than would be required to steam the same number of miles at sea.

Table XIII.—NUMBER OF DAYS SAVED, FOR VESSELS OF DIFFERENT SPEEDS, BY THE PANAMA CANAL ROUTE BETWEEN THE ATLANTIC-GULF PORTS OF THE UNITED STATES AND PACIFIC PORTS, AMERICAN AND FOREIGN.

To—	From—																								
	New York, for vessels of—					Charleston, for vessels of—					Port Tampa, for vessels of—					New Orleans, for vessels of—					Galveston, for vessels of—				
	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.
Sitka	35.9	32.3	26.8	22.9	20.0	37.6	33.8	28.1	24.0	20.9	40.0	35.9	29.8	25.5	22.2	40.5	36.4	30.2	25.9	22.6	40.8	36.7	30.5	26.1	22.7
Port Townsend	35.9	32.3	26.8	22.9	20.0	37.6	33.8	28.1	24.0	20.9	40.0	35.9	29.8	25.5	22.2	40.5	36.4	30.2	25.9	22.6	40.8	36.7	30.5	26.1	22.7
Portland, Oreg	35.9	32.3	26.8	22.9	20.0	37.6	33.8	28.1	24.0	20.9	40.0	35.9	29.8	25.5	22.2	40.5	36.4	30.2	25.9	22.6	40.8	36.7	30.5	26.1	22.7
San Francisco	35.9	32.3	26.8	22.9	20.0	37.6	33.8	28.1	24.0	20.9	40.0	35.9	29.8	25.5	22.2	40.5	36.4	30.2	25.9	22.6	40.8	36.7	30.5	26.1	22.7
San Diego	36.0	32.3	26.8	22.9	20.0	37.6	33.8	28.1	24.0	20.9	40.0	35.9	29.9	25.5	22.3	40.6	36.4	30.3	25.9	22.6	40.9	36.8	30.5	26.1	22.8
Acapulco	36.9	33.2	27.5	23.5	20.5	38.5	34.6	28.8	24.6	21.5	40.9	36.8	30.5	26.1	22.8	41.5	37.3	31.0	26.5	23.1	41.8	37.6	31.2	26.7	23.3
San Jose de Guatemala	38.0	34.2	28.4	24.3	21.2	40.2	35.7	29.7	25.4	22.1	42.1	37.9	31.5	26.9	23.5	42.6	38.4	31.9	27.3	23.8	43.0	38.7	32.1	27.5	24.0
Honolulu	30.1	27.0	22.4	19.1	16.7	31.7	28.5	23.7	20.2	17.7	34.1	30.7	25.5	21.8	19.0	34.7	31.2	25.9	22.1	19.3	35.0	31.5	26.2	22.4	19.5
Guayaquil	33.7	30.3	25.2	21.5	18.7	35.4	31.8	26.5	22.6	19.7	37.8	34.0	28.3	24.1	21.1	38.4	34.5	28.7	24.5	21.4	38.7	34.8	28.9	24.7	21.6
Callao	28.4	25.5	21.2	18.1	15.7	30.1	27.0	22.4	19.2	16.7	32.5	29.2	24.2	20.7	18.1	33.0	29.7	24.7	21.1	18.4	33.4	30.0	24.9	21.3	18.5
Iquique	23.3	20.9	17.3	14.8	12.9	25.0	22.4	18.6	15.8	13.8	27.3	24.5	20.4	17.4	15.2	27.9	25.0	20.8	17.7	15.4	28.3	25.3	21.0	17.9	15.6
Valparaiso	16.8	15.1	12.5	10.6	9.2	18.5	16.6	13.7	11.7	10.2	20.9	18.7	15.5	13.2	11.5	21.4	19.2	16.0	13.6	11.8	21.8	19.5	16.2	13.8	12.0
Coronel	14.7	13.2	10.9	9.3	8.1	16.4	14.7	12.2	10.4	9.0	18.8	16.9	14.0	11.9	10.4	19.4	17.4	14.4	12.3	10.7	20.5	17.7	14.6	12.5	10.9
Yokohama	16.9	15.2	12.6	10.7	9.3	20.7	18.5	15.4	13.1	11.4	25.3	22.8	18.9	16.1	14.0	25.9	23.3	19.3	16.5	14.4	26.2	23.6	19.5	16.7	14.5
Shanghai	8.1	7.3	6.0	5.1	4.4	11.9	10.7	8.8	7.5	6.5	16.6	14.8	12.3	10.4	9.1	17.1	15.4	12.7	10.8	9.4	17.4	15.7	13.0	11.1	9.6
Hongkong	....	....	....	....	....	3.1	2.8	2.2	1.9	1.5	7.8	7.0	5.7	4.8	4.2	8.4	7.5	6.2	5.2	4.5	8.7	7.8	6.4	5.4	4.7
Manila	....	....	....	....	....	3.4	3.0	2.4	2.0	1.7	8.1	7.2	5.9	5.0	4.3	8.6	7.7	6.4	5.4	4.7	9.0	8.0	6.6	5.6	4.8
Adelaide	7.5	6.7	5.6	4.6	4.0	10.4	9.3	7.7	6.5	5.6	14.0	12.5	10.4	8.8	7.7	14.6	13.1	10.8	9.2	8.0	14.9	13.3	11.0	9.4	8.1
Melbourne	12.3	11.0	9.1	7.7	6.7	15.1	13.5	11.2	9.5	8.3	18.7	16.8	14.0	11.9	10.3	19.3	17.3	14.3	12.2	10.7	19.6	17.6	14.6	12.4	10.8
Sydney	17.7	15.8	13.1	11.2	9.7	20.5	18.4	15.3	13.0	11.3	24.1	21.7	18.0	15.3	13.4	24.6	22.2	18.4	15.7	13.7	25.0	22.4	18.6	15.9	13.8
Wellington	11.0	9.9	8.1	6.9	6.0	12.7	11.4	9.4	8.0	6.9	15.1	13.5	11.2	9.5	8.3	15.6	14.0	11.6	9.9	8.6	15.9	14.3	11.8	10.5	8.7

TABLE XIV.—NUMBER OF DAYS SAVED, FOR VESSELS OF DIFFERENT SPEEDS, BY THE PANAMA CANAL ROUTE BETWEEN EUROPEAN PORTS AND PORTS OF PACIFIC AMERICA AND OF NEW ZEALAND.

To—	From—																								
	Liverpool, for vessels of—					Hamburg, for vessels of—					Antwerp, for vessels of—					Bordeaux, for vessels of—					Gibraltar, for vessels of—				
	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	9 knots.	10 knots.	12 knots.	14 knots.	16 knots.
Sitka	25.7	23.1	19.1	16.3	14.2	25.1	22.5	18.7	15.9	13.9	25.1	22.5	18.7	15.9	13.9	24.4	21.9	18.1	15.5	13.5	22.4	20.1	16.7	14.2	12.3
Port Townsend	25.7	23.1	19.1	16.3	14.2	25.1	22.5	18.7	15.9	13.9	25.1	22.5	18.7	15.9	13.9	24.4	21.9	18.1	15.5	13.5	22.4	20.1	16.7	14.2	12.3
Portland, Oreg	25.7	23.1	19.1	16.3	14.2	25.1	22.5	18.7	15.9	13.9	25.1	22.5	18.7	15.9	13.9	24.4	21.9	18.1	15.5	13.5	22.4	20.1	16.7	14.2	12.3
San Francisco	25.7	23.1	19.1	16.3	14.2	25.1	22.5	18.7	15.9	13.9	25.1	22.5	18.7	15.9	13.9	24.4	21.9	18.1	15.5	13.5	22.4	20.1	16.7	14.2	12.3
San Diego	25.7	23.1	19.2	16.4	14.3	25.1	22.5	18.7	15.9	13.9	25.1	22.5	18.7	15.9	13.9	24.5	21.9	18.2	15.5	13.5	22.4	20.1	16.7	14.2	12.4
Acapulco	26.7	23.9	19.9	17.0	14.8	26.0	23.4	19.4	16.6	14.4	26.0	23.4	19.4	16.6	14.4	25.3	22.8	18.9	16.1	14.1	23.4	21.0	17.4	14.8	12.9
San Jose de Guatemala	27.8	25.0	20.8	17.7	15.4	27.2	24.4	20.3	17.3	15.1	27.2	24.4	20.3	17.3	15.1	26.5	23.8	19.8	16.8	14.7	24.5	22.0	18.3	15.6	13.6
Honolulu	19.8	17.8	14.8	12.6	10.9	19.2	17.2	14.3	12.2	10.6	19.2	17.2	14.3	12.2	10.6	18.5	16.6	13.7	11.7	10.2	16.5	14.8	12.3	10.4	9.1
Guayaquil	23.5	21.1	17.5	14.9	13.0	22.9	20.6	17.1	14.6	12.7	22.9	20.6	17.1	14.6	12.7	22.2	19.9	16.5	14.1	12.2	20.2	18.2	15.0	12.8	11.1
Callao	18.2	16.3	13.5	11.5	10.0	17.6	15.8	13.1	11.5	9.7	17.6	15.8	13.1	11.5	9.7	16.8	15.1	12.5	10.6	9.2	14.9	13.3	11.0	9.4	8.1
Iquique	13.1	11.7	9.7	8.2	7.1	12.4	11.1	9.2	7.8	6.8	12.4	11.1	9.2	7.8	6.8	11.7	10.5	8.7	7.3	6.3	9.7	8.7	7.2	6.1	5.2
Valparaiso	6.6	5.9	4.8	4.1	3.5	6.0	5.3	4.3	3.5	3.1	6.0	5.3	4.3	3.5	3.1	5.3	4.7	3.8	3.2	2.7	3.3	2.9	2.3	1.9	1.6
Coronel	4.5	4.0	3.3	2.7	2.3	3.9	3.4	2.8	2.3	1.9	3.9	3.4	2.8	2.3	1.9	3.1	2.8	2.2	1.8	1.5	1.2	1.0	0.8	0.6	0.5
Wellington	6.7	6.0	4.9	4.2	3.5	6	5.3	4.4	3.7	3.2	6.0	5.3	4.4	3.7	3.2	5.3	4.7	3.8	3.2	2.7	1.7	1.5	1.2	0.6	0.5

Southern China and the Philippines—Hongkong and Manila—are near the center of the section whose commerce with New York and the other north Atlantic ports of the United States may use the Panama or Suez Canal with equal advantage, as far as distance and time of voyage are concerned. Relative tolls and coal prices via the alternative routes, and the traffic possibilities at intermediate ports, as will be explained in Chapters X and XI, rather than the days to be saved by taking one route rather than the other will determine whether the Panama or the Suez Canal will be used by vessels bound to or from that part of the Orient. Of the commerce of the western side of the Pacific with Europe, only the trade of New Zealand can save time by using the Panama instead of the Suez or some other alternative route. The point on the west coast of South America equally distant from a port of Europe via the Panama Canal and the Straits of Magellan is somewhat south of 40° south latitude. Coronel, the most southerly port mentioned in Table XIV, is about 37° south of the Equator.

CHAPTER II.

TONNAGE OF THE VESSELS EMPLOYED IN THE COMMERCE THAT MIGHT HAVE ADVANTAGEOUSLY USED THE PANAMA CANAL IN 1909-10.

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INTRODUCTION.

In the report made by the Isthmian Canal Commission in 1901, it was stated that in the year 1899, 4,891,075 net register tons of shipping would have used an Isthmian canal had it then been open to traffic. That sum was ascertained by an analysis of the entrances and clearances, at the ports of the United States and European countries, of the vessels employed in the commerce that might have advantageously used a Panama canal. A study was also made of the figures collected by the New Panama Canal Co., which had, for a number of years, kept a record of the movements or voyages of all vessels whose routes were such that the vessels would naturally have passed through a Panama canal. (See Appendix I, chapter XIX.)

The records kept by the French company presented separate tonnage totals for vessels (1) moving between Europe and Pacific-America, (2) between Europe and the Orient, (3) between Atlantic and Pacific America, and (4) between Atlantic-America and the Orient. Most of the tonnage of the vessels moving between Europe and the Orient (Group 2) was excluded from the total because it belonged to the Suez, rather than to the Panama, route. There were added 336,998 tons for the commerce crossing the Isthmus of Panama, because the records kept by the French company could not have included that traffic. These changes having been made in the total tonnage of vessel movements as recorded by the Panama Canal Co., it was found that their records indicated an available Panama traffic in 1899 of 5,001,798 tons net register—a total but slightly larger than that ascertained by the study of recorded entrances and clearances. (Appendix I, chapter XX.)

To determine what tonnage of vessels would have used a Panama canal in 1910, had it then been available, an analysis has been made of the records of the leading commercial nations concerning the entrances and clearances of vessels. The figures here presented are for the latest available year, in most instances for the year 1910. In the case of some foreign countries, figures for 1909 were the latest obtainable. The years covered by the figures are stated in the statistical tables.

The tables contained in this report have been so constructed as to show (1) total entrances and clearances; (2) the tonnage of vessels with cargo as distinct from those in ballast; and (3) the tonnage of sailing vessels separately from the tonnage of steamships. It is important to know what share of the vessels using the Panama Canal will probably move in ballast, because the tolls are ordinarily made less for empty than for loaded vessels. The tonnage of sailing vessels needs to be known to ascertain to what extent traffic will need to shift from sail to steam, for sailing vessels will not use the Panama Canal.

The statistics of vessel entrances and clearances have certain limitations which make it impossible to accept them without careful analysis. Different countries follow dissimilar rules in making their records. There are unavoidable duplications in some instances; and in other cases there are serious understatements due to the fact that the records of vessel movements do not, and can not, correspond to the actual movements of commodities in international commerce. In analyzing entrance and clearance statistics, the following facts are to be kept in mind:

1. The methods or rules followed in recording entrances and clearances in the various nations are not uniform. The regulations of the United Kingdom provide that vessels bringing cargo from more than one foreign port are to be recorded as entering from the first port at which cargo for the United Kingdom was embarked; and that loaded vessels departing from the United Kingdom for more than one foreign port are listed as clearing for the last port to which their cargo is consigned. Vessels in ballast are recorded as entering from the last foreign port at which they touched before reaching the United Kingdom, and as clearing to the

first foreign port to which they are bound. The rules of France, Belgium, Germany, and Austria are essentially the same as the British. The Italian regulations, however, provide that when vessels with cargoes come from, or go to, more than one foreign country, each country is credited with the tonnage.

The rules in force in the United States state that "in tabulating clearances to foreign ports, the tonnage is credited to the country in which is located the first foreign port at which the vessel will enter for discharge of cargo; but if the bulk of the cargo is to be discharged at some other foreign port, the tonnage will be credited to the country in which that port is located. In cases of entrances, the first foreign port from which the vessel sailed with cargo for the United States is that to which the entered tonnage will be credited." The American rule for entrances is, therefore, like the rules of Great Britain, Germany, Belgium, France, and Austria, but the American rule for clearances is different.

2. The records of vessel entrances and clearances often include duplications. This is especially the case in the trade between Europe and the west coast of South America, the Orient, and Oceania. The cause of these duplications will be explained in discussing what deductions from the recorded figures are to be made to eliminate the duplications.

3. The records of the vessel movements between some sections, as between the eastern coast of the United States and the Orient and Oceania, understate the tonnage of shipping actually employed in the commerce; and, for reasons that will be stated later, it is necessary to increase the recorded figures.

4. For the commerce between some sections, as between Europe and Pacific-Mexico and Central America, the records are incomplete, in that they do not state the tonnage at Atlantic and Pacific ports separately.

It is thus necessary to subject entrance and clearance statistics to a careful analysis and to ascertain whether they tally with the known facts as regards vessel movements and commercial exchanges; but, when so tested and corrected, they enable one to determine, with approximate accuracy, the actual vessel tonnage at present available for the Panama Canal.

Vessel Tonnage of European Trade With the West Coast of South America, 1909.

The tonnage of shipping recorded by European countries as having cleared to, and entered, from the west coast of South America, in 1909, is stated in Table I. There were 2,007,857 net tons of European entrances and 2,177,600 net tons of European clearances, a total of 4,185,457.

Table I.—EUROPEAN ENTRANCES AND CLEARANCES, NET REGISTER TONNAGE OF VESSELS TRADING BETWEEN EUROPE AND THE WEST COAST OF SOUTH AMERICA (1909).

Countries.	Entrances.									Clearances.									Total entrances and clearances.
	Chile.		Peru.		Ecuador.		Bolivia.		Total cargo and ballast.	Chile.		Peru.		Ecuador.		Bolivia.		Total cargo and ballast.	
	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.		Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.		
United Kingdom	197,270	......	173,148	1,512	15,726	......	......	......	387,656	585,681	12,234	261,558	......	48,596	......	......	......	908,069	1,295,725
German Empire.	368,445	......	79,323	......	9,684	......	......	......	457,452	113,409	......	131,130	......	3,002	......	......	......	247,541	704,993
Belgium [1]........	219,085	1,153	6,969	359	......	......	......	......	227,506	20,574	2,188	177,943	......	......	......	......	......	200,705	428,271
The Netherlands	84,616	1,860	9,851	......	[2] 4,841	......	(3)	(3)	101,168	6,552	......	......	......	......	......	(3)	(3)	6,552	107,720
Sweden........	......	......	......	......	......	......	......	......	......	1,143	......	......	......	......	......	......	......	1,143	1,143
Hungary........	4,181	......	......	......	......	......	......	......	4,181	......	......	......	......	......	......	......	......	......	4,181
Norway [4]........	......	......	......	......	......	......	......	......	......	44	......	......	......	......	......	......	......	44	44
Portugal........	191,226	......	16,506	2,518	......	......	......	......	210,250	178,888	11,310	21,709	......	......	......	......	......	211,907	422,157
Italy [5]........	21,025	110	......	......	......	......	......	......	21,135	5,502	585	14,976	......	......	......	......	......	21,063	42,198
Spain........	194,589	4,203	......	17,105	......	......	......	......	215,897	193,670	85,840	29,179	38,155	5,286	......	1,213	......	353,343	569,240
France........	215,962	445	153.182	......	12,963	......	......	......	382,552	61,026	......	152,374	......	13,833	......	......	......	227,233	609,785
Total......	1,496,399	7,771	438,979	21,494	43,214	......	......	......	2,007,857	1,166,489	112,157	788,869	38,155	70,717	......	1,213	......	2,177,600	4,185,457

[1] Year 1910; cargo and ballast separated according to ratio obtained from remaining countries, except in case of clearances to Peru.
[2] Including Venezuela and Colombia.
[3] Included under Peru.
[4] Year 1908.
[5] Cargo and ballast separated according to ratio obtained from remaining countries, except in case of clearances to Peru.

The figures in Table I contain certain rather large duplications because of the fact that—

(1) Vessels outbound from German and British ports and recorded in the German and British clearances may call at Belgium, The Netherlands, France, Spain, or Portugal; and, under their rules as to clearances, be again recorded as cleared from one or more of those countries.

(2) Vessels inbound at German and British ports and recorded in the German and British entrances may have called en route at one or more of the above-named countries and have been recorded in their entrances.

(3) The Spanish and Portuguese entrances and clearances may, in addition to possible British and German duplications, contain some tonnage that has been included in French or Italian records.

The recorded entrances and clearances of the United Kingdom, Germany, Norway, and Sweden may be accepted without change, for those countries are so situated as to be the European termini of vessel movements between Europe and the west coast of South America. In the case of Belgium, however, there are duplications, because steamers both outbound from and inbound to German and British ports call at Belgium with cargo. Under the Belgian as well as the British and German rules vessels with cargo are entered from the first port and cleared to the last port at which they loaded or discharged cargo during their voyage. Belgian entrances from the west coast of South America are one-half of those of Germany and within 160,000 tons of those of the United Kingdom; although the imports of Belgium from Pacific South America are small, as compared with those of Germany or Great Britain. The Belgian entrances of sailing vessels amount to 109,723 tons, and may be accepted without change, because they are for chartered vessels which usually bring in and discharge full cargoes. The entrances in ballast—1,512 tons—may also be accepted; because, under the entrance rules of Belgium, Great Britain, and Germany, vessels in ballast are entered from the last point at which they touch. Owing to the smallness of Belgian imports, as compared with those into Germany and Great Britain, and the comparative magnitude of Belgian vessel entrances, it was thought that not more than three-fourths of the remaining steam entrances should be included in the revised figure of entrances. This makes the net Belgian entrances 198,483 net tons.

Belgian clearances of sailing vessels contain no duplications, but amount to only 21,055 tons. The clearances of vessels in ballast (2,188 tons) may also be accepted without change. The exports from Belgium to the west coast of South America are considerably less than those from Germany; yet the recorded clearances from the two countries are not very far apart. It should also be noted that British exports to the west coast of South America do not require so much vessel tonnage as clears from British ports, and ships from Great Britain are known to call at Belgium en route. It is probable that the duplications are greater in the recorded clearances of Belgium than in the entrances. In Belgium, Holland, France, Spain, and Portugal many ships cleared from Great Britain take on cargo, and a smaller number of German vessels call at Belgium to complete their cargo for the west coast of South America. It is thought that the steamship clearances from Belgium should be reduced one-half, or to 136,311 tons. This credits Belgium with a total vessel tonnage to and from Western South America of 334,784 net tons.

A portion of the tonnage recorded by the Netherlands as to and from the west coast of South America is also included in the tonnage recorded as entering and clearing at ports of the United Kingdom and Germany. The situation as to the Netherlands entrances is similar to that of the Belgian, and the same method of avoiding duplications may be adopted. The recorded entrances of sailing vessels (31,007 tons) and those of vessels in ballast (1,860) may be accepted without change, and this sum added to three-fourths of the remaining steam tonnage makes the total entrances 84,093 tons. The recorded clearances of the Netherlands are so small that they may be accepted without change. The total vessel movement between the Netherlands and western South America aggregates 90,645 tons of entrances and clearances.

The recorded vessel entrances into France from the west coast of South America are almost as large as those of Great Britain, although the value of French imports from that section is much less than the value of the imports either of Germany or of Great Britain. The discrepancy must be due to duplication in the vessel entrances. Vessels bound for the United Kingdom or Germany sometimes call at French ports to discharge a portion of their cargo and in that way are recorded both in France and in the British or German ports where their voyages end. As in the case of Belgium and the Netherlands, France's recorded entrances of sailing vessels (109,370 tons) contain few duplications; and the figures for vessels in ballast (445 tons) contain none. Probably one-half of the steamship entrances, as recorded by France, should be deducted to allow for the duplication of tonnage in the German and British figures. Thus corrected, the total French entrances from western South America become 246,183 net tons.

The value of the French and German exports to the west coast of South America do not differ greatly in value, and their vessel clearances to the two countries are similar in amount. The exports from the United Kingdom to western South America are of large value; but the British clearances are disproportionately large in comparison with the exports. Ships from Great Britain call at French ports, partly loaded, and are thus recorded in France as well as in Great Britain. This is true to a less extent of vessels clearing from German ports. Probably one-half of the recorded French clearances to the west coast of South America should be deducted, leaving a total of 113,616 tons. This makes the aggregate net vessel movement, inbound and outbound, between France and western South America 359,799 tons. There are no clearances of sailing vessels or steamers in ballast from France to the west coast of South America.

The duplications in the Spanish tonnage figures are very pronounced. The value of the combined import and export trade of Spain with the west coast of South America is less than $3,000,000; yet the vessel entrances in this trade, as recorded by Spain, are over one-half those of Germany or Great Britain, and the clearances exceed those of Germany. The greater portion of this recorded tonnage is also included in the British, German, and French figures. The entrances of sailing vessels, vessels in ballast, and of steamers flying the Spanish flag may be accepted without deduction. Probably one-fourth of the remaining recorded entrances may properly be retained. This reduces the net entrances to 93,104 tons. The Spanish clearances of sailing vessels, of vessels in ballast, and of steamers flying the Spanish flag aggregate 125,208 tons. This analysis credits the commerce of Spain with western South America with 218,320 net tons of vessel entrances and clearances, of which 145,303 tons consist of vessels moving in ballast.

The trade of Portugal with the west coast of South America is so small that most of the abnormally large vessel tonnage recorded consists of duplications. As in the case of Spain, however, the total tonnage of sailing vessels and of vessels in ballast may be regarded as free from duplications, and doubtless about one-fourth of the remaining entrances may conservatively be retained. By this reasoning Portugal is credited with entrances of 61,600 tons and clearances of 34,966, an aggregate of 96,566. Vessels of Portuguese nationality engaged in the trade with western South America are so few in number that they are not separately specified in the official reports.

The trade of Italy with the west coast of South America is sufficiently heavy to account for the small vessel tonnage recorded by Italy. The same is true of Hungarian tonnage. In both cases the figures may be accepted without change.

The total net entrances into Europe of vessels engaged in the trade with the west coast of South America are reduced by this analysis to 1,553,887 tons and the clearances to 1,594,513, a combined total of 3,148,400. This reduction from the total tonnage as recorded is relatively greater than was made in the report of 1899–1901; but it is believed that the duplications have become more numerous because of the increased use of steamers instead of sailing vessels and because of the growth of line as compared with chartered traffic.

Though the entrances here given are slightly less than the clearances, it is to be noted (1) that 150,312 tons of the clearances consist of vessels in ballast and that a considerable portion of the remaining tonnage clears lightly laden; (2) that the recorded tonnage statistics show a similar relation between entrances and clearances; and (3) that the clearances from Great Britain are unusually large and consist partly of vessels which clear from British ports for South America later to return with cargo destined to continental European ports. Such vessels appear in the clearance returns of Great Britain and in the entrance records of other European countries. Some ships after discharging on the west coast of South America proceed to the Pacific coast of the United States or of British Columbia. Such vessels are recorded by Great Britain as having cleared for western South America and as having entered from the United States or British Columbia.

The tonnage of the sailing vessels in the trade between Europe and the west coast of South America in 1909 was 1,054,917 tons, or 25 per cent of the total recorded tonnage and 38 per cent of the tonnage after the deductions to eliminate duplications. The percentages for 1898–99 are not known, but must have been much larger.

The net tonnage of the vessels that entered and cleared the ports of Europe in 1909–10 in the trade with the west coast of South America was 3,148,400. The details as regards loaded vessels, vessels in ballast, sail and steam vessels, are presented below in Table XI.

Vessel Tonnage of European Trade with Western Central America and Mexico, 1909.

The statistics of the vessel movements between Europe and the western ports of Mexico and Central America via the Horn and the Straits of Magellan are incomplete. The German figures alone distinguish between the eastern and western ports of Mexico and Central America, although Mexico and all the Central American countries, except San Salvador, have ports on both seaboards. Only France and Spain have separate entries for San Salvador. The total recorded European entrances and clearances for the trade with western Mexico and Central America, as stated in Table II, amounted to only 99,751 net tons.

Table II.—NET REGISTER TONNAGE OF VESSELS OPERATED BETWEEN EUROPE AND WESTERN CENTRAL AMERICA AND PACIFIC MEXICO (1909).

Countries.	Central America.						Pacific Mexico.						Total.	
	Vessels in ballast.		Vessels with cargo.		Total vessels.		Vessels in ballast.		Vessels with cargo.		Total vessels.			
	Entrances.	Clearances.	Entrances.	Clearances.	Entrances.	Clearances.	Entrances.	Clearances.	Entrances.	Clearances.	Entrances.	Clearances.	Entrances.	Clearances.
German Empire			18,754		18,754				8,973	57,533	8,973	57,533	27,727	57,533
France with San Salvador			12,667		12,667								12,667	
Spain with San Salvador				1,824		1,824								1,824
Total			31,421	1,824	31,421	1,824			8,973	57,533	8,973	57,533	40,394	59,357

Most European countries trade with the west coast of Mexico and Central America, but the tonnage of shipping employed is not known. The importance of Great Britain in the commerce with this part of America is such that the above figures for Germany and the partial figures for France and Spain ought to be doubled to secure a total equal to the probable actual European entrances and clearances of vessels employed in the commerce with the west coast of Central America and Mexico. By doing this, the total entrances become 80,788 tons and the clearances 118,714, the combined total being 199,502 tons.

A portion of the trade of Europe with the western ports of Mexico and Central America is handled via the Isthmus of Panama, and is discussed later. The tonnage included in Table II is that which moves by all-water routes around South America. In Table XI is a classified summary of this vessel tonnage.

Trade of Europe with the West Coast of the United States, British Columbia, and Hawaii, 1910.

The recorded statistics of the tonnage of vessels moving between Europe and the west coast of the United States contain few duplications, because the figures are taken almost entirely from the American navigation reports and not from the separate records of the various European countries. The figures for Hawaii are taken from the same source, and contain no duplications. The tonnage credited to British Columbia, with the exception of the tonnage of vessels from and to Great Britain, is taken from the Canadian records, and there may be some duplications, because vessels en route between Europe and British Columbia may call at Pacific ports of the United States. It is believed, however, that 118,407 tons of vessel movements were required for the trade between British Columbia and Europe, and that the amount of duplications must be small. The tonnage of vessels that entered Great Britain from British Columbia and that cleared thence from Great Britain was obtained from the British Navigation Report for 1909, and there could be no duplications in the figures.

The total entrances into Europe from the Pacific ports of the United States, Hawaii, and British Columbia in 1910 were 419,865 tons, and the clearances 269,853, the combined total being 689,718. The detailed statistics are shown in Tables III and XI.

Table III.—NET REGISTER TONNAGE, ENTRANCES AND CLEARANCES, VESSEL MOVEMENTS BETWEEN EUROPE AND WESTERN COAST OF UNITED STATES, BRITISH COLUMBIA, AND HAWAII (1910).

Countries.	Vessels in ballast.		Vessels with cargo.		Total.	
	Entered.[1]	Cleared.[2]	Entered.[1]	Cleared.[2]	Entered.[1]	Cleared.[2]
Pacific United States	....	12,213	331,319	208,453	331,319	220,666
British Columbia [3]	....	586	88,546	29,275	88,546	29,861
Hawaii	....	....	....	19,326	....	19,326
Total	....	12,799	419,865	257,054	419,865	269,853

[1] Entered Europe from Pacific United States, British Columbia, and Hawaii.
[2] Cleared from Europe to Pacific United States, British Columbia, and Hawaii.
[3] Data of United Kingdom for year 1909; total divided between cargo and ballast, according to figures of the United Kingdom.

It should be noted that "Clearances" in the above table comprise clearances from Europe to the Pacific United States, Hawaii, and British Columbia. Vessel movements are heaviest toward Europe, for it is in this direction that grain, lumber, and flour, requiring heavy vessel tonnage, are carried.

Vessel Tonnage of European Trade with the Orient East of Singapore and with Oceania, 1909.

In the foregoing analysis of the entrances and clearances of the vessels employed in the trade between Europe and the west coast of South America, Central America, Mexico, and the United States and of the trade of Europe with British Columbia and Hawaii, the sole problem has been to ascertain from the records of entrances and clearances the correct tonnage of vessel movements. The saving in distance effected by the Panama Canal will be sufficient to cause all this trade, with the possible exception of a part of that to and from central and southern Chile, to use the canal. For the trade of Europe with the Orient and Oceania the Panama Canal will compete with the Suez Canal and the Cape of Good Hope route. In the following table, No. IV, the net register tonnage of all the vessels that entered and cleared European ports in 1909 in the trade between Europe and oriental countries east of Singapore is included; but, for reasons that are fully stated below, only a small share of this tonnage is to be included in the available Panama traffic.

Table IV.—NET REGISTER TONNAGE, EUROPEAN ENTRANCES AND CLEARANCES OF VESSELS TRADING BETWEEN EUROPE AND ORIENTAL COUNTRIES EAST OF SINGAPORE AND COUNTRIES OF OCEANIA (1909).

Countries.	Entrances.														
	China.[1]		Japan.		Australia.		New Zealand		Philippine Islands.		Korea.		Other Pacific countries.		Total cargo and ballast.
	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	
United Kingdom	62,313	3,999	567,618	134,934	1,104,237	71,271	387,099	......	[2] 65,024	....	3,547	......	[3] 2,224	......	2,402,266
German Empire	16,046	......	239,034	....	301,514	......	....	......	8,104	....	....	......	[4] 49,508	......	614,206
Belgium [5]	70,002	......	616,670	....	584,473	......	....	......	3,361	....	....	......	....	......	1,274,506
The Netherlands	95,221	......	89,507	....	100,737	......	....	......	....	....	....	......	....	......	285,465
Sweden	....	......	2,462	....	4,240	......	....	......	....	....	....	......	....	......	6,702
Norway	....	......	....	....	....	......	....	......	....	....	....	......	....	......	....
Austria	....	......	47,139	....	....	......	....	......	....	....	....	......	....	......	47,139
Hungary [6]	2,000	......	47,164	....	....	......	....	......	2,908	....	....	......	....	......	52,072
Italy [7]	143,488	......	67,587	....	209,642	......	....	......	36,835	....	....	......	....	......	457,552
Spain	....	......	....	....	....	......	....	......	119,417	16,498	2,853	......	....	......	138,768
France	73,567	......	523,843	....	445,021	......	....	......	50,595	....	....	......	[8] 757	......	1,093,783
Finland	....	......	....	....	....	......	....	......	....	....	....	......	....	......	....
Total	462,637	3,999	2,201,024	134,934	2,749,864	71,271	387,099	......	286,244	16,498	6,400	......	52,489	......	6,372,459

[1] Including Hongkong and foreign spheres of influence.
[2] Including Guam.
[3] Other British Pacific possessions.
[4] Other British and French Pacific possessions.
[5] Year 1910. All vessels classed as vessels with cargo, except clearances to Japan and Australia.
[6] Port of Fiume.
[7] All vessels classed as vessels with cargo, except clearances to Australia.
[8] Other Oceanic islands.

TABLE IV.—NET REGISTER TONNAGE, EUROPEAN ENTRANCES AND CLEARANCES OF VESSELS TRADING BETWEEN EUROPE AND ORIENTAL COUNTRIES EAST OF SINGAPORE AND COUNTRIES OF OCEANIA (1909)—Continued.

Countries.	Clearances.															Total entrances and clearances.
	China.[1]		Japan.		Australia.		New Zealand.		Philippine Islands.		Korea.		Other Pacific countries.		Total cargo and ballast.	
	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.	Cargo.	Ballast.		
United Kingdom	63,425	.....	652,305	136,277	953,771	119,266	409,330	5,768	[2] 17,914	.....	42,522	.....	[3] 3,948	.....	2,404,526	4,806,792
German Empire	53,574	.....	196,567	....	196,388	12,209	168	.....	....	.....	....	.....	[4] 39,536	.....	498,442	1,112,648
Belgium[5]	70,615	.....	678,760	96,965	202,181	20,422	....	.....	....	.....	....	.....	....	.....	1,068,943	2,343,449
The Netherlands	74,858	.....	21,240	....	65,108	....	....	.....	....	.....	....	.....	....	.....	161,206	446,671
Sweden	....	.....	50,367	....	65,486	11,492	....	.....	....	.....	....	.....	....	.....	127,345	134,047
Norway	2,180	.....	....	....	60,341	....	....	.....	....	.....	....	.....	....	.....	62,521	62,521
Austria	1,999	.....	47,826	3,843	....	....	....	.....	2,908	.....	....	.....	....	.....	56,576	103,715
Hungary[6]	....	.....	47,869	....	....	....	....	.....	....	.....	....	.....	....	.....	47,869	99,941
Italy[7]	137,551	.....	....	....	200,643	20,267	....	.....	34,726	.....	....	.....	....	.....	393,187	850,739
Spain	1,134	.....	4,213	....	....	....	....	.....	165,543	.....	....	.....	....	.....	170,890	309,658
France	24,153	.....	138,852	....	292,951	7,001	....	.....	....	.....	....	.....	....	.....	462,957	1,556,740
Finland	2,180	.....	....	....	....	....	....	.....	....	.....	....	.....	....	.....	2,180	2,180
Total	431,669	.....	1,837,999	237,085	2,036,869	190,657	409,498	5,768	221,091	.....	42,522	.....	43,484	.....	5,456,642	11,829,101

[1] Including Hongkong and foreign spheres of influence.
[2] Including Guam.
[3] Other British Pacific possessions.
[4] Other British and French Pacific possessions.
[5] Year 1910. All vessels classed as vessels with cargo, except clearances to Japan and Australia.
[6] Port of Fiume.
[7] All vessels classed as vessels with cargo, except clearances to Australia.

The distance tables in Chapter I show that the route from Europe to China, Hongkong, Korea, and the Philippines via the Suez Canal is so much shorter than that via the Panama Canal that the Suez route will retain most of the traffic between Europe and Pacific Asia, although the tolls and the fuel costs may be lower via Panama.

New Zealand and that part of Oceania east of Australia are nearer northern Europe by way of Panama. Wellington will be 1,564 miles nearer Liverpool by the Panama Canal than via the Suez route, and 500 miles less distant via Panama than by way of the Straits of Magellan. The distances to Liverpool from the leading groups of South Pacific islands will be from 500 to 5,500 miles less via the American Canal than by way of Suez.

The European entrances from New Zealand and the Pacific islands in 1909 aggregated 439,588 tons and the clearances 458,750. A portion of this tonnage will doubtless continue to move via the Straits of Magellan, because the distance saved is sufficient to warrant the payment of only a light toll. Line steamers and vessels carrying perishable products may be expected to use the canal. There are some small duplications in the New Zealand tonnage, because vessels to and from New Zealand make calls at Australian ports, but there is but little tonnage recorded twice, because the larger share of the trade is handled by chartered vessels. It is thought to be a conservative assumption that about 50 per cent of the vessel tonnage between Europe and New Zealand may advantageously use the Panama Canal. This credits the European trade with New Zealand with vessel entrances of 219,794 tons, and clearances of 229,375 ,an aggregate of 449,169 tons.

The distances from Sydney, Australia, and from Yokohama, Japan, to Europe via the Suez route are shorter than via the Panama Canal, but the differences are not great. Some vessels outbound from Sydney and Yokohama will doubtless take the Panama route. The reasoning of the report of 1899–1901 on this matter is, for the most part, as valid now as it was then. It was then stated that[1]—

The distance from Liverpool to Sydney, Australia, by way of the Panama Canal and Tahiti will be 150 miles greater than via the Suez, Colombo, Adelaide, and Melbourne, but this disadvantage of the westerly course will be partially, if not quite, offset by two facts favoring the American canal route. From Liverpool the distance via the Cape of Good Hope, Adelaide, and Melbourne and Sydney is 582 miles greater than by way of the Panama Canal and Tahiti. The use of the westerly route will enable vessels engaged in the European-Australian trade to avoid the excessive heat of the Gulf of Aden and the Red Sea and the storms of the tempestuous Indian Ocean. The American route also will be favored by the fact that a vessel on its way between Liverpool and the Isthmian Canal will have to go but 500 miles out of its course to call at New York, next to the greatest port of the world, whence outbound cargoes are practically always

[1] The figures for difference in distance have been revised to correspond with the tables contained in the final report.

obtainable. With the advantages of cheaper coal, a cooler passage in the Tropics, quieter seas, and the attractive force of America's heavy tonnage, the American Isthmian route will be used, instead of the course through the Suez Canal, by some of the vessels departing from Europe for Australia or other regions on that side of the Pacific Ocean.

Vessels proceeding from Europe by way of American ports and the Isthmian Canal to Oceania and the East will have the choice of returning to Europe by way of the Suez or by way of the American route. By whatever route the European vessels reach the oriental and other countries of the western Pacific, the route by which they return to Europe will be determined by the relative opportunities for obtaining cargo by way of the Suez and American routes, respectively.

The reasons for believing that a portion of Europe's imports, from the western half of the Pacific, will come by way of the American route are stronger than the reasons just cited regarding the use of the American Canal for the European export trade. A vessel finding itself in the East Indies, Japan, China, or Australia may either take on cargo for Europe and for intermediate points along the Suez route or it may load with such cargo as may be available for Europe and American countries and proceed—in most cases but partially loaded—across the Pacific to the western coast of the United States, where a great abundance of cargoes destined for Europe may be obtained, or the ship may go to Central America and West Indian ports, where a fair amount of freight for Europe will usually be available, or the vessel may proceed to Chile or some other west South American country, where there is always a heavy amount of out-bound traffic. Besides being certain of securing freight from South America or North America for Europe a vessel returning from the Orient by the American canal will also have the advantage above referred to of being able to secure coal more cheaply than it can be obtained along the Suez line.

It would seem probable, upon *a priori* grounds, that vessels leaving Europe, whether by way of the Suez or by way of the American canal, will frequently find the return trip via America more profitable than by the route in the opposite direction. This general proposition, moreover, seems to accord with the evidence regarding the present round-the-world movement of vessels. The entrance and clearance statistics of the vessels engaged in the foreign trade of the west coast of North and South America indicate that a large number of vessels now going out from Europe toward the East return from the West.

At the present time some vessels cross the Pacific to secure cargo on the west coast of the Americas for transportation to Europe via the Straits of Magellan or Cape Horn. The tendency for vessels outbound from Australia or Japan to seek cargo in North or South America will be stronger after the Panama Canal is opened. If it be assumed that but 10 per cent of the tonnage of the Australian trade and only 5 per cent of the tonnage of the commerce of Japan with Europe will move through the American canal, the European entrances of vessels coming from Australia via Panama would be 282,113 tons and the clearances 222,752; the European entrances of ships coming from Japan via Panama would be 116,797 tons and the clearances 103,754. The combined European tonnage moving through the canal in the trade with Australia and Japan would be 725,416 tons.

The above analysis credits to the Panama Canal, of European entrances in the trade with New Zealand, the Pacific islands to the north, Australia and Japan, 618,704 tons, and of the clearances 555,881, an aggregate of 1,174,585 tons, distributed between vessels with cargo and those in ballast as shown in Table XI. It is possible that this tonnage is entirely too small, because it includes none of the trade of Europe with China, Hongkong, Korea, the Philippines, and the East Indies, and but a small proportion of the trade with Australia and Japan. On the other hand, it allows fully for the distance advantage which the Suez Canal has over the Panama route. The causes affecting the choice of routes taken by vessels sailing for Europe and for the eastern seaboard of the United States from Australasia and Asiatic ports north and east of Singapore are considered at length in discussing the relation of tolls to the volume of traffic that may advantageously use the Panama Canal—Chapter XI.

Vessel Tonnage of the Trade of the Atlantic-Gulf Seaboard of the United States with the West Coast of South America, Pacific Mexico, and Hawaii, 1910.

The traffic between the Atlantic-Gulf seaboard of the United States and the west coast of North and South America, including Hawaii, will practically all take the Panama route. The only possible exception will be a slight tonnage to and from the southern part of Chile. At present the commerce between the United States and western South America is relatively small; but it should be much larger after the canal has had time to exercise its influence.

The vessel entrances into the Atlantic-Gulf ports of the United States from the west coast of South America in 1910 amounted to 300,909 tons, and the clearances to 166,686, a total of 467,595 tons. This does not include the present traffic across the Isthmus of Panama, which is considered on a later page.

Table V.—NET REGISTER TONNAGE, ENTRANCES AND CLEARANCES, VESSEL MOVEMENTS BETWEEN THE UNITED STATES ATLANTIC-GULF COAST AND PACIFIC SOUTH AMERICA, PACIFIC MEXICO, AND HAWAII (1910).

Countries.	Entrances.		Clearances.		Total entrances and clearances.
	With cargo.	In ballast.	With cargo.	In ballast.	
Chile	272,601		99,015	384	372,000
Peru	18,004		2,595		20,599
Ecuador			14,482		14,482
Pacific Mexico			20,544		20,544
Hawaii [1]	10,304		29,666		39,970
Total	300,909		166,302	384	467,595

[1] Fiscal year 1911; all clearances classed as vessels with cargo; entrances from original abstracts.

The figures in Table V may somewhat understate the actual tonnage; because, under the rules of the United States as to recording clearances, vessels are cleared to the first foreign port at which they discharge cargo, unless the bulk of the cargo is destined to some other foreign port. This partly accounts for the great difference between the entrances and clearances in trade between the eastern seaboard of the United States and Pacific-American countries. The actual vessel entrances into our eastern ports from Pacific America, however, are much in excess of the clearances; because our imports from the west coast of the Americas are greater, both in value and bulk, than our exports to that part of the world. Some addition might possibly be made to the recorded clearances, as stated in Table V, but it has been thought best to accept the figures without change.

Entrances and Clearances in the Trade of the Atlantic-Gulf Seaboard of the United States with Oceania and the Orient East of Singapore.

It is especially difficult, for the following reasons, to obtain accurate statistics of the vessel movements made in carrying on the trade between our Atlantic-Gulf Seaboard and the Orient and Pacific Oceania:

(1) A portion of the commerce is handled indirectly by way of Europe, and the cargoes there transshipped are credited to our commerce with Europe instead of to our trade with the Orient and Oceania.

(2) Some vessels engaged in our trade with points east of Singapore load and discharge freight en route at points in southern Asia. Our records of entrances and clearances may thus credit to countries west of Singapore tonnage that should be credited to countries beyond Singapore.

(3) The recorded entrance and clearance statistics of the vessel movements between the eastern seaboard of the United States and Oceania and the Orient east of Singapore are so small in comparison with the known volume of this trade that the figures for vessel movements can not be accepted at their face value. The tonnage of shipping recorded as having entered and cleared at American ports could not possibly have transported the traffic that was exchanged.

Table VI.—NET REGISTER TONNAGE, ENTRANCES AND CLEARANCES, VESSEL MOVEMENTS BETWEEN THE UNITED STATES ATLANTIC-GULF COAST AND ORIENTAL COUNTRIES EAST OF SINGAPORE AND COUNTRIES OF OCEANIA.

Countries.	Entrances.		Clearances.		Total entrances and clearances.
	Cargo.	Ballast.	Cargo.	Ballast.	
China	43,651		123,708		167,359
Hongkong	26,885		62,817		89,702
Japan	108,633	3,609	93,008	10,300	215,550
Australia and Tasmania	5,677		192,580		198,257
Philippine Islands	69,756		130,272		200,028
French Oceania	4,308				4,308
German Oceania			1,478		1,478
New Zealand			15,769		15,769
Korea			6,228		6,228
Total	258,910	3,609	625,860	10,300	898,679

The recorded entrances and clearances of 898,679 tons, as stated in Table VI, should be increased by the vessel tonnage required to handle the trade carried on between the eastern seaboard of the United States and Pacific countries indirectly by way of Europe. The Panama route from New York to Yokohama via San Francisco and the great circle is 3,768 miles shorter than the Suez route; to Shanghai the distance via Panama is 1,876 miles less. Hongkong and Manila are almost equally distant from New York via the Panama and Suez routes. Sydney, Australia, is 3,932 and Wellington, New Zealand, 5,590 miles nearer New York via the Panama Canal than via the Good Hope route; and Wellington is 2,493 miles nearer New York via the Panama Canal than by way of the Straits of Magellan. With the possible exception of a portion of the tonnage moving to and from Hongkong and the Philippines, the bulk of the trade of our Atlantic and Gulf ports with the Orient east of Singapore and with Australasia and Oceania will use the Panama Canal. Some vessels engaged in the trade with Hongkong and the Philippines will continue to take the route via the Suez Canal and the ports in southern Asia. Likewise, some vessels will sail from Europe for Hongkong and Manila via the Suez and will return to Europe via the west coast of the United States and the Panama Canal.

According to the statements of exporters, steamship agents, and navigation companies, a considerable portion of the imports into our Atlantic and Gulf ports from Oceania is handled indirectly by way of Europe. Our records state that but 9,985 tons of vessels entered directly from Oceania, whereas our imports would have required a larger tonnage of shipping had all the imports been brought directly from Oceania. Our imports from the Orient, however, are nearly all brought to us directly. They do not reach us, in large amounts, by way of Europe. It is estimated by those engaged in the trade that about 90 per cent of our imports from Oceania and 5 per cent of our imports from the Orient east of Singapore reach the United States in vessels that are not recorded as entering from the countries of Oceania or the Orient.

The portion of the export trade from our Atlantic-Gulf coast to Oceania that is handled indirectly probably does not exceed 25 per cent. The percentage of the exports to the Orient shipped indirectly is about the same as in the case of imports.

The total imports credited to the Atlantic and Gulf ports of the United States from Oceania and the Orient east of Singapore, in 1910, were valued at $66,483,000. Some of these imports entered by way of our Pacific coast ports. Indeed, in 1910, the Atlantic and Gulf ports received by rail from the Pacific ports imports valued at $9,770,073. Moreover, the New York customhouse reports state that, in 1911, imports appraised at $3,715,619 were received at New York by way of the Canadian Pacific Railroad and the ports of British Columbia.

The ratio of New York's 1911 to its 1910 imports from Oceania and the Orient, applied to the 1910 imports from those sections into the other ports than New York on the Atlantic seaboard of the United States, would make the approximate value of all imports at the Atlantic and Gulf ports received through Pacific coast ports in 1911 about $13,927,900. This sum deducted from the total value of the imports of the Atlantic and Gulf ports from Oceania and the Orient east of Singapore, leaves $52,555,000.

If it be assumed, as it probably may safely be assumed, that 90 per cent of the imports from Oceania and 5 per cent of the imports from the Orient to our eastern seaboard are at present received indirectly, then the indirect imports aggregate about $18,418,700, or 35 per cent, of the total received by water. If it, also, be assumed that 25 per cent of the exports from our Atlantic and Gulf ports to Oceania and 5 per cent of those to the Orient east of Singapore are handled indirectly, the indirect exports would aggregate about $8,996,000, or 12½ per cent, of our total exports to the trans-Pacific sections under consideration. These ratios have been adopted after advising with some of the principal steamship companies engaged in our oriental trade.

A portion of the tonnage of ships that enter the Atlantic ports of the United States from southern Asiatic countries should be added to the recorded entrances from the Orient east of Singapore and Oceania. The Bureau of Statistics reports the entrances from southern Asia to be 339,429 tons, or 29 per cent in excess of the entrances from countries east of Singapore, whereas the imports of the Atlantic and Gulf seaboards from southern Asia exceed those from the remainder of the Orient and from Oceania by only 23 per cent. The recorded entrances, as given in Table VI, may, therefore, properly be increased by about 6 per cent in order to include the tonnage now accredited to southern Asia.

The additions that need to be made to the recorded tonnage, as stated in Table VI, in order to account for the indirect trade by way of Europe, increase the clearances by 12½ per cent, or 79,520 tons. The entrances need to be increased 35 per cent, or 91,881 tons, to cover the imports via Europe, and 6 per cent, or 15,751 tons, because of the fact that vessels bringing goods from the Orient to the eastern part of the United States may be entered from southern Asia. These changes would make the clearances of the Atlantic-Gulf ports in the trade with Oceania and the Orient east of Singapore 715,680 tons, and the entrances 370,151 tons, a total of 1,085,831 tons.

In view of the known volume of trade between the Atlantic and Gulf seaboards of these countries, a vessel tonnage of 1,085,831 tons must be regarded as too low. In the reasoning in the above paragraphs liberal allowances were made for the trade handled indirectly by way of Europe, but it is evident that the tonnage recorded by the Bureau of Statistics as having entered directly from, or as having cleared for points beyond, Singapore must be much below the actual vessel movement. The value of the total trade between the Atlantic and Gulf seaboards of the United States and Oceania and the Orient east of Singapore in 1910 was $130,444,945; and, after deducting the imports by rail from the Pacific ports, the trade by water was valued at about $116,517,000. The trade of the same countries with the United States via our Pacific ports and by way of the northern border ports of the United States was, in 1910, valued at $101,418,178; and if the in-transit import trade through our Atlantic and Gulf ports to the west coast of the United States be added, the total value becomes $115,346,170. This sum is less than the value of the trade between the eastern ports of the United States and Oceania and the Orient. Moreover, our imports from those foreign sections via Europe are credited to our commerce with Europe, not to our trade with the Orient and Oceania. Were this trade via Europe added to the recorded trade of the Atlantic and Gulf ports, the difference between the value of the trade with Oceania and the Orient via the east and west coasts of the United States would be still greater.

Though the value of the trade at the eastern ports of the United States with Oceania and the Orient east of Singapore was greater, in 1910, than the value of our trade carried on with those trans-Pacific sections at the Pacific and northern border ports of the United States, the Bureau of Statistics recorded entrances and clearances of 2,512,697 tons at the Pacific ports of the United States. The tonnage of vessels engaged in the trade between the Pacific ports of the United States and Oceania and the Orient would be somewhat larger than the corresponding tonnage at our Atlantic and Gulf ports, because the exports from our Pacific ports include bulkier products, and also for the reason that more of the traffic across the Pacific moves in regular steamship lines carrying passengers as well as freight; but the difference between 2,512,697 and 1,085,831 tons is excessive.

The records kept by the New Panama Canal Co. showed that, in 1899, there were 1,271,357 tons of vessel movements between the Atlantic and Gulf seaboard and Oceania and the Orient; but their records were for a somewhat wider area in the Orient than is included in the above analysis.

The report of the Isthmian Canal Commission in 1901, after discussing the statistical problem here under consideration, accepted for the total entrances and clearances between the Atlantic-Gulf ports of the United States and Oceania and the Orient east of Singapore double the tonnage of the recorded clearances. If the same method were now followed the total entrances and clearances for the trade under consideration would be 1,272,320 tons. It was stated in the report of 1899–1901 that the total of entrances and clearances was probably more than double the recorded clearances, and it is doubtless true that the actual vessel movements to-day are in excess of double the tonnage of the recorded clearances from our Atlantic-Gulf coast directly to Oceania and oriental countries beyond Singapore.

It would hardly be possible to handle the volume of trade now carried on between the Atlantic-Gulf ports of the United States and Oceania and the Orient beyond Singapore with vessel entrances and clearances at our Atlantic-Gulf ports of less than 1,500,000 tons, and this tonnage is believed to be a conservative estimate. In accepting this as the probable tonnage, no allowance has been made for the probable diversion, after the opening of the Panama Canal, of an appreciable volume of trade between the United States and the Orient from the present routes via the Pacific ports of the United States to routes via the Atlantic and Gulf ports. Unquestionably some of the trade of the eastern and middle sections of the United States with trans-Pacific countries will be diverted from the transcontinental railroads and the routes across the Pacific to the railroads leading to the Atlantic and Gulf ports and to the steamship lines from those ports through the Panama Canal to and from the Orient.

The total tonnage of vessel movements between the eastern part of the United States and Oceania and the Orient east of Singapore is apportioned by Table XI between the tonnage of vessels with cargo and of vessels in ballast. In order to do this it was necessary to adopt an arbitrary ratio, and it was assumed that the ratio for this tonnage was the same as that of the recorded entrances and clearances for the trade in question. In dividing the total of 1,500,000 tons between entrances and clearances, it was assumed that the clearances must have exceeded the entrances by 300,000 tons, because the commodities exported are more bulky in character than those imported.

Vessel Tonnage Engaged in the Present Traffic Across the Isthmus of Panama.

The tonnage of vessels entering and clearing at Colon and Panama is exceptionally large in comparison with the amount of freight actually loaded and discharged. The following table, Number VII, shows that the tonnage of entrances and clearances at Colon, in 1909-10, amounted to 3,716,573 tons, and at Panama to 777,959 tons.

Table VII.—NET REGISTER TONNAGE, ENTRANCES AND CLEARANCES OF VESSELS AT COLON AND PANAMA, 1909-10.

	Entrances.	Clearances.	Total.
Atlantic coast of Panama	1,870,063	1,846,510	3,716,573
Pacific coast of Panama	388,060	389,899	777,959
Total	2,258,123	2,236,409	4,494,532

The Panama Railroad in 1909–10 carried 236,241 tons of through freight from Colon to Panama and 145,017 tons from Panama to Colon. Twenty-eight per cent of the total freight moving from Colon to Panama was through freight, and of the total moving from Panama to Colon, 45 per cent was through freight. If these ratios be applied respectively to the vessel entrances at Colon and at Panama they produce a total of 698,244 tons. It is assumed that this tonnage of shipping was required in 1909–10 to bring to Colon and Panama the 381,258 cargo tons of through freight that crossed the Isthmus.

Panama, and more particularly Colon, are ports of call, and vessels entering and clearing them have cargo for many other places. The tonnage of vessels used to carry to and from the Isthmus the 381,258 tons of freight that was taken across Panama in 1909–10 can not be regarded as the tonnage which would have been required if the canal had been in existence. It is assumed that most of this freight would in that case have been carried by vessels that passed through the canal and not by ships using Colon and Panama as ports of call. In estimating how great this vessel tonnage would have been, the Colon entrances and clearances must be disregarded because of the large amount of Isthmian Canal Commission freight and because Colon is a port of call for a large number of ocean lines that carry passengers as well as freight. The entrances and clearances at the port of Panama are likewise to be accounted for in part by the fact that vessels call there en route, but the tonnage of such vessels as well as the shipping employed to carry freight to Panama for the Canal Commission is much less than is the corresponding shipping entering and clearing Colon.

It may apparently be assumed that one-third of the clearances from Panama are either of vessels that have called en route or are of ships that have brought goods to be used on the Canal Zone, and that the remaining two-thirds of the clearances, 259,932 tons of shipping, were employed in transporting from Panama the 236,241 tons of through freight that reached Panama from Colon for shipment to points beyond. The tonnage of through freight moving by rail from Panama to Colon is 61 per cent of the tonnage moving in the opposite direction, and it is probable that the tonnage of vessels that entered Panama to bring in the 145,017 tons of through freight moving northward across the Isthmus is approximately 61 per cent of the tonnage of vessel clearances at Panama, or 158,558 tons. By this reasoning the total tonnage of entrances and clearances to be credited to the trade via the Isthmus in 1909–10 becomes 418,490 tons.

The figures used in the above estimate are based upon the traffic of 1909–10. The trans-Isthmian trade in 1910–11 was larger than during the previous year, but in the estimate here made the data for 1909–10 were taken because the 1910–11 figures for vessel entrances and clearances were not obtainable, and because most of the statistics in this chapter are for 1909–10.

Vessel Tonnage of the Trade of Eastern Canada with Alaska, Chile, and Australia.

No direct vessel movements between eastern Canada and the ports of the Pacific coast of the United States are recorded for the year 1909–10. There may have been some traffic by way of the Isthmus of Panama, but this would be included in the tonnage of the Panama traffic.

TABLE VIII.—NET REGISTER TONNAGE, ENTRANCES AND CLEARANCES, VESSEL MOVEMENTS BETWEEN EASTERN CANADA AND ALASKA, CHILE, AND AUSTRALIA (1910).

Countries.	Vessels in ballast.		Vessels with cargo.		Total.	
	Entered.[1]	Cleared.[2]	Entered.[1]	Cleared.[2]	Entered.[1]	Cleared.[2]
Alaska	3,233	1,478	10,177	13,608	13,410	15,086
Chile				2,836		2,836
Australia[3]				4,326		4,326
Total	3,233	1,478	10,177	20,770	13,410	22,248

[1] Entered eastern Canada from Alaska, Chile, and Australia.
[2] Cleared from eastern Canada to Alaska, Chile, and Australia.
[3] All clearances recorded as with cargo.

Table VIII shows that in 1910, 35,658 tons of vessels moved directly from eastern Canada to Alaska, Chile, and Australia.[1] As in the case of shipments from the eastern to the western seaboard of the United States, this tonnage may be accepted without change. The Australian tonnage in Table VIII is small, because the trade of eastern Canada with Australia has not been developed. There may be a slight traffic between eastern Canada and Australia via Europe, but this would be included in the tonnage of vessels moving between Europe and Australia.

THE AMERICAN-HAWAIIAN STEAMSHIP CO.'S ADDITION TO THE TONNAGE OF THE PANAMA CANAL.

Since 1907 the American-Hawaiian Steamship Co. has maintained a service between New York, San Francisco, and Hawaii by way of Tehauntepec and the railway across that Isthmus. The entrances and clearances of the vessels employed in that trade during the fiscal years 1910 and 1911 are shown in Table IX:

TABLE IX.—NET REGISTER TONNAGE, ENTRANCES AND CLEARANCES, AMERICAN-HAWAIIAN STEAMSHIP CO.'S FLEET, 1910 AND 1911.

	1910	1911
Entrances at New York from Puerto, Mexico	215,683	243,943
Clearances from New York for Puerto, Mexico	218,539	244,887
Entrances at San Francisco from Salina Cruz	218,181	263,038
Clearances from San Francisco for Salina Cruz	97,014	124,796
Entrances at Hawaii from Salina Cruz	138,261	157,339
Clearances from Hawaii for Salina Cruz	135,422	129,824

To accept without analysis these clearances and entrances as a measure of the tonnage which the American-Hawaiian fleet would have caused to pass through the Panama Canal in 1910 and 1911 would exaggerate the tonnage. The vessel movements between New York and Puerto Mexico, can not, however, be taken as the tonnage which would have used the canal; because if the vessels had been operated through a Panama Canal to San Francisco and Hawaii, they would have made fewer trips than they made between New York and Puerto Mexico.

A better measure of the vessel tonnage to be credited to the available canal traffic on account of the present trade by way of the Isthmus of Tehauntepec may be obtained by estimating the number of runs each vessel of the American-Hawaiian Co.'s fleet would make in a year from New York to the west coast and back via a Panama Canal. Had the fleet in service during 1910 been operated through the Panama Canal, it would have added 363,426 tons to the tonnage using the waterway. Five additional vessels of 4,250 tons each were then being constructed for service between New York and the Pacific coast of the United States and they, had they been operated, would have added 110,712 tons to the canal's traffic.

[1] The Alaskan tonnage is taken from the report of the United States Bureau of Statistics, and the Chilean and Australian tonnage from the official publication of Canada.

Tonnage of Vessels Moving Between the Eastern and Western Seaboards of the United States via the Straits of Magellan.

The coasting trade between the two seaboards of the United States by way of the Straits of Magellan and Cape Horn, in 1910, amounted to 172,655 tons, 117,147 of which were entrances at Pacific ports and 55,508 clearances therefrom. Over 50 per cent of the vessels moving from the Atlantic to the Pacific ports of the United States clear from our west coast to Europe, from whence they return to the United States.

Summary.

The foregoing detailed statistics of the vessel tonnage that might have used a Panama Canal in 1910 are summarized in Tables X and XI. Table X states the entrances and clearances above considered just as they were taken from the tonnage reports of the United States and of various foreign countries. As far as possible, separate figures are given for clearances and entrances, for vessels with cargo, for vessels in ballast, for sailing vessels, and for steamships.

Table X.—SUMMARY OF RECORDED NET REGISTER TONNAGE OF VESSELS EMPLOYED IN COMMERCE THAT WOULD HAVE USED THE PANAMA CANAL IN 1909–10.

TOTAL ENTRANCES AND CLEARANCES, AS STATED IN ABOVE TABLES, WITHOUT DEDUCTIONS.

	Entrances.		Clearances.		Total entrances.	Total clearances.	In total entrances and clearances are included—			Total entrances and clearances.
	With cargo.	In ballast.	With cargo.	In ballast.			Sail entrances.	Sail clearances.	Total sail tonnage.	
Europe with—	1	2	3	4	5	6	7	8	9	10
Western South America	1,978,592	29,265	2,027,288	150,312	2,007,857	2,177,600	586,191	468,726	1,054,917	4,185,457
Western Central America and Pacific Mexico	40,394	....	59,357	....	40,394	59,357	6,494	59,448	65,942	99,751
Pacific United States, British Columbia, and Hawaii	419,865	....	257,054	12,799	419,865	269,853	193,587	160,454	354,041	689,718
Pacific coast of United States, via Suez Canal	(1)	(1)	(1)	(1)	(1)	(1)	....	....	....	158,000
Oriental countries east of Singapore, and Oceania	6,145,757	226,702	5,023,132	433,510	6,372,459	5,456,642	201,579	247,552	449,131	11,829,101
Eastern United States coast with—										
Western South America, Pacific Mexico, and Hawaii	300,909	....	166,302	384	300,909	166,686	10,304	6,686	16,990	467,595
Pacific coast of United States (via Cape Horn) [2]	(1)	(1)	(1)	(1)	117,147	55,508	(1)	(1)	(1)	172,655
Pacific coast of United States and Hawaii (via American-Hawaiian Steamship Co.) [3]	215,683	....	218,539	....	215,683	218,539	....	....	....	434,222
Oriental countries east of Singapore, and Oceania	258,910	3,609	625,860	10,300	262,519	636,160	31,715	42,924	74,639	898,679
Panama traffic—										
Pacific coast	(1)	(1)	(1)	(1)	388,060	389,899	....	....	....	777,959
Atlantic coast	(1)	(1)	(1)	(1)	1,870,063	1,846,510	8,618	8,225	16,843	3,716,573
Eastern Canada with—										
Alaska, Chile, and Australia	10,177	3,233	20,770	1,478	13,410	22,248	1,915	2,096	4,011	35,658
Total	9,370,287	262,809	8,398,302	608,783	[4] 12,008,366	[4] 11,299,002	1,040,403	996,111	2,036,514	[4] 23,465,368

[1] Not reported whether with cargo or in ballast, but the totals are entered under "Total entrances" and "Total clearances," with the exception of the 158,000 tons, "Pacific coast of United States via Suez Canal," which can be included only in the final column, "Total entrances and clearances." In the entrance and clearance figures for the Pacific coast of the United States via Cape Horn, steam and sail tonnages are not separated.

[2] Not including Hawaiian traffic.

[3] Entrances and clearances at New York from and to Puerto Mexico. For tonnage at Salina Cruz, Hawaii, and San Francisco, see Table IX.

[4] The "Total entrances" and "Total clearances" exceed the sum of the entrances and clearances "with cargo" and "with ballast" by the amount of the tonnage not subdivided into "with cargo" and "in ballast." Moreover, the final column of "Total entrances and clearances" includes 158,000 tons—Pacific coast of United States via Suez Canal—not comprised in the preceding columns

The entrances and clearances after the duplications, shortages, and overstatements of the recorded tonnage have been eliminated are presented in Table XI. The total tonnage of vessels that might have advantageously used the Panama Canal in 1910 was 8,328,029 tons.

Table XI.—NET REGISTER TONNAGE OF VESSELS THAT MIGHT HAVE ADVANTAGEOUSLY USED A PANAMA CANAL IN 1909–10.

TOTAL ENTRANCES AND CLEARANCES, AS STATED IN ABOVE TABLES, WITH PROPER DEDUCTIONS.

	Entrances.		Clearances.		Total entrances.	Total clearances.	In total entrances and clearances are included—			Total entrances and clearances.
	With cargo.	In ballast.	With cargo.	In ballast.			Sail entrances.	Sail clearances.	Total sail tonnage.	
	1	2	3	4	5	6	7	8	9	10
Europe with—										
Western South America	1,524,622	29,265	1,444,201	150,312	1,553,887	1,594,513	586,191	468,726	1,054,917	3,148,400
Western Central America and Pacific Mexico	80,788	....	118,714	....	80,788	118,714	12,988	118,896	131,884	199,502
Pacific United States, British Columbia, and Hawaii	419,865	....	257,054	12,799	419,865	269,853	193,587	160,454	354,041	689,718
Pacific United States via Suez Canal	(1)	(1)	(1)	(1)	(1)	(1)	....	....	....	158,000
Oriental countries east of Singapore, and Oceania	604,831	13,873	522,078	33,803	618,704	555,881	24,934	32,072	57,006	1,174,585
Eastern United States coast with—										
Western South America, Pacific Mexico, and Hawaii	300,909	....	166,302	384	300,909	166,686	10,304	6,686	16,990	467,595
Pacific coast of United States (via Cape Horn) [2]	(1)	(1)	(1)	(1)	117,147	55,508	(1)	(1)	(1)	172,655
Pacific coast of United States and Hawaii (via American-Hawaiian Steamship Co.)	181,713	....	181,713	....	181,713	181,713	....	....	....	363,426
Oriental countries east of Singapore, and Oceania	591,600	8,900	885,600	14,400	600,000	900,000	31,715	42,924	74,639	1,500,000
Panama traffic—										
Pacific coast	(1)	(1)	(1)	(1)	158,558	259,932	....	....	....	418,490
Atlantic coast	(1)	(1)	(1)	(1)	....	....	....	....	....	....
Eastern Canada with—										
Alaska, Chile, and Australia	10,177	3,233	20,770	1,478	13,410	22,248	1,915	2,096	4,011	35,658
Total	3,714,505	54,771	3,596,432	213,176	[3] 4,044,981	[3] 4,125,048	861,634	831,854	1,693,488	[3] 8,328,029

[1] Not reported whether with cargo or in ballast, but the totals are entered under "Total entrances" and "Total clearances," with the exception of the 158,000 tons "Pacific coast of the United States via Suez Canal," which can be included only in the final column, "Total entrances and clearances." In the entrance and clearance figures for the Pacific coast of the United States via Cape Horn, steam and sail tonnages are not separated.

[2] Not including Hawaii.

[3] The "Total entrances" and "Total clearances" exceed the sum of the entrances and clearances "with cargo" and "in ballast" by the amount of the tonnage not subdivided into "with cargo" and "in ballast." Moreover, the final column of "Total entrances and clearances" includes 158,000 tons—Pacific coast of United States via Suez Canal—not reported in the preceding columns.

Separate figures for vessels with cargo and in ballast are not available in every case. The official reports distinguish between cargo and ballast vessel movements as regards 7,578,884 tons, or 91 per cent of the aggregate. Of this total, 7,310,937 net tons were for vessels with cargo, and but 267,947 tons were for vessels in ballast. Thus, 96 per cent of the tonnage which might have used the canal in 1909–10 was made up of vessels with cargo. In the same year 95.7 per cent of the tonnage of the Suez Canal consisted of vessels with cargo.

The statistics distinguishing between sail and steam tonnage include 8,155,374 tons, or $97\frac{9}{10}$ per cent of the total. Of this tonnage, but 1,693,488 tons, or $20\frac{7}{10}$ per cent were for sailing vessels.

The recorded tonnage of sailing vessels aggregated 2,179,951 tons. In revising the figures so as to avoid duplications, overstatements, and shortages, the recorded sail tonnage between Europe and western South America, Pacific United States, British Columbia, and Hawaii was accepted without change, because the sailing vessels are chartered ships that usually carry full cargo for a single destination. The tonnage of sail entrances and clearances for the trade between Europe and western Central America, Mexico, Oriental countries east of Singapore, and Oceania was revised according to the methods previously applied to the combined tonnage of sail and steam vessels. The sail tonnage between the eastern United States and the Orient and Oceania was accepted as recorded, because the indirect shipments via Europe are not made in sailing vessels. The sail tonnage for the trade between the eastern United States and western South America, Pacific Mexico, and Hawaii was also accepted without change. No sail tonnage was allowed for the shipments across the Isthmus of Panama, because none was recorded at the port of Panama in 1910. The sail tonnage moving between eastern Canada and Alaska, Chile, and Australia was accepted without change.

It may be contended that this sail tonnage should not be included in the tonnage of available canal traffic, because sailing vessels will not use the canal. The sail tonnage should, however, be included, because the advantages of the canal in the trade of the various regions considered are so manifest that the very certainty that sailing vessels will not use the canal will cause steamers to be shifted to the canal routes and cause sailing vessels to be employed elsewhere. Sailing vessels account for but a relatively small share of the total tonnage of vessels employed in the commerce of the regions tributary to the canal. After the canal is completed, these sailing vessels will be employed on other routes.

The opening of the Panama Canal will necessarily hasten the substitution of steamers for sailing vessels in the world's commerce; but the effect will simply be to quicken a change now in progress. The world's seagoing sail tonnage declined from 14,185,836 tons in 1873–74 to 11,636,289 in 1888–89; to 8,693,769 in 1898–99; and to 6,412,211 in 1910–11; while steam tonnage increased from 4,328,193 in 1873–74 to 41,061,077 in 1910–11.

CHAPTER III.

INCREASE IN AVAILABLE CANAL TRAFFIC 1899 TO 1914-15.

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The investigation of traffic statistics in accordance with the methods explained in the preceding chapter shows that had the Panama Canal been in existence during the fiscal year ending June 30, 1910, it might advantageously have been used by vessels with an aggregate net register tonnage of 8,328,029. The purpose of measuring, with all possible accuracy, the traffic available for the use of a canal was to find an answer to the much more important question of what the available tonnage will be in 1914, at the time of the opening of the Panama Canal. Intelligent action in fixing the canal tolls requires a knowledge of the volume of traffic upon which charges may be levied. The purpose of transit dues is to secure revenue, and the receipts at the canal will be the product of the rate of tolls and the volume of traffic.

In the report of the Isthmian Canal Commission,[1] published in 1901, an account was given of two investigations that were made to determine the net register tonnage of the traffic that might advantageously have used an isthmian canal during the year 1899. It was found that the statistics of entrances and clearances indicated an available traffic of somewhat less than 5,000,000 tons net register—4,891,075 tons; while the records of vessel movements that had been kept by the New Panama Canal Co. showed an available traffic of somewhat over 5,000,000 tons, the exact figures being 5,001,798 net register. In the following table the Panama Canal traffic of 1910, as determined by the investigation of entrance and clearance statistics, is compared item by item with the corresponding statistics for the year 1899. Three items appear in the 1910 column that are not to be found in the 1899 column. Thus the figures for the two periods are not entirely comparable, but the table is of especial value because it shows the rapid increase in the commerce of Europe and the United States with western South America, and because it indicates the comparatively small volume of traffic now moving between the west coast of the United States and the Atlantic seaboards of the United States and Europe.

TABLE I.—VESSEL TONNAGE, ENTRANCES AND CLEARANCES, AVAILABLE PANAMA CANAL TRAFFIC, 1899 AND 1910.

Item.	1898-99	1909-10
Europe with—		
Western South America	1,771,858	3,148,400
Western Central American and Mexico	140,000	199,502
Pacific United States, British Columbia, and Hawaii	642,180	689,718
Pacific United States via Suez Canal		158,000
Oriental countries east of Singapore and Oceania	816,223	1,174,585
Eastern seaboard of United States with—		
Western South America, Pacific Mexico, and Hawaii	166,364	467,595
Pacific coast of United States via Cape Horn	109,312	172,655
Pacific United States and Hawaii via American-Hawaiian Steamship Co		363,426
Oriental countries east of Singapore and Oceania	908,140	1,500,000
Panama traffic	336,998	418,490
Eastern Canada with Alaska, Chile, and Australia		35,658
Total	4,891,075	8,328,029

The tonnage of traffic available for the use of an American isthmian canal in 1899 was 5,001,798 tons according to the record kept by the New Panama Canal Co. The tonnage that might have used a canal to advantage in 1910 was 8,328,029 tons, the increase during the 11 years having been 66½ per cent, or at the rate of 58.96 per

[1] See Appendix I.

cent per decade.[1] If the rate of increase that prevailed during the decade ending in 1910 shall continue during the five years ending in 1914–15, the growth for the five years will be 26.08 per cent, and the tonnage in 1915 will be 10,499,799—practically 10,500,000 tons.

Is it safe to assume this rate of increase during the five years ending in 1915? This question can best be answered by ascertaining what the actual rate of increase has been in the commerce of the world and of the leading sections of the world during the past decade.

If it be found that the increase in the available canal traffic from 1899 to 1910 is no greater, or is less, than the rate of growth prevailing in the commerce of the leading sections of the world, it will presumably be safe to conclude that the increase in the available canal traffic of less than 60 per cent per decade during the 15 years, 1900–1915, will result in a conservative estimate of the traffic that may advantageously annually use the Panama Canal during the first years of its operation. A study has been made of the increase in the value (1) of the foreign trade of the 22 leading countries of the world, (2) of the trade of the United States with foreign countries, (3) of the commerce of the United States with non-European countries, (4) of the commerce between the Atlantic-Gulf seaboard of the United States and Pacific countries, and (5) of the commerce between European and Pacific countries and the west coast of South and North America. An analysis has also been made of the growth in the volume of traffic using the Suez Canal. The results of this study are summarized in the following paragraphs.

The investigation here made of the growth in the *value* of international commerce is to assist in deciding whether the rate of increase in the volume or *tonnage* of available canal traffic from 1899 to 1910 may be predicted for the five-year period ending in 1915. Such being the problem, it becomes necessary to reduce all percentages of increase in the value of commerce sufficiently to eliminate the effect of rising prices upon the value of commerce. The effect of rising prices upon the percentages of increase in commercial values can be offset by reducing value increases by the percentage that prices have risen during the decade. The rise in general prices from 1899 to 1910 may be computed from the index numbers compiled by the London "Economist," by Sauerbeck, by the United States Bureau of Labor, and by "Bradstreet." Most of the figures cited in the following pages refer to the decade 1900–1910, but inasmuch as a few of the figures are for the 10-year period ending in 1909, the percentages of price increases for two decades, one ending in 1909 and the other ending in 1910, are stated in Table II.

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[1] To determine the rate of increase for one or more years when the total percentage of increase for a period of years is known, the following formulas may be used:

Formula to find rate per annum.

A
$A=p\ (1+r)^n$
A=amount after n years=8,328,029
r=rate per annum
p=amount at first date=5,001,798
n=number of years after first date=11.

Formula to find amount in tenth year.

B
$A=p\ (1+r)^n$
A=amount in tenth year
p=amount in first year=5,001,798
r=rate per annum
n=number of years after first date=10.

Formula to find rate of increase for decade.

C
$\frac{A-p}{p}$=per cent increase
A=amount in tenth year
p=amount in first year.

TABLE II.—PERCENTAGES OF INCREASE IN PRICES DURING THE DECADES ENDING IN 1909 AND IN 1910.

	1899–1909	1900–1910
	Per cent.	*Per cent.*
Economist	12.2	13.7
Sauerbeck	12.6	4.0
United States Bureau of Labor	24.5	14.4
Bradstreet	23.6	12.6
Average Great Britain (Economist and Sauerbeck)	12.4	8.8
Average United States (Bureau of Labor and Bradstreet)	24.05	13.5
General average	18.2	11.17

The relatively low prices of 1899 compared with the high prices of 1909 give a large percentage of increase in prices for that decade, particularly in the United States. Prices in 1910 were not so much above those of 1900 as were the prices of 1909 in excess of those prevailing 10 years earlier; but even during the decade ending in 1910 there was, particularly in the United States, a relatively large increase in average prices. In order to secure a percentage which represents as nearly as possible the actual increase in average prices, the mean has been taken of the percentages shown by the two English price indexes and the mean of the two American price indexes.

The value of the international commerce of the 22 leading countries of the world has increased 58.4 per cent during the decade 1900 to 1910. The following table, compiled from the reports of the United States Bureau of Statistics, shows the increase during this decade in the imports and exports of these countries.

TABLE III.—INCREASE IN THE FOREIGN TRADE OF TWENTY-TWO LEADING COUNTRIES, 1900–1910.[1]

Year.	Imports.	Exports.	Total.	Per cent increase.
1900 [2]	$9,532,615,165	$8,485,860,991	$18,018,476,156	....
1910 [3]	15,199,868,105	13,357,891,025	28,557,759,130	58.4

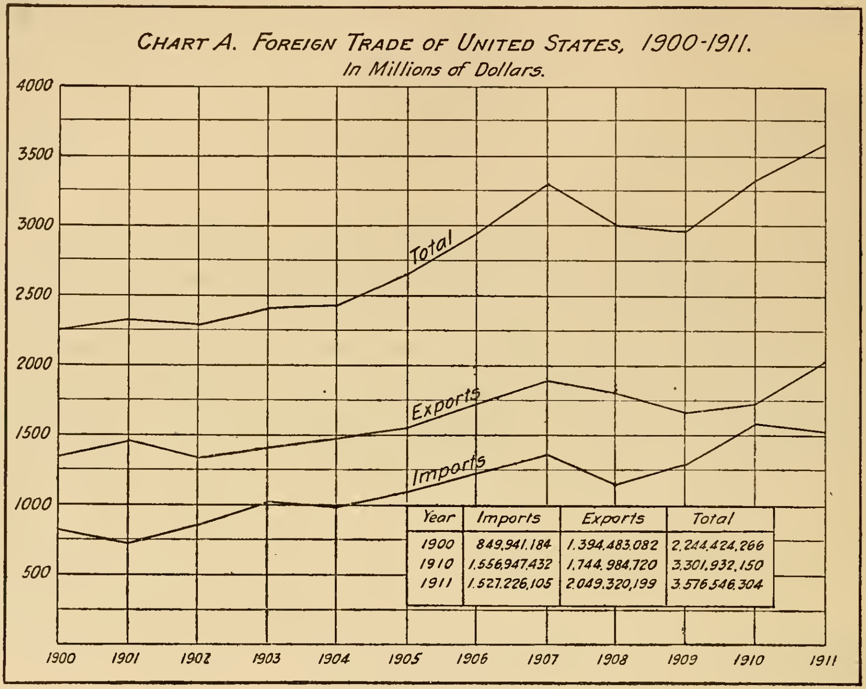
[1] Argentina, Australia, Austria-Hungary, Belgium, Brazil, Bulgaria, Canada, China, France, Germany, British India, Italy, Japan, Mexico, Netherlands, Norway, Russia, Spain, Sweden, Switzerland, United Kingdom, and United States.

[2] Not including Brazil.

[3] Including Mexico, Netherlands, and Sweden as in year 1909.

The general average of British and American price increases for the decade ending in 1910 shows a rise in average prices of 11.17 per cent; accordingly, the increase in the *volume* of the commerce of the 22 countries included in the preceding table was presumably but 88.83 per cent of 58.4 per cent, or 51.9 per cent. This rate of increase applies to the commerce of practically all important commercial countries and includes the trade of the older sections of the world, where the rate of growth is relatively slow, as well as of the newer parts of the world, where the increase in commerce is relatively rapid. For this reason the rate of increase ought to be less than that of the available commerce of the Panama Canal, which will be used by the commerce of the Pacific countries, whose trade is growing at a relatively rapid rate.

The total foreign trade of the United States increased 47.1 per cent in value during the decade ending in 1910. To eliminate the effect of the rise in prices, this rate should be decreased 13½ per cent, or to 40.7 per cent. The foreign commerce of the United States during the decade ending June 30, 1911, increased 54.9 per cent in value. After reducing this 13½ per cent, the increase representing the presumable growth in volume of trade becomes 47.4 per cent. The following chart shows graphically the increase in the value of the imports and exports and total foreign commerce of the United States from 1900 to 1911:



The only commerce which the United States will have via the Panama Canal with European countries will be that between the Pacific coast of the United States and Europe. For this reason, the increase in trade of the United States with non-European countries is more indicative of the probable growth in the available canal traffic than is the growth in the total foreign commerce of our country. The value of the commerce of the United States with non-European countries rose from $763,689,189 in 1900 to $1,359,747,319 in 1910, the growth having been 78 per cent. This percentage reduced by 13½ per cent, to eliminate the effect of advance in prices in the United States, leaves a net growth in the commerce of the United States with non-European countries of 67½ per cent during the 10 years ending in 1910. This is an appreciably higher rate of increase than is predicted for the available Panama Canal traffic for the decade preceding 1915. A still closer indication of the probable rate of increase in available canal traffic is the growth in the commerce between the Altantic-Gulf seaboard of the United States and Pacific countries, American and Asiatic. The growth in this trade by imports and exports and by Pacific countries is shown in detail in Table IV.

TABLE IV.—TRADE OF ATLANTIC AND GULF PORTS OF UNITED STATES WITH WESTERN SOUTH AND CENTRAL AMERICA, BRITISH COLUMBIA, AND PACIFIC COUNTRIES EAST OF SINGAPORE.[1]

	1900			1910			Per cent increase 1910 over 1900.
	Imports.	Exports.	Total.	Imports.	Exports.	Total.	
Western South America:							
Bolivia	22	59,223	59,245	189	590,481	590,670	897.0
Chile	6,271,078	2,873,063	9,144,141	16,841,788	7,552,423	24,394,211	166.7
Ecuador	1,336,224	1,048,367	2,384,591	2,049,120	1,956,602	4,005,722	68.0
Peru	2,122,543	1,441,586	3,564,129	7,128,595	3,039,976	10,168,571	185.5
Salvador	247,633	376,025	623,658	93,700	808,278	901,978	44.5
British Columbia	94,914	5,630	100,544	[2] 208,957	490,118	699,075	596.5
Hawaii	9,591,415	1,493,793	11,085,208	24,029,997	3,683,174	27,713,171	150.0
Orient (east of Singapore):							
China	11,033,144	12,367,357	23,400,501	17,671,079	13,600,922	31,272,001	33.6
Leased China	....	256,484	256,484	1,268,602	532,102	1,800,704	603.1
Korea	105	4,174	4,279	2,777	316,407	319,184	7,497.0
Hongkong	951,032	2,518,247	3,469,279	1,614,811	1,614,199	3,229,010	[3] 7.4
Japan	8,697,449	15,969,694	24,667,143	14,181,303	9,483,811	23,665,114	[3] 4.2
Asiatic Russia	230	2,379,887	2,380,117	1,075,535	545,320	1,620,855	[3] 46.2
Philippines	5,385,078	708,884	6,093,962	12,910,296	8,869,930	21,780,226	257.4
Oceania:							
Australia and Tasmania	4,712,022	23,018,716	27,730,738	13,633,048	24,004,591	37,637,639	67.8
New Zealand	(4)	(4)	(4)	3,992,593	4,912,593	8,905,186	
Other foreign Oceania	43,972	11,433	55,405	133,025	82,001	215,026	288.0
Total	50,486,861	64,532,563	115,019,424	116,835,415	82,082,928	198,918,343	72.9

[1] Not including Alaska, western Mexico, western Central America except Salvador, and Pacific coast of United States.
[2] Not accounting for $27,456, which is not distributed by ports.
[3] Decline.
[4] Included under Australia.

The value of the commerce between the Atlantic-Gulf ports of the United States and the countries on both sides of the Pacific rose 72.9 per cent during the 10 years ending in 1910. To indicate the increase in volume of trade, this percentage should be reduced 13½ per cent, or to 63.1 per cent. This again is a higher rate of growth than is credited to the available canal traffic prior to the opening of the canal. The details presented in Table IV are especially instructive. The commerce between the eastern part of the United States and the west coast of South America, as a whole, advanced 158.4 per cent in value during the decade; this rate, decreased by 13½ per cent, becomes 137 per cent. The commerce of our eastern seaboard with Hawaii increased 150 per cent in value; the trade with the Philippines, 257.4 per cent, with Australia and New Zealand, 67.8 per cent; and with other parts of Oceania, 288 per cent.

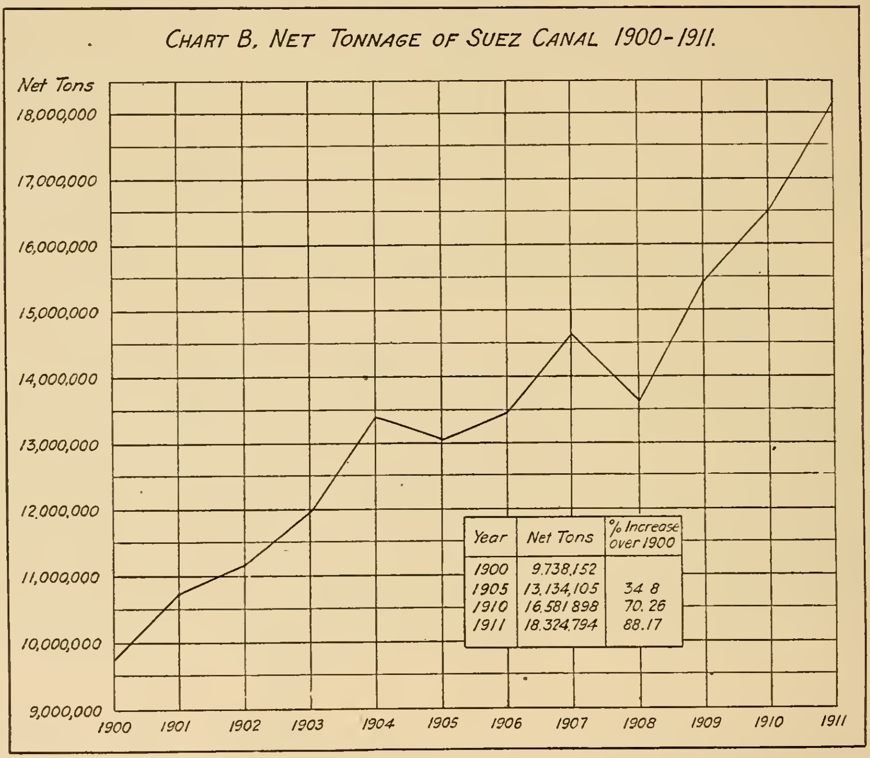
The growth in the value of the commerce between Europe and Pacific countries, other than British Columbia, during the decade 1900–1910 is shown by the following table:

TABLE V.—INCREASE IN EUROPEAN TRADE WITH PACIFIC COUNTRIES EAST OF SINGAPORE, 1900-1910.

Year.	Imports.	Exports.	Total.	Per cent increase.
1899–1900	$508,309,000	$297,118,000	$805,427,000	....
1909–1910	756,536,000	468,695,000	1,225,231,000	52.1

In spite of the large value of the trade of Europe with Pacific countries in 1900, the percentage of increase during the decade ending in 1910 was 52.1 per cent. To offset the effect of rise in prices, this rate of increase has been reduced 12.9 per cent, or to 45.4 per cent. It was thought that the mean between the increase in British prices, 1899–1909, and the increase in American prices from 1900–1910—12.9 per cent—should be taken as the factor to be applied in offsetting the effect of the rise in prices in the commodities composing the trade of Europe with the two sides of the Pacific.

The traffic of the Suez Canal rose from 9,738,152 tons, net register, in 1900, to 16,581,898 net tons in 1910, the increase for the decade being 70.26 per cent. During the year 1911, the traffic of the Suez Canal amounted to 18,324,794 net tons, the growth for the decade ending in 1911 having been 69.3 per cent. A striking fact regarding the Suez traffic is the continued high rate of growth in spite of the large total tonnage already attained. The Suez Canal is used largely not only by the commerce of Europe but by the trade of the eastern seaboard of the United States with the countries of southern and eastern Asia, with the East Indies, and with Australasia. This traffic thus includes the shipping employed in a large share of the world's trade. The traffic of the Suez Canal is diversified and stable, and its growth represents the normal increase of a large part of the world's international trade. The increase in the net tonnage of the Suez Canal is graphically shown by the following chart:



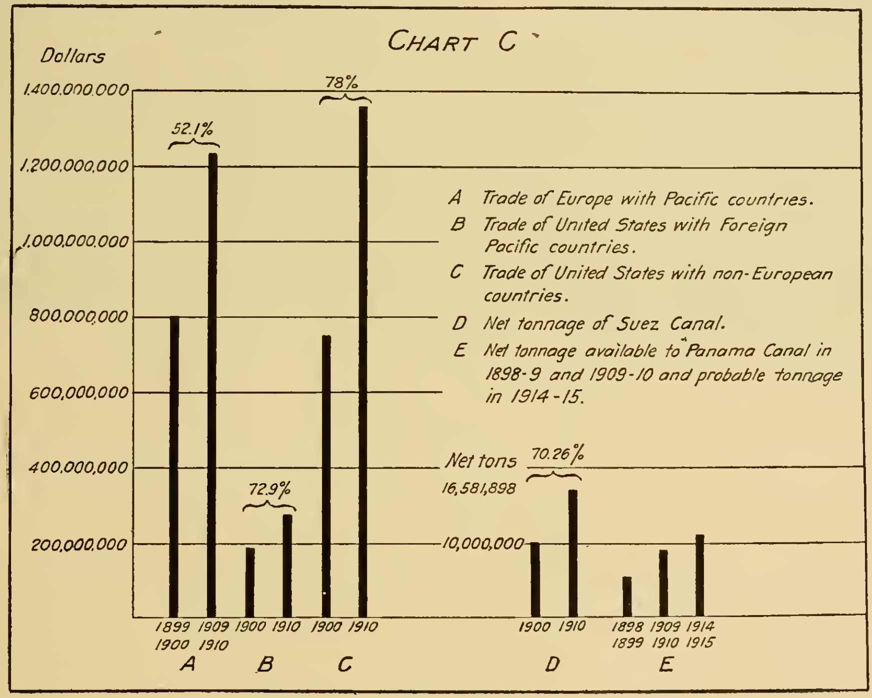
The details in the foregoing discussion of the increase in the value of the commerce of the world, the United States, Europe, and the Suez Canal, may be summarized in the following tabular form.

TABLE VI.—PERCENTAGES OF INCREASE IN THE VALUE OF COMMERCE, 1900–1910.

Commerce of—	Percentage of increase in value.	Percentage of increase after reduction to offset rise in prices.
Twenty-two leading countries	58.4	51.9
United States with foreign countries	47.1	40.7
United States with non-European countries	78.0	67.5
Atlantic-Gulf seaboard of the United States with Pacific countries	72.9	63.1
Europe with Pacific countries	52.1	45.4
Suez Canal		[1] 70.26

[1] In tonnage.

Most of the details presented in Table VI are represented graphically in the following chart:



It is believed that the facts presented in the foregoing discussion and summarized in Table VI and in Chart C indicate that the increase of 58.96 per cent in available canal traffic during the decade ending in 1910 does not err on the side of overstatement, and that a continuance of that rate of growth in the available canal tonnage may conservatively be predicted for the five-year period ending in 1915. It is, of course, possible that a period of business depression may precede 1915; however, the economic conditions prevailing in 1912 give no indication of an early decline in business activity. Indeed, the United States and the world at large is still slowly overcoming the effect of business interruption during the years 1907–1909. The world is apparently still within the first half of a period of general business expansion. Unless some entirely improbable event occurs, prosperity may not be expected to give way to general business depression for some years to come.

The facts presented in this chapter indicate an available Panama Canal traffic in 1914–15 of 10,500,000 tons, net register. It is however, not probable that this entire tonnage will immediately abandon present routes upon the opening of the canal; a period of possibly two years may be required by merchants and carriers to arrange for doing business by the canal route; the transfer of traffic to the canal route, however, will be accomplished in a comparatively short time. Steamship companies are already laying their plans; terminal facilities are being sought; ships are being constructed; and arrangements with rail carriers are being made.

The Suez Canal traffic increased slowly during the first five years, because the traffic between Europe and the East was handled almost entirely in sailing vessels at the time of the opening of the Suez Canal. Steamers had to be built to use the canal. The total tonnage of steamers in 1869 was relatively small; to-day the situation is different, most of the world's seagoing fleet consisting of steamers. The Panama Canal will not have to wait for ships to be built to handle its available traffic.

The increase in the available Panama Canal traffic up to 1915 will be at the rate of about 60 per cent per decade. How rapidly the traffic of the canal will increase after the waterway has been put in operation can, of course, merely be conjectured. The assumption of an increase of 60 per cent during the first decade, from 1915 to 1925, would unquestionably be conservative, because such an estimate would assume merely the continuance of the rate that has prevailed during the 15 years preceding the opening of the canal. The Panama Canal will unquestionably stimulate and accelerate the growth of the commerce it serves, particularly the trade between the two seaboards of the United States and between the eastern part of the United States and South America. The influence of the canal upon the commerce between Europe and the west coast of the United States, and between Europe and western South America, can hardly fail to be important.

It is probable that the traffic of the canal will advance more than 60 per cent between 1915 and 1925. If, however, it be assumed that the growth will be but 60 per cent during this decade, the traffic of the Panama Canal will reach 17,000,000 tons, net register, in 1925. This figure may seem large but it will be small in comparison with the traffic which the Suez Canal will have secured by 1925. Indeed, the traffic of the Suez Canal in 1915 will be considerably in excess of 20,000,000 tons, net register, and unless the traffic of that waterway should increase at a much slower pace than it is now advancing, the tonnage passing the Suez Canal in 1925 will be nearly double 17,000,000 net tons.

CHAPTER IV.

THE RELATION OF THE PANAMA CANAL TO THE TRAFFIC AND RATES OF AMERICAN RAILROADS.

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INTRODUCTION.

Since the opening of the first railway to the Pacific, in 1869, shippers have had the choice of rail and water routes for the transportation of their freight from coast to coast, and, in spite of artificial restraints upon the competition of the water routes with the transcontinental railroads, the rates by rail between the two seaboards have been affected by those charged by the carriers by water. The Panama Canal will shorten and improve the intercoastal water route and will greatly increase the influence which the coastwise lines will be able to exert upon the railroad services and rates. The volume of traffic moving coastwise will be greatly enlarged by the canal. Some goods now handled all-rail will move by water or by rail and water lines, and there will necessarily follow a modification of rail rates and a readjustment of the relation of the charges of rail and water lines.

What the actual freight rates between the Atlantic and Pacific seaboards will be, by rail and water lines, after the opening of the Panama Canal, and what shares of the total traffic will move coastwise and by rail, can not be predicted in advance; but inasmuch as the division of intercoastal traffic between the water and rail carriers and the rates charged by the competing ocean and rail routes may be affected by the tolls charged for the use of the Panama Canal, it is desirable that before fixing the tolls as complete information as it is practicable to secure should be obtained concerning the existing traffic and rates of both the water and the rail lines connecting our two seaboards. Accordingly, it is the purpose of this chapter:

(1) To state the volume and explain the nature of the traffic now carried by water routes between the two seaboards; (2) to present the available information concerning the tonnage and character of the transcontinental railroad traffic; (3) to compare present coast-to-coast rates by rail and water carriers; (4) to explain the rates now prevailing at inland points in the eastern and western sections of the United States on transcontinental traffic that is carried by combined rail and ocean routes, and to state what the railroads have done to retain and develop the direct all-rail movement of traffic between the eastern and western portions of the United States; (5) to indicate in general terms how the railroads may be expected to adjust rates so as to enable the Middle West to continue to compete successfully with the Eastern States in the markets and for the trade of the Pacific Coast and Rocky Mountain States; and (6) to summarize the probable effects of the Panama Canal upon transcontinental traffic and rates.

It is well known that only partial information regarding the traffic by rail between the eastern and western sections of the United States is obtainable, but enough facts are known as to the total transcontinental rail tonnage and as to the seaboard and inland origin and destination of that tonnage to give some indication of the probable effects of the Panama Canal upon the traffic and upon the rate policies of the eastern, southern, and transcontinental railroads. It will be possible to present in sufficient detail the traffic and rates of the coast-to-coast carriers by water and to compare the present intercoastal rates by water and rail lines. It will be understood that the conclusions as to the effects which the Panama Canal will have upon the transcontinental traffic and rates of the railroads must be only tentative.

I. Routes and Traffic by Water Between the Atlantic and Pacific Seaboards of the United States.

Shipments between the two seaboards of the United States may move by three water routes that compete with the rail lines connecting the two coasts, (1) the all-water route around South America via Cape Horn for sailing vessels and through the Straits of Magellan for steamers; (2) the route by way of Panama with the transfer of traffic by rail across the Isthmus; and (3) the route via the Isthmus of Tehuantepec, across which, from Puerto Mexico on the Gulf to Salina Cruz on the Pacific, freight is handled by a railroad owned by the Mexican Government. Plate 3, in the pocket at the end of this report, charts these routes.

Traffic carried by rail lines between the Atlantic and Pacific seaboards may move coastwise for a short distance on each seaboard—as from New York to Norfolk or from Portland, Oreg., to San Francisco at the beginning or end of the railroad haul across the continent. The only railroad controlling a through route between the Atlantic and Pacific seaboards is the Southern Pacific, which operates the Morgan Line of steamers between New York and New Orleans and Galveston. The steamers of the Morgan Line extend the Southern Pacific route from the Gulf termini of the railroad to New York, and thus enable the Southern Pacific to compete both with the other transcontinental railroads and with the intercoastal water routes around South America and across the Isthmuses of Panama and Tehuantepec. This combined rail and water line of the Southern Pacific is called the "Sunset-Gulf Route."

1. The oldest route between the two seaboards of the United States is the one taken by sailing vessels around Cape Horn. Prior to 1849, however, only an occasional vessel, which was in most instances a whaler, undertook the voyage between the Atlantic and Pacific, but with the discovery of gold at the close of 1848, and for a few years thereafter, there was a very large use of this route. In 1849, 775 vessels cleared from the Atlantic seaboard for San Francisco and all but 12 of them were sailing vessels. The opening of the Panama Railroad early in 1855 caused most of the traffic between the seaboards to abandon the long route around South America, but a considerable number of sailing vessels were annually dispatched between the two seaboards by way of Cape Horn, and a small amount of steam tonnage made use of the Magellan route.

The superiority of steamers over sailing vessels for handling most classes of freight, even for such a long route as that between the two seaboards of the United States around South America, became evident during the 1890's and caused the company which was then operating the principal line of sailing vessels between our two seaboards by way of Cape Horn to sell its sailing vessels and to inaugurate, in 1899, the American-Hawaiian line of steamers run by way of the Straits of Magellan. Early in 1907 the American-Hawaiian line shifted to the route via the Isthmus of Tehuantepec, and since that date practically all of the shipping moving between our two seaboards around South America has consisted of chartered sailing vessels and steamers that handle such bulky cargoes as can be economically shipped by that circuitous route. Table I shows the approximate tonnage of freight handled between our two seaboards via Cape Horn and the Straits of Magellan and by way of other routes during the six years from 1906 to 1911, inclusive. It will be seen that there was a sudden decline in the tonnage via Cape Horn and Magellan after the withdrawal of the American-Hawaiian line from the Magellan route, and that the volume of tonnage around South America has fluctuated largely during recent years.

TABLE I.—VOLUME OF INTERCOASTAL WATER TRAFFIC, 1906–1911.

[Tons of freight.]

Years.	Total coastwise traffic of Panama Railroad.[1]			Coastwise traffic of Panama Railroad Steamship Line.[2]			Coastwise traffic of Pacific Mail.[2]			California-Atlantic Steamship Line (Pacific service).[2]			California-Atlantic Steamship Line (Atlantic service).[2]				
	Atlantic to Pacific.	Pacific to Atlantic.	Total.	New York to Colon.	Colon to New York.	Total.	Atlantic to Pacific.	Pacific to Atlantic.	Total.	Atlantic to Pacific.	Pacific to Atlantic.	Total.	Philadelphia to Colon.	Colon to Philadelphia.	New Orleans to Colon.	Colon to New Orleans.	Total.
1906	25,914	24,937	50,851	25,866	24,937	50,803	25,866	24,937	50,803								
1907	26,944	15,285	42,229	26,859	15,285	42,144	26,859	15,285	42,144								
1908	23,258	15,162	38,420	23,131	15,132	38,263	23,131	15,132	38,263								
1909	38,095	8,728	46,823	37,910	8,700	46,610	37,910	8,700	46,610								
1910	46,394	33,482	79,876	46,394	33,482	79,876	46,394	33,482	79,876								
1911	96,420	115,508	211,928	66,922	105,577	172,499	29,080	47,892	76,972	67,332	67,213	134,545	28,488	5,487	1,002	4,041	39,018

[1] Annual Reports of Panama Railroad Co.

[2] Statement of E. A. Drake, vice president Panama Railroad Co.

Table I.—VOLUME OF INTERCOASTAL WATER TRAFFIC, 1906-1911—Continued.

[Tons of freight.]

Years.	American-Hawaiian Steamship Line.[1]				Tonnage via Cape Horn and Straits of Magellan.[2]				Total line traffic (excluding Hawaiian sugar).[4]	Total tramp-vessel traffic.[5]	Total water traffic (excluding Hawaiian sugar).[6]	Total water traffic (including Hawaiian sugar).
	New York to Pacific ports.	Pacific ports to New York.	Hawaiian sugar.	Total (excluding Hawaiian sugar).	Vessel tonnage (entrances plus clearances).			Approximate freight carried.[3]				
					Atlantic to Pacific.	Pacific to Atlantic.	Total.					
1906	114,900	32,000	91,700	146,900	169,787	140,243	310,030	271,276	197,703	271,324	469,027	560,727
1907	131,900	14,000	198,300	145,900	191,432	82,343	273,775	239,553	188,044	239,638	427,682	625,982
1908	117,200	27,000	242,700	144,200	159,725	56,182	215,907	188,918	182,463	89,075	371,538	614,238
1909	229,200	83,200	248,100	312,400	52,873	32,821	85,694	74,982	359,010	75,195	434,205	682,305
1910	247,100	59,600	244,300	306,700	117,147	55,508	172,655	151,073	386,576	151,073	537,649	781,949
1911	295,800	162,500	296,600	458,300	117,007	40,601	157,608	137,907	669,817	138,318	808,135	1,104,735

[1] Statement of American-Hawaiian Steamship Co.

[2] U. S. Commerce and Navigation Reports, 1906-1911.

[3] Assuming $1\frac{3}{4}$ tons of freight for 1 net vessel ton, and dividing by 2, as in the vessel tonnage each ship is counted twice—once as an entrance and once as a clearance.

[4] Traffic of Panama Railroad Steamship Line, Pacific Mail, California-Atlantic, and American-Hawaiian Line.

[5] Total water traffic less total line traffic.

[6] Coastwise Panama Railroad traffic plus American-Hawaiian traffic plus traffic via Horn and Magellan.

2. The Panama route between our two seaboards was opened for traffic at the close of 1848, at the time of the rush to the California gold fields. With the completion of the railroad from Colon to Panama, early in 1855, most of the traffic between our two seaboards moved by way of Panama; and this continued to be the principal highway for transcontinental traffic until 1869, when the connection of the Missouri River with the Pacific coast by the Union and Central Pacific Railroads established the first rail line across the United States. The traffic by way of Panama rapidly fell off after 1869; and, though varying from year to year, remained comparatively small until 1911, when there was a sudden increase in the volume of traffic by water between our two seaboards.

Several causes account for the relative unimportance of the Panama route since 1869. The transcontinental railroads, until recently, have maintained a relentless competitive warfare against the Panama route. The through rail rates between the Atlantic and Pacific seaboards are lower than the rates for shorter hauls to and from the intermediate points in the Rocky Mountain territory; and, until the Government regulation of railroads became effective, the railroad companies quoted shippers such rates as were necessary to keep traffic from taking the Panama route. Moreover, the transcontinental railroads were able to restrict the use of the Panama route through their close relations with the Pacific Mail Steamship Co., which has, for most of the time, been the only regular line between the west-coast ports of the United States and Panama. For a period of 20 years, ending in 1893, the railroads, through the Transcontinental Association, paid the Pacific Mail Steamship Co. a fixed monthly sum, or rental, for the freight space available in its steamers, and thus completely controlled the Pacific Mail as a competitor. From 1900 to the present, the Southern Pacific Co. has owned a majority of the stock of the Pacific Mail Steamship Co. The history of the relations of the Pacific Mail to the transcontinental railroads and to the Panama Railroad need not be presented in this account of the traffic and rates by the various routes connecting the two seaboards of the United States.[1] It is sufficient to state that the transcontinental railroads by active competition and by artificial restraint have, until recently, kept the traffic via the Panama route comparatively small.

The development of traffic via Panama has been hampered, not only by the competition and restraint of the transcontinental railroads, but also by two other causes. While the French company was engaged in construction work on the Isthmus from 1882 to 1889, the use of the Panama Railroad by commercial freight was restricted by employment of the railroad for the transportation of materials and supplies used in construction work. Likewise, since 1904, the construction of the canal has limited the volume of commercial freight

[1] For the history of the relations of the Panama Railroad to the Pacific Mail Steamship Co. and for an account of the connection of the Pacific Mail with the transcontinental railroads, the following references may profitably be consulted:

(1) Opinion of the Interstate Commerce Commission in Railroad Commission of Nevada *v.* Southern Pacific Company et al. (June 22, 1911), 21 I. C. C. Reports, 329-384.

(2) Statement by Edward A. Drake, vice president Panama Railroad, to the Committee on Interoceanic Canals, United States Senate, Feb. 11, 1910.

(3) Report of Joseph L. Bristow, special Panama Railroad commissioner, to the Secretary of War, June 24, 1905, upon the Policy to be Pursued in Management of the Panama Railroad Co. (Government Printing Office, Washington); also report of Jan. 20, 1908, on the Advisability of the Establishment of a Pacific Steamship Line by the Isthmian Canal Commission (S. Doc. No. 409, 62d Cong., 2d sess.).

(4) Statement by R. P. Schwerin, vice president and general manager Pacific Mail Steamship Co., to the Committee on Interoceanic Canals, United States Senate, on Senate bill 428, Mar. 10, 1910. Also statement by Mr. Schwerin before same committee, on House bill 21969, Mar. 1, 2, and 3, 1912.

(5) Statement by William R. Wheeler, representative of San Francisco Chamber of Commerce, to Senate Committee on Interoceanic Canals, on House bill 21969, May 27, 1912.

that could be handled across the Isthmus. The other cause that has checked the growth of traffic via Panama has been the competition of the Tehuantepec route, which, since the beginning of 1907, has afforded a shorter and better transportation route than the one by way of Panama for the traffic between the two seaboards of the United States. The volume of traffic handled via Panama between our two seaboards during recent years is shown in Table I. For several years preceding 1910 the tonnage was small and tended to decline.

3. The Tehuantepec route was opened for traffic early in 1907, when the American-Hawaiian Steamship Co. took its steamers off the route via the Straits of Magellan and established regular line services on the Atlantic between New York and Puerto Mexico and on the Pacific between Salina Cruz and Hawaii and the west-coast ports of the United States. In 1906 it made an agreement with the Tehuantepec National Railway, which is owned by the Mexican Government, stipulating that the railway company should receive one-third of the through rate. This agreement also included a guaranty on the part of the Tehuantepec National Railway that the net earnings of the steamship company, per ship ton, should not be less than the earnings had been in 1904, when the steamship company was operating by way of the Straits of Magellan. This guaranty, however, did not require the Tehuantepec National Railway to reduce its share of the gross receipts of the steamship company to less than 25 per cent. The American-Hawaiian line has been very successful. The fleet of the American-Hawaiian Steamship Co. increased from 3 steamers in 1899 to 9 steamers in 1904, and to 17 in 1911. Five new steamers were ordered in 1911. The rapid growth in the traffic of the company has been made possible by the sugar tonnage from Hawaii to the eastern ports of the United States. The freight shipments westbound between our two seaboards are larger than those eastbound, but the exports of Hawaiian sugar have enabled the American-Hawaiian Steamship Co. to run its steamers loaded in both directions. Indeed, the exports of sugar from Hawaii have been much larger than the American-Hawaiian Co. could handle. The growth in the traffic handled by the American-Hawaiian Steamship Co. between our two seaboards and the tonnage of Hawaiian sugar transported by the company from 1906 to 1911, inclusive, are stated in Table I.

The through route between the two seaboards via the Southern Pacific Railroad from the Pacific coast to Galveston and New Orleans and from those cities to New York by the Southern Pacific Co.'s steamers (the Morgan Line) was established in 1883. The Sunset-Gulf route immediately began an active warfare against its competitors by rail and by water lines, and secured a large share of the traffic from coast to coast. The transcontinental railroads, other than the Southern Pacific, ran from the Mississippi and Missouri Rivers to the Pacific coast and were primarily interested in the development of traffic between the Middle West and the Pacific coast. The rates by the Sunset-Gulf route from New York to San Francisco were made the same as the rates by the transcontinental lines from St. Louis and Missouri River crossings to the Pacific. Gradually the rates by the through all-rail lines from the Atlantic to the Pacific were made the same as the rates from Chicago, St. Louis, and Missouri River crossings to the Pacific seaboard. This system of blanket rates was worked out by 1896, and has since prevailed on west bound traffic. The establishment of the same rates by the Sunset-Gulf route and by the all-rail lines between the two seaboards allied the Sunset-Gulf route with the all-rail lines as common competitors against the water routes around South America and via the Isthmuses of Panama and Tehuantepec. The control of the Pacific Mail Steamship Co. by the transcontinental railroads since 1874, and the ownership of the Pacific Mail by the Southern Pacific from 1890 to the present, enabled the transcontinental railroads, as has been explained, to keep the traffic by the water routes within small proportions, until a few years ago, when the American-Hawaiian Steamship Co., and later the California-Atlantic, developed a relatively large tonnage coastwise via the Tehuantepec and Panama routes. This development of the coastwise business during the last few years has not been seriously opposed by the railroads, doubtless because of the rapid development of the rail tonnage consequent upon the industrial progress of the Intermountain and Pacific Coast States.

The volume of traffic handled between the Atlantic and Pacific ports of the United States by the several water routes, not including the Sunset-Gulf route, each year from 1906 to 1911, inclusive, is shown in detail in Table I. The total tons of freight, not including Hawaiian sugar, rose from less than 500,000 tons in 1906 to over 800,000 tons in 1911. If the tonnage of Hawaiian sugar be included, the increase during the six years n total traffic was from 560,000 to 1,104,000 cargo tons. The increase during the four years ending in 1911 was steady and rapid. The decline during 1907 and 1908 is to be accounted for mainly by the San Francisco earthquake and fire.

An important feature of Table I is the separation of total traffic into that handled by regular steamship lines and that carried by individual vessels owned or chartered by the shippers. The traffic handled by the regular lines more than trebled during the six-year period, while that carried by individual vessels decreased more than 50 per cent. In 1911, 82.8 per cent of the entire traffic, other than Hawaiian sugar, was carried by the regular lines, whereas in 1906 only 42.1 per cent was shipped by the established steamship lines.

The volume and variety of the traffic between the two seaboards of the United States have so expanded as to render the services of established steamship lines having regular and frequent sailings more economical than the services of individual vessels carrying full cargoes of single commodities. The traffic manager of the American-Hawaiian line stated to the Interstate Commerce Commission, on January 16, 1907, that—

> We carry practically everything. In the course of a year I think we have at least 90 per cent of the articles that may be named in the transcontinental tariffs and a great many articles not on any tariff that are continually offered and carried.

The traffic carried by way of the Panama route also includes a large variety of commodities. The west-bound freight tariff of the Panama Railroad Steamship Line requires 25 pages to enumerate the several articles upon which individual rates are quoted. The east-bound tariff of the California-Atlantic Steamship Co. is a typewritten document of 20 pages.

The freight carried between our two seaboards by way of Panama and Tehuantepec originates and terminates not only at the Atlantic and Pacific ports, but also at interior points. Manifests of the shipments by the American-Hawaiian line enumerate commodities shipped from eastern New York, eastern Pennsylvania, Massachusetts, New Jersey, Vermont, Connecticut, Rhode Island, Maine; also commodities from Syracuse and Buffalo, N. Y., from numerous cities in Ohio, from certain cities in Michigan, and from Chicago, Milwaukee, and St. Louis. These same manifests show that this freight is destined not only to Pacific coast ports, but to inland points, such as Sacramento, Stockton, The Dalles, Oreg., Spokane and Everett, Wash., and Reno, Nev.

Most of the bulk cargoes handled in vessels owned or chartered by shippers now move by the disadvantageous routes around Cape Horn or through the Straits of Magellan. The opening of the Panama Canal will make it possible for the individual ship to engage in intercoastal traffic under much better conditions. It is not probable, however, that the percentage of the total traffic handled by individual vessels will increase in the future. It is more probable that the percentage of the entire business handled by lines will increase. Most of the traffic from our Pacific to Atlantic ports carried in individual vessels owned or chartered by the shipper will necessarily consist of cargoes of grain, lumber, and sugar. The sugar traffic is already large and may be expected to become heavier. The shipments of grain from the west coast, especially from Puget Sound ports, to Europe through the canal will be large, but it is not probable that the grain from the northwestern part of the United States will find very much market at the Atlantic seaboard. That section of the United States will in all probability be supplied from the grain fields of the Middle West. Barley from the Pacific Coast States will be required in the Mississippi Valley and Atlantic coast sections of the United States, and may be shipped in vessel cargoes as charter traffic. However, such commodities as wheat, barley, wool, canned salmon, and others of a like character that might advantageously be shipped as full cargoes in chartered vessels will probably be carried eastbound mainly by line vessels, because of the fact that the tonnage of traffic westbound is normally heavier than the tonnage eastbound. Line vessels will seek these bulk commodities as supplemental cargoes eastbound and at low rates. As was stated above, the American-Hawaiian line has developed a profitable business by securing a heavy eastbound tonnage of Hawaiian sugar. In 1911 the Hawaiian line transported 295,800 tons westbound, but only 162,500 tons, other than sugar, eastbound.

The lumber shipments from the Pacific coast through the canal will comprise a large tonnage, but the destination of most of the traffic will be Europe and not the eastern part of the United States, which will continue to be supplied mainly from the forests in the Southern States. The southern pine and hardwood forests constitute the largest lumber-producing district in the United States at the present time. Shipments are made economically and expeditiously both by all-rail routes to northern markets and also by rail to southern seaports and thence by coastwise vessels.

Upon the opening of the Panama Canal it is probable that manufacturers and other large shippers will employ their own or chartered vessels for shipments of some heavy commodities to Pacific markets. Undoubtedly there will be a good deal of coal shipped westbound in chartered vessels. Fertilizers, heavy iron and steel, and some other commodities may be sent as bulk cargoes in individual ships from time to time. It is probable, however, that most commodities, other than coal and fertilizers, will be shipped by line steamers.

The fact that most of the traffic through the canal between the two seaboards of the United States will be handled by regular steamship lines and that only a minor, and probably a decreasing, percentage of the total will be transported in individual vessels owned or chartered by shippers should be given careful attention in considering, (1) what the policy of the United States should be concerning the prohibition of the use of the canal by vessels controlled by railroads, and (2) concerning the remission or omission of tolls upon vessels engaged in the coastwise business.

1. The policy of denying the use of the canal to vessels owned or controlled by, or affiliated with, railroad companies is advocated by those who favor the policy mainly for two reasons, (*a*) that the competition between the railroad-controlled and the independent steamship lines will be disastrous to the independent lines, and (*b*) that the Government regulation of the rates and services of ocean carriers is impracticable and undesirable. If coastwise traffic through the canal were to be handled mainly by individual vessels owned or chartered by shippers, Government regulation would, indeed, be impracticable; but the service of steamship lines operating over established routes is not essentially different from the transportation service of the railroads. Moreover, when several steamship lines operate over the same route or over competing routes they have fixed schedules of rates established by agreement and their rate policy differs in no marked degree from that of competing railroads.

The rates charged by steamship lines differ fundamentally from charter rates, which are highly competitive and fluctuate with the supply of and demand for chartered tonnage. Charter rates fluctuate according to business conditions and could not be and ought not to be subject to Government regulation. The rates of steamship lines, however, are not only made in conferences of the competing lines, but also in many cases are fixed with reference to the rates charged by the railroads with which the steamship lines must compete for traffic. It is thus at least doubtful whether it is good public policy not to regulate the rates and services of coastwise steamship lines. Whether such regulation is wise or unwise, it is at least not impracticable.

2. The question of exempting coastwise shipping from the payment of Panama Canal tolls should be decided with reference to the parties that would be benefited by that policy. This subject is discussed in Chapter XII of this report in considering "The principles that should control in fixing tolls," and need only be referred to in this connection. If the tolls charged coastwise ships using the canal are added to the rate of freight paid by shippers, the remission of tolls will benefit the shippers and possibly, to some extent, the general public. On the other hand, if the freight rates are not any higher because of the tolls, the exemption of ships from the payment of tolls will not affect the freight rates, and the exemption of the payment of tolls will benefit the steamship company and not the shippers. Charter rates, as has just been stated, are highly competitive and the rates which a shipper must pay to secure the use of a vessel for a trip through the canal will undoubtedly be increased by the amount of tolls paid. Shippers using vessels which they own or charter will receive the benefit of the exemption of canal tolls. On the other hand, the rates charged by steamship lines, being regulated by agreements among competing companies and being fixed with reference to what the traffic will bear, will presumably be as high as traffic conditions warrant regardless of canal tolls. If the tolls are charged, the operating expenses of the steamship companies will be increased by the amount of the tolls and their net profits will be lessened by the same amount. In other words, free tolls will be a gratuity or a subsidy to the coastwise steamship lines. The reasons for believing that the rates of the coastwise steamship lines, which will handle from four-fifths to nine-tenths of the water traffic between the two seaboards of the United States, will not be affected by the policy of the United States Government as regards free tolls are presented in Chapter XII, above referred to.

II. Volume and Nature of Transcontinental Railroad Traffic.

The tonnage of transcontinental railroad traffic can not be accurately stated, because the railways in reporting their traffic do not distinguish between transcontinental and local freight. Estimates made by the traffic officials of the transcontinental lines in 1909 placed the total volume of westbound transcontinental tonnage moving by rail and water at approximately 3,000,000 tons.[1] The westbound tonnage of the water lines that year (see Table I) was 313,558 tons. In round numbers, therefore, 2,686,000 tons, or 89.5 per cent moved westward by rail and 10.5 per cent by water.

The total through and local traffic of the six leading transcontinental railroads [2] increased 11.2 per cent from 1909 to 1911. That rate of growth would bring the westbound through transcontinental rail traffic up to about 2,987,000 tons in 1911. The tonnage moved westward coastwise in 1911 was 494,600 tons and the total westbound transcontinental rail-and-water tonnage aggregated about 3,481,600 tons. This would indicate that

[1] Railroad Commission of Nevada *v.* Southern Pacific Co. et. al. (21 I. C. C. Reps., 351).

[2] Northern Pacific; Great Northern; Union Pacific; Chicago, Milwaukee & St. Paul; Southern Pacific; and Atchison, Topeka & Santa Fe.

85.8 per cent of the total volume in 1911 moved by rail and 14.2 per cent by water. The higher percentage of the total rail-and-water traffic carried by the water lines in 1911, as compared with 1909, is explained by the fact that during 1911 there was a slight decline in rail tonnage and a large gain in the traffic of the coast-to-coast water carriers, the tonnage of the six leading transcontinental railroads decreasing 3.9 per cent and that of all of the railroads in the United States, 3.7 per cent. The volume of westbound water traffic, however, was 24.9 per cent in excess of what it was in 1910. During the two-year period, 1909–1911, there was a net increase of 11.2 per cent in the total tonnage of the six leading transcontinental railroads, but the gain during those years in the westbound tonnage of the coast-to-coast water lines was 57.7 per cent.

The westbound rail tonnage comprises a wide range of commodities, the manufactures, prepared food, stuffs, and merchandise shipped to the Pacific coast by rail being of great variety. Table IX, pages 63–65, contains a list of the more important commodities, with the freight rate for each article.

Several tabulations have been made to indicate roughly the origin of the westbound railroad traffic. Table II shows the origin of the shipments to the Pacific coast over one of the transcontinental lines during a period of four months.[1] Only 22 per cent of the through traffic of this line originated in "Atlantic coast and common point territory;" 35 per cent came from points in the east, including Pittsburgh, Buffalo, and common points; 62 per cent originated west of Pittsburgh-Buffalo common points; and 54 per cent was shipped from the Chicago territory and points west of Chicago.

Table II.—ORIGIN OF WESTBOUND RAIL SHIPMENTS TO PACIFIC COAST TERMINALS.

	Less than carload.	Carload.	Total.
	Per cent.	*Per cent.*	*Per cent.*
New York-Boston and common points	39	19	22
Pittsburgh-Buffalo and common points	8	14	13
Cincinnati-Detroit and common points	12	8	8
Chicago and common points	16	16	16
Mississippi River and common points	9	11	11
Missouri River and common points	10	25	23
Southeastern points	2	3	3
Colorado points	4	4	4
	100	100	100

This agrees substantially with the statement made by Mr. G. W. Luce, assistant to the vice president of the Southern Pacific, before the Interstate Commerce Commission. He stated that not over 20 per cent of the eastern traffic destined to the Pacific terminals originated east of Buffalo and Pittsburgh. Of this 20 per cent he estimated that over half moved by water.

Various compilations were filed by the transcontinental railroads with the Interstate Commerce Commission, at its request, during the hearings of the transcontinental rate cases, for the purpose of showing the origin of transcontinental traffic received at Spokane, Wash., and Reno, Nev. Table III contains an estimate of the westbound shipments received at Spokane, via the Northern Pacific, in 1906. The percentage of freight originating at or near the Atlantic seaboard was smaller than was true of the shipments to the Pacific Coast terminals. Indeed, only 12.09 per cent originated in "New York–Boston and common points," and but 5.82 per cent in the Pittsburgh-Buffalo district. Four-fifths of the traffic originated west of Pittsburgh and Buffalo, and seven-tenths at Chicago and points west of Chicago. The Intermountain States of the West receive their supplies mainly from the Mississippi Valley, and not from the Atlantic seaboard States.

October, 1909, and January, April, and July, 1910.

TABLE III.—ESTIMATED TONNAGE OF INTERSTATE WESTBOUND TRANSCONTINENTAL FREIGHT RECEIVED AT SPOKANE VIA THE NORTHERN PACIFIC RAILWAY, 1906.

From—	Carload (pounds).	Less than carload (pounds).	Total.	Per cent.
New York-Boston and common points	12,252,504	5,736,954	17,989,458	12.09
Pittsburgh-Buffalo and common points	8,001,972	658,788	8,660,760	5.82
Cincinnati-Detroit and common points	10,589,274	1,886,370	12,475,644	8.39
Chicago and common points	24,717,180	2,776,542	27,493,722	18.48
Mississippi River points	10,867,710	1,881,684	12,749,394	8.57
Missouri River points	34,230,210	1,903,344	36,133,554	24.29
Colorado points	28,880,268	325,734	29,206,002	19.63
Southeastern points	3,607,368	437,820	4,045,188	2.73
	133,146,486	15,607,236	148,753,722	100.00

Table IV contains a statement, made by the Great Northern Railway, of the origin of the westbound freight delivered at Spokane, Wash., during 1906.

TABLE IV.—ESTIMATED TONNAGE OF INTERSTATE WESTBOUND TRANSCONTINENTAL FREIGHT RECEIVED AT SPOKANE VIA THE GREAT NORTHERN RAILWAY, 1906.

	Carload. (pounds).	Less than carload (pounds).	Total.	Per cent.
New York-Boston and common points	6,005,112	3,208,248	9,213,360	14.61
Pittsburgh-Buffalo and common points	17,307,306	694,038	18,001,344	28.52
Cincinnati-Detroit and common points	5,184,192	596,886	5,781,078	9.16
Chicago and common points	13,797,918	1,406,778	15,204,696	24.09
Mississippi River points	6,259,806	260,130	6,519,936	10.33
Missouri River points	7,748,922	485,736	8,234,658	13.05
Southeastern points	145,200	....	145,200	.24
	56,448,456	6,651,816	63,100,272	100.00

Table V contains a statement of the origin of the westbound tonnage carried to Reno, Nev., via the Ogden gateway, in 1908. The figures were compiled from the waybills of the Southern Pacific by the Nevada Railroad Commission. Groups B and C comprise the territory east of Chicago. Only 24.48 per cent of the traffic reaching Reno westbound originates east of Chicago.

TABLE V.—WESTBOUND TRANSCONTINENTAL FREIGHT RECEIVED AT RENO, NEV., VIA OGDEN GATEWAY (1908), IN TONS.

	Carload.	Less than carload.	Total.	Per cent.
Originating in group—				
B	183	70	253	2.08
C	2,030	685	2,715	22.40
D	2,207	507	2,714	22.40
E	1,970	173	2,143	17.64
F	1,891	89	1,980	16.30
G	1,666	11	1,677	13.88
H, I, J	619	44	663	5.30
Total eastern traffic	10,566	1,579	12,145	100.00
Wheat, salt, barley, cement, and coal from Idaho, Utah, and Wyoming	....	....	11,177	....
Total traffic	....	....	23,322	....

Commissioner Lane [1] of the Interstate Commerce Commission, in discussing the origin of the traffic received from the east at Reno, stated:

Whatever the reason, the fact stands forth throughout this record that the source of supply upon which the far western communities largely draw their manufactures has within half a century moved westward from the Atlantic seaboard, so that, as was found by the Railroad Commission of Nevada from an analysis of the billing of actual shipments into Reno, 75 per cent of their traffic coming from the east originated no farther east than the longitude of Chicago. There are cotton mills as far west as Kansas City; mining, milling, and farming machinery is produced more largely in and about Chicago than in any other section of the country; boots and shoes, hats and clothes, cooking utensils, and the multitudinous articles of domestic use may be secured in large part without coming east of the Alleghenies; in fact the center of those industries which supply the far West apparently is not far removed from the center of population of the country. This is a pregnant fact. It was announced by the Santa Fe officials, when they opened their through line from Chicago to Los Angeles, that they thought it the part of wisdom to make their rates lower, or as low, from Chicago than from New York, so that the industries of the Middle West might develop. They would make their line independent of their eastern connections in so far as that was possible, and instead of bidding against the shippers of the seaboard for traffic destined to the Pacific coast they would develop industries close to their own eastern terminus which would supply the western demand, and thereby develop a traffic for the lines west of Chicago which need not be divided with the carriers east of that city—an exclusive traffic, one which could be carried at rates more compensatory than any that could be had out of the division of a through coast-to-coast rate.

The share of the traffic received at interior points, such as Spokane and Reno, originating east of Chicago is now perhaps slightly larger than in 1906 to 1908, when the railroads began making blanket rates to these points on certain commodities. However, the interior towns receive a smaller share of their total receipts from the east than do the Pacific coast terminals, because lower rates are generally maintained to the interior intermountain towns from the Central West than from the eastern part of the United States.

In considering the possible effect of the Panama Canal upon the traffic of the transcontinental railroads it is important to know the destination of the westbound rail traffic. The following statement was made by the Southern Pacific to the Interstate Commerce Commission to show the destinations of the freight moving westward through the Ogden gateway during the three years 1906–7 to 1908–9:

Table VI.—TOTAL TRAFFIC MOVING WESTWARD THROUGH THE OGDEN GATEWAY (IN TONS).[1]

To—	1906–7	1907–8	1908–9
San Francisco	330,195	281,413	238,426
Oakland	56,779	46,895	39,828
San José	17,305	13,200	12,914
Stockton	32,037	43,302	26,427
Sacramento	59,239	46,903	35,228
Marysville	27,216	24,258	19,924
Los Angeles	54,747	28,842	24,632
All other points	367,311	454,629	412,133
Total	944,829	939,442	809,512
	Per cent.	*Per cent.*	*Per cent.*
All terminals	61.1	51.7	49.9
San Francisco and Sacramento	41.2	34.9	33.8
San Francisco	34.9	29.9	29.4
Nonterminal points	38.9	48.3	50.1

[1] I. C. C. Docket 1665, Exhibit No. 29 of Traffic Bureau of Southern Pacific (Mr. Butler), Oct. 25, 1909.

During the three years included in the statement presented in Table VI, from 49.9 per cent to 61.1 per cent of the westbound traffic through the Ogden gateway was destined to the various Pacific coast terminals, and from 38.9 to 50.1 per cent to nonterminal points.

The foregoing evidence tends to show that only a small portion of the westbound transcontinental traffic of the railroads is strictly transcontinental in the sense that it moves between the seaboards. The different statements vary, but indicate that but 20 to 22 per cent of this traffic originates east of Pittsburgh and Buffalo, and that but 50 per cent to 55 per cent is destined to Pacific coast terminals.

A general estimate has been made of the eastbound transcontinental traffic. It is apparently about equal to the volume of the westbound tonnage but may be less. A greater volume of freight is shipped out of the

[1] Railroad Commission of Nevada *v.* Southern Pacific Company et al. (21 I. C. C. Reps., 364).

Pacific coast States than is received; but most of the traffic goes to foreign countries and to the Middle West, and not to the eastern part of the United States. The heaviest items of the outbound tonnage—lumber, grain, and oil—are not sold largely in our eastern markets.

The water-borne traffic eastbound from our Pacific to our Atlantic ports in 1910 aggregated about 141,600 tons. In 1911, after the California-Atlantic Line had entered the field and the traffic of the Pacific Mail and American-Hawaiian had suddenly increased, the total was about 313,500 tons. According to a reliable estimate, the total eastbound transcontinental traffic in 1910 and in 1911—by coastwise and by rail lines—was 3,000,000 tons per annum, which was the amount of the westbound tonnage in 1909. The railroad share was about 2,858,400 in 1910 and about 2,686,500 in 1911. The tonnage of the transcontinental railroads is known to have been somewhat less in 1911 than in 1910. The estimate shows that the railroads carried nearly 95 per cent of the eastbound transcontinental traffic in 1910, and 89.5 per cent in 1911; and the share of the water carriers was respectively 5 per cent and 10.5 per cent.

The leading commodities transported eastbound by the transcontinental railroads are listed in Tables X and XI, pages 66–68. Fresh, dried, and preserved fruits and vegetables, fresh, frozen, dried, smoked, salted, and canned fish, fish oil, hides and skins, leather, twine and cordage, wool, barley and malt, wine, earthenware, and spices are among the leading articles shipped to eastern markets. To the Central West these articles and, in addition, a certain amount of sugar are shipped, some sugar also reaching New York via the Sunset-Gulf route. The Central West likewise purchases some Pacific coast lumber, wood products, and barley.

The percentage of traffic moving by water is less in the eastbound than in the westbound business, chiefly because fresh fruits and vegetables are not at present handled by the water carriers, and because some of the bulky commodities, such as lumber, do not find a ready market east of the Central West.

Westbound water-borne traffic originates throughout a comparatively wide area extending from the Atlantic seaboard to Chicago; but the nature of eastbound water-borne cargoes is such that they are not carried inland in large amounts from the eastern ports of destination. Shipments from the Pacific coast to the Central West are almost entirely by rail.

The eastbound transcontinental railroad traffic has not been classified by destinations, but it may be safely assumed that, as in case of the westbound business, only the smaller portion is strictly transcontinental. From 20 to 22 per cent of the westbound tonnage originates east of Buffalo and Pittsburgh, but the percentage of the eastbound tonnage destined to points east of Buffalo and Pittsburgh is probably smaller.

III. Transcontinental Rail and Water Rates.

A. TRANSCONTINENTAL RAILROAD RATES.

The present rate systems of the transcontinental railroads have been largely influenced by the rates charged by coastwise carriers. An analysis of the present rates from coast to coast charged by the railroads and by the competing water carriers must necessarily precede an intelligent consideration of the probable effects of the Panama Canal upon the traffic and rates of the transcontinental railroads. It will be well to begin this analysis with a brief description of the transcontinental rate structure. In a volume on Railroad Traffic and Rates the main features of the transcontinental rate system are described as follows:[1]

1. Blanket or common rates are charged on westbound transcontinental traffic from most points east of the Missouri River. This is true of both class and commodity tariffs, but, as will appear as the discussion proceeds, there are numerous exceptions made to the general policy of blanketing rates from the territory east of the Missouri. Upon some commodities the rates eastbound from the Pacific coast are the same to all places east of the Missouri, and on more articles common rates prevail to places east of the Mississippi, but the blanketing of rates is less general upon eastbound than upon westbound shipments.

2. Upon eastbound traffic, and to a less extent upon that toward the west, graded zone tariffs have been established. The places east of the Rocky Mountains are classified in 10 "rate groups," A to J. Upon the higher classes of freight and upon numerous commodities the rates to all groups are the same, but upon the lower classes and upon most commodities the tariffs vary by rate groups. Class rates westbound are practically identical with those eastbound, i. e., graded for classes below the third; and in westbound commodity tariffs there are numerous instances of grading by groups, but this grading of commodity tariffs westbound is an exception to the more general rule of blanketing rates from points on and east of the Missouri River.

3. The rates westbound to the intermediate points east of the Pacific seaboard terminals are, as a rule, higher than the through tariffs, the higher charges being fixed by the addition to the through rates of either fixed arbitraries or the local rates back from the terminals, as will be explained presently. The rates eastbound from the intermediate points are usually higher than from the terminals, although many intermediate towns are given the same rates as the terminal cities enjoy.

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[1] E. R. Johnson and G. G. Huebner, "Railroad Traffic and Rates," Vol. I, pp. 459–460.

The 10 rate groups A to J referred to are defined in the accompanying Plate A. Eastbound, and to a less extent westbound, the rates from and to the Pacific coast are graded according to these rate groups. The rates on all articles not so graded are blanketed, i. e., they are the same to all points east of the Missouri River on commodities shipped to and from Pacific coast terminals.

The rates to intermediate points such as Spokane and Reno are generally higher than to the Pacific Coast terminals, and are, for the most part, not blanketed. Recently, however, the rates on some commodities to these interior points have also been blanketed and have, in some cases, been made equal to the charges granted to the coast terminals. The system of charging higher rates to the interior towns than to the coast terminals has long been opposed by the intermountain cities, and relief was sought of the Interstate Commerce Commission, which rendered decisions regarding Spokane,[1] Wash., rates in 1910 and 1911, and Reno,[2] Nev., rates, in 1909, 1910, and 1911. The Spokane and Reno decisions announced June 22, 1911, are especially important in that the commission then attempted to change the system according to which rates to intermediate points are made. Five territorial zones were established by the commission, as shown in Plate B, and it was ordered that in shipments from zone 1 to intermediate points no higher rate may be made than to coast terminal points, that from zone 2 the rates to intermediate points may not exceed those to the coast terminals by more than 7 per cent, that from zone 3 the rates to intermediate points were not to be more than 15 per cent, and from zone 4 not more than 25 per cent, above the through rates to the coast terminals. No opinion was expressed as to zone 5, because the rates from that territory were not involved in the proceedings. These orders of the commission have been appealed to the United States Supreme Court for review, but they indicate the attitude of the commission with respect to the extent to which transcontinental railroad charges may properly be allowed to be affected by the competition of the coastwise water lines.

Table VII tabulates the westbound transcontinental class rates now in effect and shows the extent to which they are blanketed. The various groups A to J are those defined by Plate A. Table VIII gives the eastbound class rates. Class rates, however, are of but slight importance in the transcontinental shipments, for but few articles are shipped under the class tariffs.

Commodity rates are quoted, in the transcontinental tariffs, on over 3,000 different articles to the coast terminals, and on a somewhat less number from those terminals. The westbound commodity rates on selected, leading articles shipped to the Pacific coast terminals are shown in Table IX, and the eastbound commodity rates on articles of similar importance shipped from the Pacific are given in Table X. They are quoted to and from the various rate groups A to J defined in Plate A, so as to show the extent to which they are blanketed and graded.

The transcontinental eastbound railroad rates on lumber are fixed in accordance with a different plan than is followed in making other commodity rates, and are published in separate tariff books. Table XI states the lumber rates from the Pacific Coast States to various indicated eastern and central western markets. The terms coast rates, Spokane rates, Montana-Oregon rates, Truckee rates, etc., refer to different lumber shipping districts. The rates quoted in columns A to F, in the case of the charges from the northwestern area, and in columns 1 and 2 under California rates are the charges on different kinds of lumber products as defined in the footnotes of the table.

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[1] City of Spokane et al. *v.* Northern Pacific Railway Co. (21 I. C. C. Reps., 400–427).

[2] Railroad Commission of Nevada *v.* Southern Pacific Co. et al. (21 I. C. C. Reps., 329–384).

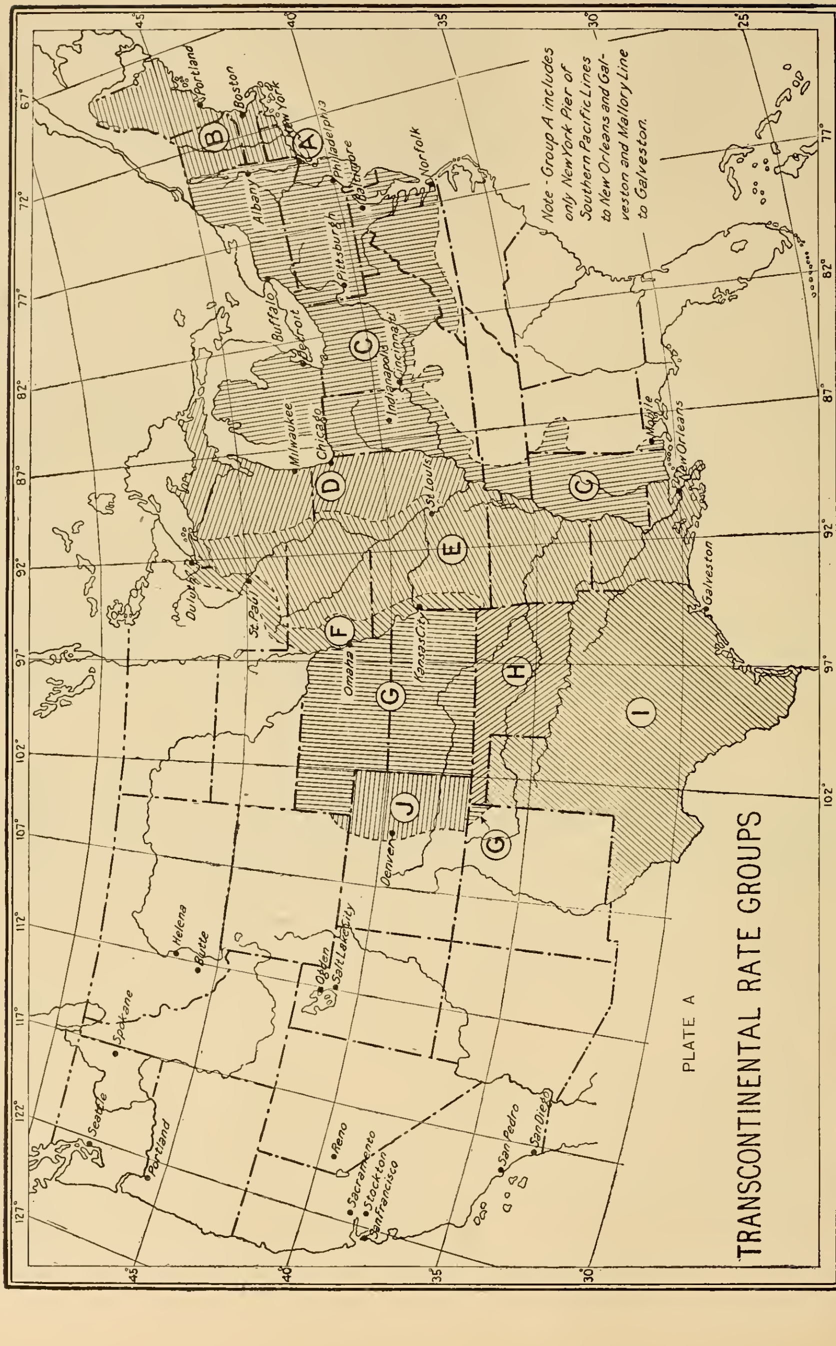

PLATE A

TRANSCONTINENTAL RATE GROUPS

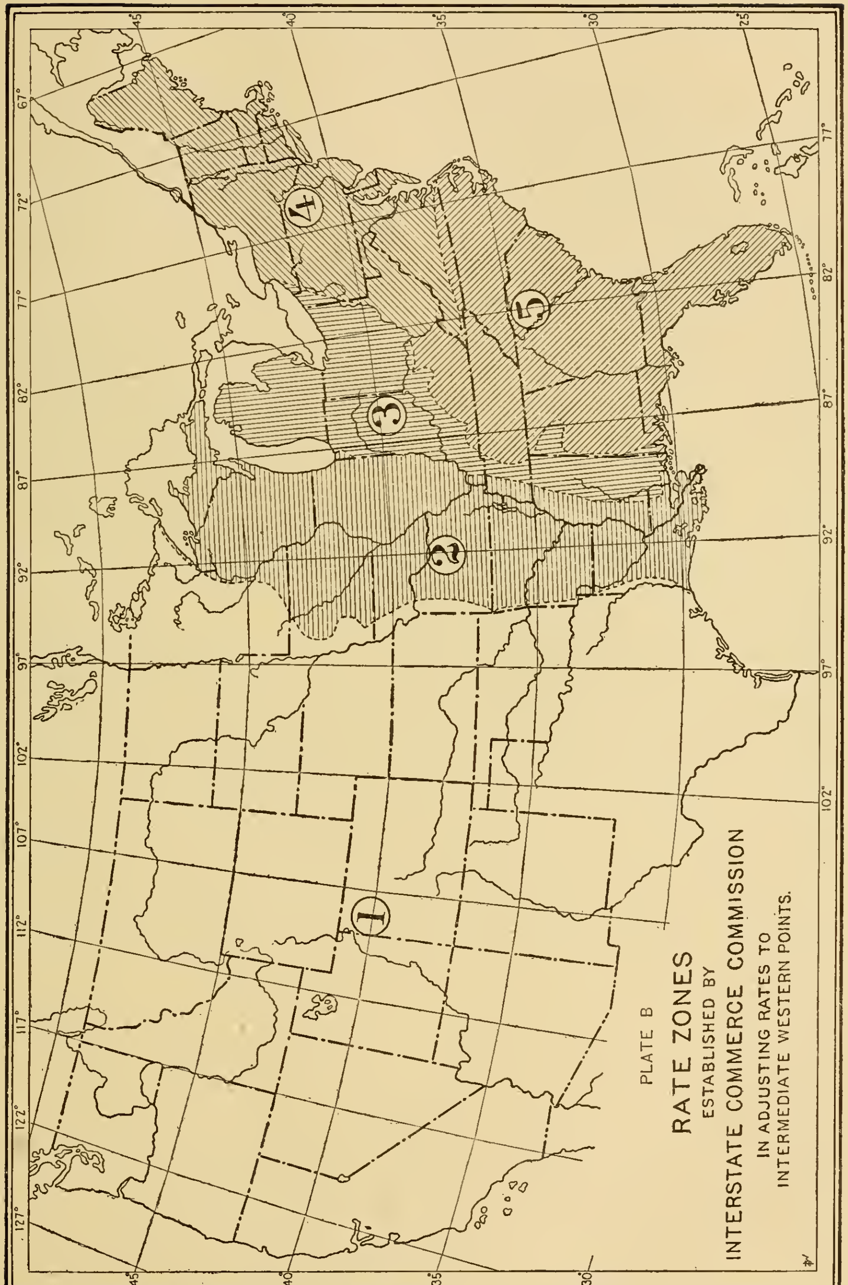

PLATE B
RATE ZONES
ESTABLISHED BY
INTERSTATE COMMERCE COMMISSION
IN ADJUSTING RATES TO
INTERMEDIATE WESTERN POINTS.

TABLE VII.—WESTBOUND TRANSCONTINENTAL RAILROAD CLASS RATES.

[Rates in cents per 100 pounds.]

Classes.	To north Pacific coast terminals from groups—										To California terminals from groups—									
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
Class I	300	300	300	300	300	300	300	300	300	300	300 [1] 300	300 300	300 300	300 300	300 300	300 300	300 280	300 280	....	300 260
Class II	260	260	260	260	260	260	260	260	260	260	260 260	260 260	260 260	260 260	260 260	260 260	260 242	260 242	....	260 225
Class III	220	220	220	220	220	220	220	220	220	200	220 220	220 220	220 220	220 220	220 220	220 220	220 205	220 205	....	200 190
Class IV	190	190	190	190	190	190	190	190	190	175	190 190	190 190	190 190	190 190	190 190	190 183	190 170	190 170	....	175 160
Class V	......	......	......	165	165	160	160	160	160	160	165 165	....	....	165 165	165 165	165 160	165 150	165 150	....	160 140
Class A	......	......	......	160	160	160	160	160	160	140	160 160	....	....	160 160	160 160	160 160	160 150	160 150	....	140 140
Class B	......	......	......	125	125	125	125	125	125	120	125 125	....	....	125 125	125 125	125 123	125 115	125 115	....	120 107
Class C	......	......	......	100	100	100	100	100	100	95	100 100	....	....	100 100	100 100	100 95	100 90	100 90	....	95 83
Class D	......	......	......	100	100	95	95	95	95	85	100 100	....	....	100 100	100 100	100 93	100 87	100 87	....	85 80
Class E	......	......	......	95	95	85	85	85	85	80	95 95	....	....	95 95	95 92	95 85	95 78	95 78	....	80 73

[1] Upper line=class rates via gateways 10 to 16; lower line=class rates via gateways 1 to 9 and via 17.

TABLE VIII.—EASTBOUND TRANSCONTINENTAL RAILROAD CLASS RATES.

[Rates in cents per 100 pounds.]

Classes.	From north Pacific coast terminals to groups—										From California terminals to groups—									
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
Class 1	370	370	370	340	320	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Class 2	330	330	330	300	280	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260
Class 3	265	265	265	240	230	220	220	220	220	190	220	220	220	220	220	220	220	220	220	200
Class 4	210	210	210	190	185	180	180	180	180	155	190	190	190	190	190	190	190	190	190	175
Class 5	......	......	......	170	165	160	160	160	160	130	......	......	......	165	165	165	165	165	165	160
Class A	......	......	......	175	167	160	160	160	160	140	......	......	......	160	160	160	160	160	160	140
Class B	......	......	......	155	148	140	140	140	140	120	......	......	......	125	125	125	125	125	125	120
Class C	......	......	......	120	115	110	110	110	110	95	......	......	......	100	100	100	100	100	100	95
Class D	......	......	......	105	100	95	95	95	95	85	......	......	......	100	100	100	100	100	100	85
Class E	......	......	......	95	90	85	85	85	85	80	......	......	......	95	95	95	95	95	95	80

TABLE IX.—WESTBOUND TRANSCONTINENTAL COMMODITY RAIL AND WATER[1] RATES.

[Rates in cents per 100 pounds.]

Commodities.	Railroad rates to North Pacific terminals from groups—																			
	A.		B.		C.		D.		E.		F.		G.		H.		I.		J.	
	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.
Harvesters, reapers, etc. (24,000 pounds)		125		125		125		125		120		115		115		115				
Plows, harrows, etc. (24,000 pounds)		125		125		125		125		120		115		115		115				
Beer, malt extract in glass or stone, packed or in wood		100		100		100		100		100		100								
Boots and shoes, n. o. s. boxed	275		275		275		260		250											
Cement, building and paving, in packages (40,000 pounds)							100	45	100	45	100	40	100	40	100	50	100	50	100	35
Cereal breakfast foods in packages	140	90	140	90	140	90	140	90	140	90	140	90	140	90						
Chinaware, not including ornaments, in boxes, barrels, or casks (24,000 pounds)	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100
Underwear, boxed (20,000 pounds)	200	150	200	150	200	150	200	150	200	150	165	150	165	150	165	150	165	150	165	150
Coffee (green), in sacks	140	80	140	80	140	80	140	75	140	75	140	75	140	75	140	75	140	75	140	75
Coffee (roasted) in boxes, barrels, or drums	160	110	160	110	160	110	160	110	160	95	160	95							160	95
Crackers, etc., in boxes, barrels, baskets, or tubs, or cases (24,000 pounds)	220	150	220	150	220	150	220	150	220	150	220	150								
Creamery and cheese factory machinery (24,000 pounds)		150		150		150		150		150		150								
Cotton sheets and sheetings, etc	160	110	160	110	160	110	160	110	160	110	160	110	160	110	160	110	160	110	160	110
Earthenware, stoneware, and crockery (packed) (24,000 pounds)	150	95	150	95	150	95	150	95	150	90	150	85								
Electrical goods, trolley wire, line materials, etc		160		160		160		160		160		160								
Chairs, cane, carpet or leather seated, boxed (20,000 pounds)	200		200		200		185		175											
Glass, common window, boxed (24,000 pounds)	125	90	125	90	125	90	125	90	125	90	125	90	125	90	125	90	125	90	125	90
Mechanics' tools, boxed	175		175		175		175		175		175									
Harness and saddlery, n. o. s. (20,000 pounds)		220		220		220		200		200		200		200		200		200		200
Iron and steel rails, girders, bars, plate No. 11 and heavier, etc. (30,000 pounds)		80		80		80		80		80		80								65
Boiler plate, n. o. s., Nos. 11 to 16, not bent or punched (40,000 pounds)		85		85		85		85		85		85								70
Billets, blooms, ingots, and scrap steel (60,000 pounds)					125	65	100	60	100	60	100	60							100	50
Pipes, fittings, and connections	150	70	150	70	150	70	150	65	150	65	150	65								
Whisky, in bulk, in barrels, or drums (24,000 pounds)	175	125	175	125	175	125	175	125	175	125	175	125								
Gas and gasoline engines		140		140		140		140		140		140		140		140		140		140
Condensed milk in tin, glass, packed in boxes or in wood (40,000 pounds)	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	120	80
Nails, spikes, and wire (40,000 pounds)		90		90		90		80		80		80								65
Oil-well supplies (24,000 pounds)		150		150		150		150		150		150								
Paints (40,000 pounds)	130	95	130	95	130	95	120	90	120	90	115	85	115	85					115	85
Paper, news	110	75	110	75	110	75	110	75	110	75	110	75								
Paper, building	110	75	110	75	110	75	110	75	110	75	110	75	110	75					110	65
Paraffine wax		90		90		90		90		90		90		90		90		90		75

[1] See also pages 64 and 65.

TABLE IX.—WESTBOUND TRANSCONTINENTAL COMMODITY RAIL AND WATER RATES—Continued.

[Rates in cents per 100 pounds.]

Commodities.	Railroad rates to North Pacific terminals from groups—																			
	A.		B.		C.		D.		E.		F.		G.		H.		I.		J.	
	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.
Pickles, n. o. s.	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100
Sewing machines, k. d., boxed or crated	175	......	175	......	175	......	175	......	175	......	175	......	......	......	......	......	......	......	......	......
Soap, in packages (40,000 pounds)	130	80	130	80	130	80	130	80	130	80	130	80	130	80	130	80	130	80	130	80
Stamped ware	......	120	......	120	......	120	......	120	......	120	......	120	......	......	......	......	......	......	......	120
Stoves (cast iron), cooking, heating, etc. (24,000 pounds)	......	130	......	130	......	130	......	130	......	130	......	130	......	......	......	......	......	......	......	......
Tin plate or sheet metal for trunks.	125	75	125	75	125	75	125	75	125	75	125	75	......	......	......	......	......	......	......	......
Tobacco, unmanufactured, in cases or hogheads (20,000 pounds)	175	150	175	150	175	150	175	150	175	150	175	150	......	......	......	......	......	......	......	......

Commodities.	Railroad rates to California terminals from groups—																				Water rates to Pacific coast ports from New York (Panama Line).[1]		Water rates to Pacific coast ports from New York (Hawaiian Line).	
	A.		B.		C.		D.		E.		F.		G.		H.		I.		J.					
	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.
Harvesters, reapers, etc. (24,000 pounds)	.....	125	.....	125	.....	125	.....	125	.....	120	.....	120	.....	120	.....	120	.....	120	.....	120	125	88	.....	85
Plows, harrows, etc. (24,000 pounds)	.....	125	.....	125	.....	125	.....	125	.....	120	.....	120	.....	120	.....	120	.....	120	.....	120	125	88	.....	85
Beer, malt extract in glass or stone, packed or in wood	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	105	88	.....	60
Boots and shoes, n. o. s. boxed	275	.....	275	.....	275	.....	275	.....	275	.....	275	.....	275	.....	275	.....	275	.....	275	.....	165	.....	.....	.....
Cement, building and paving, in packages (40,000 pounds)	100	50	.....	.....	.....	.....	100	50	100	50	100	45	100	40	100	40	100	40	100	40	60	45	.....	.....
Cereal breakfast foods in packages	140	90	140	90	140	90	140	90	140	90	140	90	140	90	140	90	140	90	140	90	84	60	.....	.....
Chinaware, not including ornaments, in boxes, barrels, or casks (24,000 pounds)	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	90	.....	.....	.....
Underwear, boxed (20,000 pounds)	200	150	200	150	200	150	200	150	200	150	200	150	200	150	200	150	200	150	200	150	120	.....	.....	.....
Coffee (green), in sacks	140	75	140	75	140	75	140	75	140	75	140	75	140	75	140	75	140	75	140	75	.....	.....	95	70
Coffee (roasted) in boxes, barrels, or drums	160	110	160	110	160	110	160	110	160	110	160	110	160	110	160	110	160	110	160	110	96	77	95	70
Crackers, etc., in boxes, barrels, baskets, or tubs, or cases (24,000 pounds)	220	150	220	150	220	150	220	150	220	150	220	150	220	150	220	150	220	150	220	150	132	112	.....	.....
Creamery and cheese factory machinery (24,000 pounds)	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	150	105	.....	.....
Cotton sheets and sheetings, etc	160	110	160	110	160	110	160	110	160	110	160	110	160	110	160	110	160	110	160	110	87	70	90	65
Earthenware, stoneware, and crockery (packed) (24,000 pounds)	150	95	150	95	150	95	150	95	150	95	150	95	150	95	150	95	150	95	150	95	90	67	.....	.....
Electrical goods, trolley wire, line materials, etc	.....	160	.....	160	.....	160	.....	160	.....	160	.....	160	.....	160	.....	160	.....	160	.....	160	150	100	.....	.....
Chairs, cane, carpet or leather seated, boxed (20,000 pounds)	200	.....	200	.....	200	.....	200	.....	200	.....	200	.....	200	.....	200	.....	200	.....	200	.....	.....	.....	.....	.....
Glass, common window, boxed (24,000 pounds)	125	90	125	90	125	90	125	90	125	90	125	90	125	90	125	90	125	90	125	90	100	80	.....	.....
Mechanics' tools, boxed	175	.....	175	.....	175	.....	175	.....	175	.....	175	.....	175	.....	175	.....	175	.....	175	.....	105	80	.....	.....
Harness and saddlery, n. o. s. (20,000 pounds)	.....	200	.....	200	.....	200	.....	200	.....	200	.....	200	.....	200	.....	200	.....	200	.....	200	154	.....	.....	.....
Iron and steel rails, girders, bars, plate No. 11 and heavier, etc. (30,000 pounds)	.....	80	.....	80	.....	80	.....	80	.....	80	.....	80	.....	80	.....	80	.....	80	.....	65	78	55	.....	55–65

[1] Panama Railroad Steamship Co.

TABLE IX.—WESTBOUND TRANSCONTINENTAL COMMODITY RAIL AND WATER RATES—Continued.

[Rates in cents per 100 pounds.]

Commodities.	Railroad rates to California terminals from groups— A.		B.		C.		D.		E.		F.		G.		H.		I.		J.		Water rates to Pacific coast ports from New York (Panama Line).[1]		Water rates to Pacific coast ports from New York (Hawaiian Line).	
	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.
Boiler plate, n. o. s., Nos. 11 to 16, not bent or punched (40,000 pounds)	.....	85	.....	85	.....	85	.....	85	.....	85	.....	85	.....	85	.....	85	.....	85	.....	70	78	76	......	......
Billets, blooms, ingots, and scrap steel (60,000 pounds)	100	60	.....	.....	125	60	100	60	100	60	100	60	100	60	100	60	100	60	100	50	60	45	......	40
Pipes, fittings, and connections	150	65	150	70	150	70	150	65	150	65	150	65	150	65	150	65	150	65	150	65	80	45	......	45
Whisky, in bulk in barrels or drums (24,000 pounds)	175	125	175	125	175	125	175	125	175	125	175	125	175	125	175	125	175	125	175	125	90	70	......	60
Gas and gasoline engines	.....	140	.....	140	.....	140	.....	140	.....	140	.....	140	.....	140	.....	140	.....	140	.....	140	150	100	......	100
Condensed milk in tin, glass packed in boxes, or in wood (40,000 pounds)	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	120	80	90	60	......	60
Nails, spikes, and wire (40,000 pounds)	.....	70	.....	85	.....	85	.....	70	.....	70	.....	70	.....	70	.....	70	.....	70	.....	55	75	55	......	55
Oil-well supplies (24,000 pounds)	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	.....	150	130	105	......	......
Paints (40,000 pounds)	130	95	130	95	130	95	130	95	130	95	130	95	130	95	130	95	130	95	130	85	78	65	......	60
Paper, news	110	75	110	75	110	75	110	75	110	75	110	75	110	75	110	75	110	75	110	55	66	52	......	......
Paper, building	110	75	110	75	110	75	110	75	110	75	110	75	110	75	110	75	110	75	110	75	66	52	......	55
Paraffin wax	150	90	150	90	150	90	150	90	150	90	150	90	150	90	150	90	150	90	150	75	90	70	......	70
Pickles, n. o. s.	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	90	70	80	......
Sewing machines, k. d., boxed or crated	175	.....	175	.....	175	.....	175	.....	175	.....	175	.....	175	.....	175	.....	175	.....	175	....	100	85	......	......
Soap, in packages (40,000 pounds)	130	80	130	80	130	80	130	80	130	80	130	80	130	80	130	80	130	80	130	80	78	55	......	50
Stamped ware	.....	120	.....	120	.....	120	.....	120	.....	120	.....	120	.....	120	.....	120	.....	120	.....	120	105	84	......	85
Stoves (cast iron), cooking, heating, etc. (24,000 pounds)	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	125	90	......	......
Tin plate or sheet metal for trunks	125	75	125	75	125	75	125	75	125	75	125	75	125	75	125	75	125	75	125	75	75	45	......	......
Tobacco, unmanufactured, in cases or hogsheads (20,000 pounds)	175	150	175	150	175	150	175	150	175	150	175	150	175	150	175	150	175	150	175	150	125	95	......	[2] 75

[1] Panama Railroad Steamship Co.

[2] Manufactured smoking.

Table X.—EASTBOUND TRANSCONTINENTAL COMMODITY RAIL AND WATER[1] RATES.

[In cents per 100 pounds.]

Commodities.	Railroad rates from North Pacific coast terminals to groups—																			
	A.		B.		C.		D.		E.		F.		G.		H.		I.		J.	
	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.	L.c.l.	C.l.
Dried fruits (raisins, prunes, and figs) in boxes, barrels, casks, or kegs (40,000 pounds)	220	110	220	110	220	110	220	110	220	110	220	110	220	110	220	110	220	110	220	110
Preserved fruit in bulk in wood	180	75	180	75	180	75	165	75	165	75	155	75	155	75	155	75	155	75	155	75
Fresh apples (30,000 pounds)[2]	......	......	......	100	......	100	......	100	......	100	......	85 100	......	85 100	......	100	......	100	......	85 100
Melons (24,000 pounds)[2]	......	......	......	120	......	115	......	100	......	100	......	85 100	......	85 100	......	100	......	100	......	85 100
Fresh vegetables (20,000 pounds)[2]	......	......	......	120	......	115	......	100	......	100	......	85 100	......	85 100	......	100	......	100	......	85 100
Potatoes (30,000 pounds)[2]	......	......	......	......	......	......	......	75	......	75	......	65 70	......	65 70	......	75	......	75	......	60 65
Citrus fruits	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Deciduous fruits	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Grapes and peaches (20,000 pounds)[2]	......	......	......	......	......	150	......	125	......	125	......	125	......	125	......	125	......	125	......	125
Sugar in packages (30,000 pounds)	......	......	......	......	......	......	......	65	......	65	......	60	......	......	......	......	......	......	......	60
Sugar in packages (60,000 pounds)	......	......	......	......	......	......	......	60	......	60	......	55	......	......	......	......	......	......	......	55
Sugar-beet seed in packages	150	75	150	75	150	75	135	75	135	75	125	75	125	75	125	75	125	75	125	75
Earthenware, packed	200	......	200	......	200	......	200	......	200	......	200	......	200	......	200	......	200	......	200	......
Fish, fresh or frozen, in refrigerator cars (24,000 pounds)	......	......	......	150	......	150	......	125	......	125	......	125	......	125	......	150	......	150	......	112½
Fish, canned, boxed (40,000 pounds)	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85
Fish, dried, smoked, or salted, in packages l. c. l. and in boxes or bundles c. l	150	85	150	85	150	85	125	85	125	85	125	85	125	85	125	85	125	85	125	85
Leather, various kinds, in boxes or rolls	125	......	125	......	125	......	125	......	125	......	125	......	125	......	125	......	125	......	125	......
Hides, dry, in bales or loose (20,000 pounds)	......	120	......	120	......	120	......	120	......	120	......	120	......	120	......	120	......	120	......	120
Skins, various kinds, in boxes or bales	250	......	250	......	250	......	250	......	250	......	250	......	......	......	......	......	......	......	......	......
Fish oil	......	70	......	70	......	70	......	70	......	70	......	70	......	70	......	70	......	70	......	70
Spices, n. o. s. (24,000 pounds)	170	125	170	125	170	125	170	125	170	125	170	125	170	125	170	125	170	125	140	125
Twine and cordage	......	......	......	......	......	......	145	95	145	95	145	95	145	95	145	95	145	95	145	95
Woodenware, various kinds	......	135	......	135	......	135	......	125	......	125	......	125	......	125	......	125	......	125	......	100
Wool, in grease, in bales (24,000 pounds)	150	100	150	100	150	100	150	100	150	100	150	100	......	......	......	......	......	......	......	......
Wool, scoured, in bales (24,000 pounds)	......	150	......	150	......	150	......	150	......	150	......	150	......	......	......	......	......	......	......	......
Barley	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Wheat	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Malt, in sacks	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Wine, in wood	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

[1] See also page 67.

[2] From fruit-shipping centers specified in tariffs; in case of California terminal rates on grapes and peaches, those shown apply only to certain destinations, regular deciduous fruit rates applying to other destinations.

TABLE X.—EASTBOUND TRANSCONTINENTAL COMMODITY RAIL AND WATER RATES—Continued.

[In cents per 100 pounds.]

Commodities.	Railroad rates from California terminals to groups—																				Water rates from Pacific coast to New York (Panama Lines).[1]	Water rates from Pacific coast to New York (American-Hawaiian Line).
	A.		B.		C.		D.		E.		F.		G.		H.		I.		J.			
	L.c.l.	C. l.	L.c.l.	C. l.	L.c.l.	C. l.	L.c.l.	C. l.	L.c.l.	C. l.	L.c.l.	C. l.	L.c.l.	C. l.	L.c.l.	C. l.	L.c.l.	C. l.	L.c.l.	C. l.	Any quantity.	Any quantity.
Dried fruits (raisins, prunes, and figs) in boxes, barrels, casks, or kegs (40,000 pounds)	220	110	220	110	220	110	220	110	220	110	220	210	220	210	220	210	220	210	220	210	45–50	45
Preserved fruit in bulk in wood	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	45	45
Fresh apples (30,000 pounds) [2]	.....	110	.....	110	.....	110	.....	110	.....	110	.....	110	.....	110	.....	110	.....	110	.....	110	.....	.....
Melons (24,000 pounds) [2]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fresh vegetables (20,000 pounds) [2]	.....	.....	.....	125	.....	110 / 115	.....	100	.....	100	.....	95	.....	95	.....	95	.....	95	.....	95	.....	.....
Potatoes (30,000 pounds) [2]	.....	.....	.....	.....	.....	.....	.....	75	.....	75	.....	75	.....	75	.....	75	.....	75	.....	75	.....	.....
Citrus fruits	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	.....
Deciduous fruits	.....	140	.....	140	.....	120 / 140	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	.....
Grapes and peaches (20,000 pounds)[2]	.....	125	.....	125	.....	120 / 125	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sugar in packages (30,000 pounds)	.....	65	.....	.....	.....	.....	.....	65	.....	65	.....	60	.....	60	.....	68	.....	85	.....	60	40	.....
Sugar in packages (60,000 pounds)	.....	60	.....	.....	.....	.....	.....	60	.....	60	.....	55	.....	55	.....	63	.....	.....	.....	.....	40	.....
Sugar-beet seed in packages	150	75	150	75	150	75	145	75	135	75	125	75	125	75	125	75	125	75	125	75	55	.....
Earthenware, packed	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	75	.....
Fish, fresh or frozen, in refrigerator cars (24,000 pounds)	.....	.....	.....	150	.....	150	.....	125	.....	125	.....	125	.....	125	.....	125	.....	125	.....	125	.....	.....
Fish, canned, boxed (40,000 pounds)	150	85	150	[3]75 / 85	150	[3]75 / 85	150	85	150	85	150	85	150	85	150	85	150	85	150	85	45	45
Fish, dried, smoked, or salted, in packages l. c. l. and in boxes or bundles c. l.	125	85	125	85	125	85	125	85	125	85	125	85	125	85	125	85	125	85	125	85	50	.....
Leather, various kinds, in boxes or rolls	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	115	.....	75	.....
Hides, dry, in bales or loose (20,000 pounds)	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	60	65
Skins, various kinds, in boxes or bales	250	.....	250	.....	250	.....	250	.....	250	.....	250	.....	250	.....	250	.....	250	.....	250	.....	[4]100	.....
Fish oil	.....	70	.....	70	.....	70	.....	70	.....	70	.....	70	.....	70	.....	70	.....	70	.....	70	45	45–50
Spices, n. o. s. (24,000 pounds)	170	125	170	125	170	125	170	125	170	125	170	125	170	125	170	125	170	125	170	125	60	.....
Twine and cordage	145	95	145	95	145	95	145	95	145	95	145	95	145	95	145	95	145	95	145	95	50–55	.....
Woodenware, various kinds	.....	135	.....	135	.....	135	.....	135	.....	135	.....	135	.....	135	.....	135	.....	135	.....	135	.....	.....
Wool, in grease, in bales (24,000 pounds)	100	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100	.....	40	40
Wool, scoured, in bales (24,000 pounds)	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	130	.....	40	40
Barley	.....	65	.....	70	.....	70	.....	62½	.....	62½	.....	55	.....	55	.....	55	.....	55	.....	55	35	35–42½
Wheat	.....	.....	.....	.....	.....	.....	.....	65	.....	65	.....	55	.....	55	.....	55	.....	55	.....	55	40	35–42½
Malt, in sacks	.....	70	.....	75	.....	75	.....	70	.....	70	.....	60	.....	60	.....	60	.....	60	.....	60	40	35–42½
Wine, in wood	200	75	200	75	200	75	200	75	200	75	200	75	200	75	200	75	200	75	200	75	40	40

1 Panama R. R. S. Co.; Pacific Mail S. S. Co.; California-Atlantic S. S. Co.

2 From fruit-shipping centers specified in tariffs; in case of California terminal rates on grapes and peaches, those shown apply only to certain destinations, regular deciduous fruit rates applying to other destinations.

3 Minimum carload weights for salmon 60,000, in order to get rate of 75 cents.

4 Sealed in pickle, in barrels or casks.

TABLE XI.—EASTBOUND TRANSCONTINENTAL RAILROAD RATES ON LUMBER.

[In cents per 100 pounds.]

	From points in Oregon, Washington, Idaho, Montana, Alberta, and British Columbia.[1]														From points in California, Nevada, Oregon, and Utah.[2]					
	Coast rates.				Spokane rates.				Montana-Oregon rates.				Coast, Spokane, Montana-Oregon rates.	Proportional rates applying from Albina, East Portland, Portland, and St. Johns, Oreg.	Coast rates.		Truckee rates.		Beckwith rates.	
	A.	B.	C.	D.	A.	B.	C.	D.	A.	B.	C.	D.	Group E.	Group F.	Group 1.	Group 2.	Group 1.	Group 2.	Group 1.	Group 2.
Albany	84	84	84	74	81	81	81	71	81	81	81	71	80	75						
Baltimore	82	82	82	72	79	79	79	69	79	79	79	69	80	75						
New York and Boston	85	85	85	75	82	82	82	72	82	82	82	72	80	75						
Norfolk	82	82	82	72	79	79	79	69	79	79	79	69	80	75						
Philadelphia	83	83	83	73	80	80	80	70	80	80	80	70	80	75	75	80	72	77	72	77
Richmond	82	82	82	72	79	79	79	69	79	79	79	69	80	75						
Rochester	81½	81½	81½	71½	78½	78½	78½	68½	78½	78½	78½	68½	80	75						
Syracuse	81½	81½	81½	71½	78½	78½	78½	68½	78½	78½	78½	68½	80	75						
Utica	83	83	83	73	80	80	80	70	80	80	80	70	80	75						
Chicago[3]	65	65	65	55	62	62	62	52	62	62	62	52	....	....	60	65	57	62	57	62

[1] Group A rates apply to shingles.

Group B rates apply to lumber (including creosoted lumber), and timbers (including creosoted timbers), of cedar, single-car lengths, and the following articles manuactured from cedar: Blocks (base, corner, and head), box shooks, columns, cross arms, eave troughs, guttering, ladder material, match blocks, match splints, molding (carpenters'), paving blocks (creosoted or not creosoted), picture backing, pipe material, sash (knocked down), staves, heading and bolts, tank material, telegraph and telephone brackets, ties, tubing (pump), window frames (knocked down).

Group C rates apply to long timbers, poles, piling, or lumber requiring two or more cars for transportation.

Group D rates apply to lumber (including creosoted lumber), poles (including cedar poles), piling (including cedar piling), and timbers (including creosoted timbers) of cottonwood, fir, hemlock, larch, pine, and spruce, single-car lengths, and the following articles manufactured therefrom: Bark (hemlock), blocks (base, corner, and head), box shooks, columns, cross arms, eave troughs, guttering, ladder material, lath (including cedar lath), match blocks, match splints, mine wedges, molding (carpenters') paving blocks (creosoted or not creosoted), pickets (including cedar pickets), picture backing, pipe material, posts (including cedar posts), sash (knocked down), staves, heading and bolts, tank material, telegraph and telephone brackets, ties, tubing (pump), window frames (knocked down).

Group E rates apply to articles manufactured from cedar, cottonwood, fir, hemlock, larch, pine, redwood, or spruce lumber, as follows: Sash, doors and blinds; door, window, and screen frames; inside finishings; panel frames (used as backing for keyboards for pianos); stairwork and veneering, in straight carloads, or in mixed carloads with any or all of the following named articles, viz, carpenters' moldings in the white for door frames and for inside finishing, columns, eave troughs, guttering, ladder material match blocks, match splints in packages, pickets, picture backing, pipe material, including iron bands and wooden or iron connections for wooden pipe, consisting of ells, tees, crosses, and reducers; porch balusters and spindles, pump tubing, tank material. } Minimum carload weight, when in cars 34 feet or less in length, 24,000 pounds; in cars over 34 feet in length, 30,000 pounds.

NOTE.—Cottonwood, fir, hemlock, larch, pine, redwood, or spruce lumber, and lath may be shipped in mixed carloads with the above-mentioned articles at the rate named, except that the rate on cedar lumber and articles enumerated above, when shipped in mixed carloads, will be the Group B rate, but not less than 80 cents per 100 pounds.

Group F rates apply to articles manufactured from cedar, cottonwood, fir, hemlock, larch, pine, redwood, or spruce lumber, as follows: Backing (picture), blinds, blocks (base), blocks (corner), blocks (head), box material, carpenters' moldings, in the white for door frames and for inside finishing, columns, cross arms, doors, eave troughs, forest waste, frames (door), frames (panel used as backing for keyboards for pianos), frames (screen, k. d.), frames (window), guttering, heading, inside finishings, ladder material, lath, logs, lumber, lumber (cedar), lumber (redwood), match blocks, match lumber, match splints (in packages), match strips, pickets, pipe material, poles (telegraph), poles (telephone), posts (fence), sash, sawmill refuse, shingles, stairwork, staves, tank material, ties, timbers (mining), tubing, tubing (pump), veneering. } Minimum carload weight when in cars 34 feet or less in length 24,000 pounds; in cars over 34 feet in length, 30,000 pounds.

NOTE.—Cottonwood, fir, hemlock, larch, pine, or spruce lumber, and lath may be shipped in mixed carloads with the above-mentioned articles at the rate named.

[2] Group 1 rates apply on lumber (except woods of value, viz, cocobolo, ebony, lignum-vitæ, and rosewood), and the following articles manufactured therefrom: Blinds, blocks (base, corner, and head), box material, columns, cross arms, doors, finishings (inside), forest waste, frames (door, window, and screen, plain or wired), guttering, heading, lath, logs, lumber, match blocks, match splints, match strips or match lumber, moldings (carpenters') in the white, for door frames or inside finishing, pipe material, poles (telegraph and telephone), posts (fence), sash, saw-mill refuse, staves, tank material, ties, timber (mining), tubing.

Straight or mixed carloads, minimum weight 30,000 pounds, except that minimum carload weight for unglazed sash in straight carloads will be 24,000 pounds.

Group 2 rates apply on shingles, in straight carloads, or in mixed carloads with articles taking Group 1 rates (see above), minimum carload weight 30,000 pounds.

[3] Via Chicago, Milwaukee & St. Paul Railway.

B. RATES COAST TO COAST BY WATER.

The water rates between Atlantic and Pacific ports may now be described and compared with the charges by rail. The regular lines operating via the Panama and Tehuantepec routes have tariffs or schedules of rates, and a comparison of water and rail charges may readily be made. In Tables IX and X eastbound and westbound rates via the Panama and American-Hawaiian Lines are stated side by side with corresponding rail charges on commodities transported both by the railroads and by the water lines. Direct comparison can be made between the water rates given in the table and the rail rates quoted to and from territorial groups "A" and "C" in which the port of New York is located. The relation of all-rail rates to rail-and-water rates to and from interior points is explained below.

The water rates on lumber from the Pacific coast to New York via the Panama and Tehuantepec routes are given in Table XII. They vary from 40 to 60 cents per 100 pounds ($8 to $12 per ton) by way of Panama. Via Tehuantepec the rates range from 40 cents per 100 pounds ($8 per ton) to $20 per thousand feet of lumber. The railroad rates from the North Pacific coast to New York vary from 75 to 85 cents per 100 pounds on different lumber products, and from the California coast from 75 to 80 cents per 100 pounds.

TABLE XII.—EASTBOUND TRANSCONTINENTAL WATER RATES ON LUMBER.

Kind of lumber.	Panama Line,[1] from Portland, Astoria, Oreg.; Grays Harbor and Puget Sound ports, San Francisco and East San Pedro, Cal., to New York.				American-Hawaiian Line, from Pacific coast terminals to New York.
	Estimated weight per 1,000 feet b. m.		Rate per 100 pounds.		Rate.
Fir lumber:	*Pounds.*				
Rough green	3,300		$0.45		40 cents per 100 pounds to $20 per M feet.
Rough dry	3,000		.55		
Finishing surfaced	2,500		.55		
Flooring	2,000		.55		
Spruce or cedar:					
Rough green	3,300		.45		
Rough dry	3,000		.55		
Finishing surfaced	2,000		.55		
Siding	700		.55		
Lath:					
Dry	[2] 500		.50		
Green	[2] 650		.40		
Shingles:	*Green.*	*Dry.*	*Green.*	*Dry.*	
Extra "A"	200	140	$0.50	$0.60	
Perfection	275	200	.50	.60	
Eureka	250	180	.50	.60	
Clears	220	160	.50	.60	

[1] Rates via California Atlantic Line. The Pacific Mail does not cater to the lumber traffic.

[2] Per 1,000 lath.

Notes applying to shipments via Panama:

1. Lumber exceeding 35 feet in length or 12 inches in width or less than 1 inch thick will not be accepted for transportation except that the smaller pieces will be taken when put up in secure bundles.
2. All shipments of lumber, shingles, and lath will be accepted and charges collected on basis of estimated weights shown opposite each item.
3. All small pieces of lumber to be put up in secure bundles.
4. We reserve the privilege of carrying all shipments of green lumber and shingles on deck

The rates by the water lines on different commodities range from 20 to 60 per cent below the railroad tariffs. Upon some articles the difference is greater, while for others it is less. There is no general relation or fixed differential between the water and rail charges, the water rates upon each commodity being sufficiently below the rail charges to enable the steamship lines to secure the traffic desired.

The rates over the Sunset-Gulf route have, since 1909, been the same as the all-rail rates. Southern Pacific traffic agents route freight over the Morgan Line steamers as their connection between the Gulf and New York; and by getting freight through from New York to San Francisco within an average time of 15 days and 5 hours [1] and by absorbing the rail rates to and from interior points, they obtain a large tonnage of freight for their combined rail and water line. When freight is shipped via the Sunset-Gulf route from an interior point such as Pittsburgh, the rate is the same whether the freight moves direct by all rail from Pittsburgh to the West Coast or to New York and is then forwarded via the Sunset-Gulf route. The Southern Pacific absorbs the rail rate to New York.[2]

There is no fixed or definite relationship between the rates via the Panama and Tehuantepec routes. Originally the rates were practically the same by both routes; then, for a time, the Panama charges were generally less, especially eastbound, the Panama line being the differential or longer route as compared with that via Tehuantepec. At present, many rates are the same by the two routes; on numerous commodities the Tehuantepec rates are slightly less; and on some articles the charges are less via the Panama route. In making comparisons, however, it is important to bear in mind the difference in the service rendered by the Panama Line and the American-Hawaiian Line. As hereafter explained, the rates of the latter are to and from coast terminals, while the Panama line absorbs railroad rates from interior points to the extent of 20 cents per 100 pounds on westbound shipments, and the entire rail rate from the Pacific Coast to certain interior points in California.

In Table X, a small number of the eastbound water rates are quoted. The information contained in Table X is supplemented by the detailed list of commodity rates westbound and eastbound via the Panama route and via the American-Hawaiian Steamship Line, presented in Table XIII, A and B:

TABLE XIII A.—WESTBOUND WATER RATES VIA PANAMA AND TEHUANTEPEC ROUTES, NEW YORK TO PACIFIC COAST TERMINALS.

[In cents per 100 pounds.]

Commodities.	American-Hawaiian Line.	Panama Line.
Agricultural implements	85	88
Bath tubs, iron-porcelain lined	100	125
Bats, baseball	75	75
Belting, leather or rubber	85	84
Bicycles	175	180
Binders' boards	55	52
Books, blank, including school composition books	75	75
Brass and copper heavy goods	85	85–90
Calcium chloride	45	52
Candles, wax, grease	70	70
Canned goods	60	65
Chemicals and drugs	100	100
Clothes pins	65	65
Clothes wringers	85	85
Copper wire	65	50
Dry goods	60–200	70–88
Food, animal	60	70
Glucose	55	52
Glycerine	55	52
Hardware	60–100	60–100

[1] G. F. Richardson, Supt. of Transportation of Southern Pacific, in U. S. v. Union Pacific et al., evidence Vol. X, p. 4459.
[2] J. C. Stubbs, Traf. Director Harriman System, in U. S. v. Union Pacific et al., Evidence Vol. I, p. 295.

TABLE XIII A.—WESTBOUND WATER RATES VIA PANAMA AND TEHUANTEPEC ROUTES, NEW YORK TO PACIFIC COAST TERMINALS—Continued.

[In cents per 100 pounds.]

Commodities.	American-Hawaiian Line.	Panama Line.
Horseshoes, per keg	55	55
Insulators, glass or porcelain	55	60
Iron, band, bar, or plates	55	55
Iron, sheets	65	70-76
Iron, blooms and billets	40	45
Lampblack, in barrels	125	120
Lawn mowers	85	85
Machinery, n. o. s., K. D	100	100
Milk, condensed	60	60
Nuts, edible	100	125
Nuts, kernels and meats	150	125
Oil, lubricating	60	60
Paint	60	65
Paper bags	65	70
Paper, book	55	63
Paper, building	55	52
Paper tickets, sales, transfer	100	120
Paper, writing	70	70
Plaster	50	52
Preserves	75	77
Pumps	100	105
Radiators	50-100	70
Rubber goods	200	180
Safes	80	123
Soap	50	55
Soda, ash	40	45
Soda, caustic	40	45
Stamped ware	85	84
Starch	65	70
Stove polish	65	65
Tapioca	65	63
Tobacco, manufactured smoking	75	95
Toys	100-300	110-360
Trunks	175	150-200
Varnish	60	65
Wax	70	105
Whisky	60	70
Wire, barbed or plain	55	55
Wire rope	60	77
Wire cloth	65	70
Wine	60	70-88

Table XIII B.—EASTBOUND WATER RATES VIA PANAMA AND TEHUANTEPEC ROUTES—PACIFIC COAST TERMINALS TO NEW YORK.

[In cents per 100 pounds.]

Commodities.	American-Hawaiian Line.	Panama Line.
Asphaltum	35	35
Barytes	40	40
Beans	45	45–50
Barley	35–42½	40
Beans, vanilla	200	100
Books	40	40
Beeswax	65	65
Canned goods	45	45
Fruit, dried	45	45–50
Grain and mill stuffs	35–42½	35–40
Hides, dry	65	60
Hops	90	90
Household goods	100	100
Junk	35–45	35–60
Liquors	40	40–100
Lumber and shingles	[1]	45–60
Machinery	100	75
Matting	70	70
Metals	35	35
Nuts, edible	50	50
Nuts, kernels	60	60
Oils	45–50	45–50
Reels	55	50
Tea	40	40
Wool	40–75	40–75

[1] Forty cents per 100 pounds to $20 per M feet.

As is shown by Table XIII, A and B, the coast-to-coast rates via the Panama and Tehuantepec routes, while similar, are not absolutely alike. Some are identical by both routes, and others less via Panama, but the greater number are slightly lower via Tehuantepec. In shipments to and from the interior, however, the rates of the Panama line are lower because of its absorption of part or all of the rail rate. There is no traffic agreement covering the rates by the two routes; but, naturally, the rates over the two routes are made with reference to each other and to the rates of the transcontinental railroads. The general level of charges by each of the water routes is so fixed as to enable each of the water lines to obtain sufficient traffic in competition with the other and with the rail lines.

C. INTERRELATION OF INTERCOASTAL WATER RATES AND TRANSCONTINENTAL RAIL RATES.

The extent to which the transcontinental railroad tariffs are affected by the coast-to-coast water rates has long been a disputed question; but it is indisputable that the rail charges are influenced by water competition. The Interstate Commerce Commission in 1911 reiterated its former findings as follows: (City of Spokane et al. *v.* Northern Pacific Railway, 21 I. C. C. Reps., 416.) "This question of fact has been often considered in the past, and with but one unvarying result. The Circuit Court of the United States has twice found, once in a proceeding concerning these very rates to Spokane, that active water competition does exist which controls the coast rates." "The manifests of steamships," says the commission, "proves more conclusively than any mere statement that almost every article which is the subject of ordinary commerce between the coasts can and does move from New York to San Francisco by water at rates materially lower than those mentioned by the defendants by rail. We have used San Francisco as the destination port upon the Pacific coast, and in some instances rates from New York to San Francisco are a trifle lower than to the other coast cities; but, generally speaking, the San Francisco rate is maintained at Los Angeles, Portland, Seattle, Tacoma, and other points on the coast. Passing for the time being the extent and effect of this competition at interior points, it must be found as a fact that there is real and active water competition between New York and San Francisco, between the Atlantic and the Pacific coasts, which does limit the rate of transportation which can be charged by rail between those points upon nearly every article which moves by rail."

The fact that the water lines have at times been controlled by the rail carriers does not alter the conclusion that water competition is a factor influencing the transcontinental rail rates. The traffic by water is now increasing, and the water rates are materially lower than the rail tariffs. Moreover, potential ocean competition influences the charges fixed by the railways. As was stated by Commissioner Prouty in the Spokane decision:

It is said that the amount of the movement by water is so insignificant that it should be disregarded. The amount is not insignificant. If reference be had to the traffic which actually originates upon the Atlantic seaboard a considerable percentage moves by water, but the significant thing is not the amount of the movement, but the ever-present possibility of that movement. As was said by the Supreme Court in the *Alabama Midland case*, speaking of the effect produced upon rail rates to Montgomery by the Alabama River:

* * * "When the rates to Montgomery were higher a few years ago than now, actual, active water-line competition by the river came in, and the rates were reduced to the level of the lowest practicable paying water rates, and the volume of carriage by the river is now comparatively small; but the controlling power of that water line remains in full force, and must ever remain in force as long as the river remains navigable to its present capacity."

So here the ocean is ever present. The possibility of using it as an avenue of transportation is ever open, and the fact that it will be used, if for any considerable length of time the defendants maintain rates which are so high, or so adjusted as to render it profitable for shippers to resort to that means of transportation, is never doubtful.

The system of blanketing the transcontinental rates from points east of the Missouri River is the result of this water competition, active and potential; and so, too, is the difference between the through rates to and from the Pacific coast terminals as compared with the charges to and from the intermediate points in the West. The rate percentages established in the Reno and Spokane decisions by the Interstate Commerce Commission, to apply upon westbound transcontinental traffic, express the judgment of the commission as to the force that may well be allowed water competition in controlling the railroad tariffs.[1]

As the evidence just presented clearly indicates, the transcontinental railroad tariffs have been, and now are, influenced by the rates charged by the coast-to-coast water lines; but it is equally true that the rates of the steamship lines operating via Tehuantepec and Panama are to a large extent made with reference to the tariffs of the transcontinental railroads. The competition of the water routes with the rail lines, and the recurring rate wars have, in the past, forced the transcontinental railroads to adopt the system of rate making now in force; but during recent years rate wars have been avoided; the transcontinental railroads have not been under pressure to fight against the water lines for traffic; the tonnage moving by rail has been large and has rapidly increased; and the policy of the railroads has been to maintain, and where practicable, to raise the established level of rail tariffs.

Since 1907, when the American-Hawaiian Line began its service via Tehuantepec, there has been a large increase in the water-borne intercoastal tonnage; but there has been no consequent general decline in the charges by the transcontinental railroads. It was stated by the Interstate Commerce Commission in 1911, in the Reno decision,[2] that "Out of 1,535 commodity rates compared by the carriers, it appears that no change has taken place since December 1, 1906, as to 696 of such commodities, reductions have been effected in 287, advances and reductions as to 132, and advances as to 418. Of the items increased, the rates on 318 commodities were increased from the whole eastern blanket."

The relation that has recently prevailed between the rates of the intercoastal water lines and the transcontinental rail tariffs is indicated by a statement made by the assistant to the vice president of the Southern Pacific in the testimony taken by the Interstate Commerce Commission in the Reno case. The statement, which was an answer to the question whether the water lines controlled the transcontinental rates, was "I believe the rail lines control the making of their own rates, and when we say to-day that we do not wish to go any lower, that indicates our disposition in that regard in making the rates." The same official also stated, "I have never seen a tariff of the American-Hawaiian Line, because they have never been published. They are simply based on our rates as the basis of theirs."

[1] See above, p. 59; also Pl. B above.

[2] Railroad Commission of Nevada *v.* Southern Pacific Co., et al., 21 I. C. C. Reps., 354.

The president of the American-Hawaiian Line, in testifying before the Senate Committee on Interoceanic Canals in 1910, spoke as follows:[1] "We are friendly with them (the railroad traffic managers). We discuss rates. I don't know of any other business in the world where competitors don't get together and talk matters over. We are not tied up; we are not committed. We do as we please, absolutely untrammeled. * * * Our traffic manager doesn't attend the conferences of the railroads, but he goes to Chicago and gets his ear pretty close to the ground. That's his business." In answer to the question, "To-day, as I understand it, you frankly admit that you follow more or less what the transcontinental railroads determine?" he said: "Certainly," but expressed the view that the water lines would dominate rates after the canal is open and after they carry the bulk of the strictly transcontinental traffic.[2] It is also the opinion of the Interstate Commerce Commission, expressed in the Spokane decision, that "Since the advent of the American-Hawaiian Line there has been, not perhaps a definite agreement between it and the rail lines, but a general understanding that such rates should be maintained by water as compared with rates by rail as would give to the vessels a reasonable amount of traffic from the immediate vicinity of New York."

That the intercoastal water lines should now tend to adjust their rates with reference to the established level of railroad tariffs is in accordance with a general economic law. In any business or industry where the major share of the business is handled by one group of concerns the smaller individual competitors normally make their charges with reference to the prices established by the concerns doing the larger share of the business. More than four-fifths of the transcontinental traffic westbound and eastbound, until 1911, was handled by rail and less than one-fifth by the water carriers; and it naturally follows that the level of rail rates influences the charges of the carriers by water.

Though the fact may seem paradoxical, it is not to be inferred from the preceding analysis either that the railroad rates are not or are not to be influenced by the charges of the water lines, or that there is now or is to be no effective competition among the intercoastal carriers by water. The transcontinental rail and intercoastal water rates are and will be made with reference to each other. There will probably be no fixed percentage, or general differential, relation between the rail and water charges. Under present conditions the rates via Panama and Tehuantepec are from 20 to 60 per cent below the transcontinental rail tariffs, and the opening of the canal will so reduce the costs of transportation by the water lines and will so increase the number of carriers and the volume of coastwise shipping as to make a still greater difference between the rail and water rates. The future level of rail tariffs must necessarily be established with reference to the rates charged by water.

Moreover, while it is to be expected that the competition among the coast-to-coast steamship lines will be regulated by conferences, formal or informal, of the interested lines, there will none the less be an incentive on the part of each steamship company to increase its tonnage. There will be the regulated competition among the steamship lines that generally exists among rival carriers, and rates will thereby be kept below the maximum charges that the traffic will bear. For a part of the water-borne traffic the cost of shipping by chartered vessels will regulate the rates charged by the regular steamship lines, but for most of the traffic shipped by water the rates will be such as the regulated competition of the steamship lines or as Government control (if the coast-to-coast water carriers should be made subject to the Interstate Commerce Commission) may establish. The level below which, and with reference to which, the rates charged by the coast-to-coast steamship lines will be fixed will be the stable tariffs of the transcontinental railroads.

[1] Senate Hearings on bill 3428, Feb. 10, 1910, p. 90.

[2] Ibid., p. 97.

IV.—Transcontinental Rates to and from Interior Points: Effect of Water Competition.

A. RATES BY RAIL AND WATER TO AND FROM INTERIOR POINTS IN THE EAST AND WEST.

The steamship lines now engaged in the coast-to-coast business obtain a part of their freight from interior points in the Eastern States for shipment to the Pacific coast. The manifests of cargo show that a small tonnage is obtained from places as far west as Chicago and St. Louis, and also state that some of the westbound freight shipped by water is destined to interior points in the western part of the United States. The great bulk of westbound freight, however, originates at the eastern terminals of the water lines—at New York and points not far distant therefrom—and is destined to the Pacific coast terminals and to places not far inland. The evidence secured by the Interstate Commerce Commission in the Spokane and other cases led the commission to state that "The principal movement by water is from the Atlantic seaboard itself, from New York and from points having water communication with New York, and from interior territory immediately contiguous. There is a considerable movement as far inland as Buffalo and Pittsburgh, and an occasional movement from Detroit, Chicago, and similar points. A movement of starch from Cedar Rapids, Iowa, of considerable proportions was shown, but generally speaking, up to the present time, comparatively little traffic originating west of the Buffalo-Pittsburgh zone has reached the Pacific Coast by water."[1] The present eastbound freight of the steamship lines, to a larger degree than is true of their westbound tonnage, originates and terminates near the seaboard.

The competition of the intercoastal water lines with the railroads has benefited the sections near the Atlantic and Pacific seaboards more than the interior section; because, for most shipments to and from interior points via a combined rail and water route, the through rate is the sum of the rail rate to or from the coast and the rate by water from coast to coast. There are also transshipment or rehandling charges.

Table XIV, compiled by the division of tariffs of the Interstate Commerce Commission, contains a tabulation of the rail rates from Philadelphia, Pittsburgh, Cincinnati, Indianapolis, Chicago, St. Louis, Kansas City, St. Paul, and Omaha to New York on the same commodities as are listed in Table IX, in which the transcontinental coast-to-coast rates of the railroads and the water lines are quoted. Though the rail rates are not in direct proportion to distance, the charges between the interior points and the seaboard are greater the farther the inland place of origin or destination is from New York. For points west of the Pittsburgh-Buffalo zone the rail rates to New York soon become so high that most goods move directly to the Pacific coast by rail at rates which are usually the same from all places east of the Missouri River. On some commodities the rail rates to the Pacific are less from the Central West than from the Eastern States.

The addition of the rail rates from the interior to New York to the intercoastal—if always made in fixing through rates—would have prevented interior points beyond Pittsburgh and Buffalo from making as many shipments as have been made via the water lines between the Atlantic and Pacific coasts. Fortunately for the interior eastern shippers, the coastwise steamship lines sometimes absorb all or a part of the rail rates to and from the seaboard on westbound shipments.

[1] City of Spokane et al v. Northern Pacific Railway Company et al, 21 I. C. C. Reps., 420.

Table XIV.—STATEMENT SHOWING CLASS AND COMMODITY RATES TO NEW YORK, N. Y., FROM PHILADELPHIA, PITTSBURGH, CINCINNATI, INDIANAPOLIS, CHICAGO, ST. LOUIS, KANSAS CITY, ST. PAUL, AND OMAHA.

[Rates are in cents per 100 pounds, except as noted.]

To New York, N. Y.	From—								
	Philadelphia, Pa.	Pittsburgh, Pa.	Cincinnati, Ohio.	Indianapolis, Ind.	Chicago, Ill.	St. Louis, Mo.	Kansas City, Mo.	St. Paul, Minn.	Omaha, Nebr.
Classes:									
First	22	45	65	69½	75	87½	147½	135	147½
Second	18	39	56½	60½	65	76	121	115	121
Third	15	30	43½	46½	50	58½	93½	90	93½
Fourth	12	21	30½	32½	35	41	67	60	67
Fifth	10½	18	26	28	30	35	57	50	57
Sixth	9½	15	21½	23	25	29			
COMMODITIES.									
Harvesters and reapers, k. d..: plows and harrows, k. d.:									
Carload	10½	18	26	28	30	35	57½	50	57½
Less than carload	15	33	48	51½	55	65	100	95	100
Beer:									
Carload	10½	18	26	28	30	35	52	47	52
Less than carload	15	.30	43½	46½	50	58½	93½	90	93½
Boots and shoes:									
Carload Less than carload	22	45	65	69½	75	87½	147½	135	147½
Cement (building):									
Carload	9½	15	17½	18½	20	23½	40½	37	40½
Less than carload	12	21	30½	32½	35	41	67	60	67
Cereal breakfast foods:									
Carload	10½	18	17½	18½	30	19⅞	41 7/10	25	41 7/10
Less than carload	12	21	30½	32½	35	41	67	60	67
Chinaware (value, $20 per hundredweight):									
Carload	18	39	56½	60½	65	76	92	85	92
Less than carload	18	39	56½	60½	65	76	136	125	136
Cotton underwear:									
Carload Less than carload	22	45	65	69½	75	87½	147½	135	147½
Green coffee:									
Carload	10½	18	26	28	30	35	57	50	57
Less than carload	12	24	34½	37½	40	46½	72	65	72
Roasted coffee:									
Carload	10½	18	26	28	30	35	57	50	57
Less than carload	12	24	34½	37½	40	46½	72	65	72
Crackers:									
Carload	12	21	30½	32½	35	41	67	60	67
Less than carload	18	39	56½	60½	65	76	121	115	121
Creamery and cheese factory machinery:									
Carload	10½	18	26	28	30	35	59½	55	59½
Less than carload	18	39	56½	60½	65	76	121	115	121
Cotton sheets and sheetings (cotton piece goods):									
Carload Less than carload	15	33	48	51½	55	65	100	115	100
Stoneware and crockery (in boxes or barrels):									
Carload	10½	18	26	28	30	35	54½	50	54½
Less than carload	12	24	34½	37½	40	46½	91½	90	91½

TABLE XIV.—STATEMENT SHOWING CLASS AND COMMODITY RATES TO NEW YORK, N. Y., FROM PHILADELPHIA, PITTSBURGH, CINCINNATI, INDIANAPOLIS, CHICAGO, ST. LOUIS, KANSAS CITY, ST. PAUL, AND OMAHA—Continued.

[Rates are in cents per 100 pounds, except as noted.]

To New York, N. Y.	From—								
	Philadelphia, Pa.	Pittsburgh, Pa.	Cincinnati, Ohio.	Indianapolis, Ind.	Chicago, Ill.	St. Louis, Mo.	Kansas City, Mo.	St. Paul, Minn.	Omaha, Nebr.
COMMODITIES—continued.									
Trolley wire (copper):									
Carload	12	21	30½	32½	35	41	67	60	67
Less than carload	15	30	43½	46½	50	58½	103½	100	103½
Cane-seated chairs (boxed):									
Carload	18	39	56½	60½	65	76	110	105	110
Less than carload	33	67½	97½	104½	112½	131½	191¼	172½	191¼
Common window glass:									
Carload	10½	18	26	28	30	35	57	50	57
Less than carload	12	24	34½	37½	40	46½	72	65	72
Mechanics' tools (boxed):									
Carload	12	21	30½	32½	35	41	101	95	101
Less than carload	15	30	43½	46½	50	58½	118½	110	118½
Harness and saddlery:									
Carload Less than carload	22	45	65	69½	75	87½	147½	135	147½
Girders, bars and plates, No. 11 or heavier:									
Carload	9	16	26	28	30	35	57	50	57
Less than carload	12	19	30½	32½	35	41	67	60	67
Steel rails:									
Carload	190	300	430	460	500	580	755	675	755
Less than carload	12	19	30½	32½	35	41	67	60	67
Iron and steel blooms, billets, and ingots:									
Carload [1]	180	260	430	460	500	580	$882\frac{4}{10}$	$813\frac{6}{10}$	$882\frac{4}{10}$
Less than carload	12	19	30½	32½	35	41	67	60	67
Plate [2] and sheet (boiler) Nos. 11 to 16:									
Carload	10½	16	26	28	30	35	57	50	57
Less than carload	12	19	30½	32½	35	41	67	60	67
Pipe and fittings:									
Carload	9	16	26	28	30	35	48½	44	48½
Less than carload	12	19	30½	32½	35	41	67	60	67
Whisky (in wood):									
Carload	12	21	30½	32½	35	41	69	68	69
Less than carload	15	33	48	51½	55	65	110	105	110
Condensed milk:									
Carload	12	21	30½	32½	35	35	57	55	57
Less than carload	15	30	43½	46½	50	58½	82	75	82
Nails and spikes:									
Carload	9	16	26	28	30	35	57	44	57
Less than carload	12	19	30½	32½	35	41	67	60	67
Oil-well supplies:									
Carload	10½	18	26	28	30	35	59½	55	59½
Less than carload	15	30	43½	46½	50	58½	118½	110	118½

[1] In cents per 2,240 pounds.

[2] Plate from Philadelphia 9 cents; from Pittsburgh, C. l., 16 cents; and from Pittsburgh, L. c. l., 19 cents per 100 pounds.

TABLE XIV.—STATEMENT SHOWING CLASS AND COMMODITY RATES TO NEW YORK, N. Y., FROM PHILADELPHIA, PITTSBURGH, CINCINNATI, INDIANAPOLIS, CHICAGO, ST. LOUIS, KANSAS CITY, ST. PAUL, AND OMAHA—Continued.

[Rates are in cents per 100 pounds, except as noted.]

To New York, N. Y.	From—								
	Philadelphia, Pa.	Pittsburgh, Pa.	Cincinnati, Ohio.	Indianapolis, Ind.	Chicago, Ill.	St. Louis, Mo.	Kansas City, Mo.	St. Paul, Minn.	Omaha, Nebr.
COMMODITIES—continued.									
Paints (dry) in wood:									
Carload	10½	18	26	28	30	35	47	47	47
Less than carload	15	30	43½	46½	50	58½	82	75	82
Paints (in oil):									
Carload	10½	18	26	28	30	35	57	50	57
Less than carload	15	30	43½	46½	50	58½	82	75	82
Building paper:									
Carload	10½	18	17½	18½	20	23½	34½	30	34½
Less than carload	12	24	34½	37½	40	46½	81½	80	81½
Paraffine wax, carload	10½	18	24	25½	27½	32	49	47½	51 3/10
Paraffine wax (in wood), less than carload	15	30	43½	46½	50	58½	93½	90	93½
Pickles, carload	10½	18	26	28	30	35	57	47	57
Pickles (in wood), less than carload	15	30	43½	46½	50	58½	82	75	82
Sewing machines, boxed or crated:									
Carload	15	30	43½	46½	50	58½	93½	90	93½
Less than carload	22	45	65	69½	75	87½	147½	135	147½
Soap:									
Carload	10½	18	26	28	30	35	57	50	57
Less than carload	13	24	35	37½	40	47	72	65	72
Stamped ware, carload	12	21	30½	32½	35	41	67	60	67
Stamped ware (nested solid), less than carload	15	33	48	51½	55	65	100	90	100
Stoves (cooking and heating):									
Carload	10½	18	26	28	30	35	57	50	57
Less than carload	15	30	43½	46½	50	58½	93½	90	93½
Tin plate:									
Carload	10½	18	26	28	30	35	57	50	57
Less than carload	12	21	30½	32½	35	41	67	60	67
Tin, sheet:									
Carload	12	21	30½	32½	35	41	63	55	63
Less than carload	15	30	43½	46½	50	58½	82	75	82
Tobacco, unmanufactured, in hogsheads, barrels, or cases:									
Carload; Less than carload	12	21	30½	32½	35	41	67	60	67
Malt extract, carload	12	21	30½	32½	35	41	62	55	62
Malt extract (in wood), less than carload	18	39	56½	60½	65	76	136	125	136

Tariff authority:

Class rates.—Philadelphia to New York, P. R. R., G. O., I. C. C. 553; Pittsburgh to New York, P. R. R., G. O., I. C. C. 3107; Chicago and Cincinnati to New York, C., C., C. & St. L. Ry., I. C. C. 5893; St. Louis to New York, Cameron's I. C. C. D-62; Indianapolis to New York, C., C., C. & St. L., I. C. C. 5893; Kansas City and Omaha to New York, C., C., C. & St. L., I. C. C. 5893, Cameron's I. C. C. D-62, and Hosmer's I. C. C. A-243; and St. Paul to New York, Hosmer's I. C. C. A-244 and C., C., C. & St. L., I. C. C. 5893.

Commodity rates.—To New York, from Philadelphia, P. R. R., G. O., I. C. C. 553, 3794, and G-2994; from Pittsburgh, P. R. R., G. O., I. C. C. 3107 and G. O. 1277; from Cincinnati, Indianapolis and Chicago, Big 4, I. C. C. 5893 and 5891; from St. Louis, Cameron's D-62; from Kansas City and Omaha, Hosmer's A-243, Cameron's D-62, and Big 4, 5893; from St. Paul, Big 4, 5893 and Hosmer's A-244.

NOTE.—Rates from St. Louis and points east of Mississippi River governed by Official Classification; rates from Kansas City, St. Paul, and Omaha made on Mississippi River and Chicago Combinations; proportions west of Chicago and Mississippi River governed by Western Classification.

The Panama Railroad Steamship Line, which makes the westbound rates applying over its line and Pacific coast connections, deals as follows with charges from interior eastern points. From its New York pier to Pacific coast points the following "minimum rates" apply:

	Per 100 pounds.
To East San Pedro, Cal	$0.50
To Los Angeles, Cal	.55
To Oakland, Cal	.50
To Portland, Oreg	.52½
To Sacramento, Cal	.55
To San Francisco	.50
To Stockton, Cal	.55
To all other Pacific coast ports	.60

The tariff then provides that, except in case of special rates from New York pier or of rates which do not exceed the above minima, the water rates quoted "may apply from interior points, and when a rate is at least 20 cents higher than the minimum, the Panama Rail Road Co. will assume the charges from shipping point to New York pier not exceeding 20 cents per 100 pounds, any excess over this absorption to be shown on bill of lading as 'advance charges' to be paid by shippers or consignees as the case may be. When a freight rate is not at least 20 cents higher than the minimum, the Panama Rail Road Co. will assume the difference between the minimum and said rate." For example, Table XIV shows that the carload rate on harvesters and reapers, knocked down, from Philadelphia to New York is 10½ cents, which is absorbed by the steamship line; because the water rate on harvesters and reapers from New York pier is 88 cents, or more than 20 cents above the theoretical minimum charge of 50 cents on any commodity from New York to San Francisco. So also is the 18-cent rate from Pittsburgh absorbed; but the Cincinnati rate of 26 cents is absorbed only to the extent of 20 cents, the shipper or consignee being obliged to pay the excess. The 28-cent Indianapolis rate is absorbed only to the amount of 20 cents, and the same is true of the 30-cent Chicago rate, etc. When the water rate on the commodity in question does not exceed the theoretical minimum water rate by 20 cents, the Panama Rail Road Co. absorbs the rail rate only to the extent of the excess of the actual water rate over the minimum water rate, and if the actual rate is only equal to, or is less than, the minimum, the shipper or consignee is obliged to pay the entire rail charge from the inland point to New York.

The policy of the American-Hawaiian Steamship Co. is to "make its rates from the terminals."[1] It does not absorb any of the rail rates to New York; but as the rates of this company are not published it is probable that traffic of large shippers from interior points is solicited at such rates from New York to the Pacific coast as to allow the inland shippers to pay the rail charges to New York and yet enjoy a favorable through rail-and-water rate.

At the Pacific destination of westbound traffic the Panama Line and connections absorb the rates to certain points not on the coast. The tariffs apply alike to the following points: San Francisco, Sacramento, Stockton, Oakland, Berkeley, Los Angeles, San Diego, Santa Barbara, San Pedro, Redondo, Vancouver, Portland, Astoria, Seattle, Tacoma, Port Townsend, Everett, Anacortes, New Whatcom, and Victoria. As is shown above, different minima water rates prevail from the Atlantic seaboard to these points on or near the Pacific coast; but upon any particular commodity the same actual rates are quoted from New York to all the above-named Pacific destinations. The actual rate on any given article shipped from an interior point near the Atlantic via New York to any one of the Pacific destinations will depend both upon the amount of rail charge from the interior point to the Atlantic seaboard absorbed by the steamship lines and also upon the minimum water rate from New York to the Pacific destination. The minimum bill of lading for single shipments, likewise, varies from $1 to $1.50. The American-Hawaiian Line does not absorb the rail rates from the Pacific coast terminals to any interior destinations.

Table XV states the rail rates, on the same list of articles as is included in the former tables of westbound rates, from San Francisco to Sacramento, Stockton, Fresno, Reno, Salt Lake City, and Denver. Since no interior rates beyond Sacramento and Stockton are absorbed by any line, most of the traffic that reaches the west coast by water does not go far inland, although some freight is carried to points as distant as Reno, Nev.

Table XVI gives the rail rates from Seattle to Spokane and Walla Walla, Wash., and to Butte and Helena, Mont. The eastbound freight movement via combined rail-and-water from and to interior points in the West being relatively light, it has not been thought necessary to present a detailed compilation of rail rates between inland points and other Pacific seaboard terminals.

[1] G. S. Dearborn. Testimony, Jan. 24, 1912, in Hearings on Panama Canal by House Committee on Interstate and Foreign Commerce.

The Sunset-Gulf Line from New York to the Pacific coast takes traffic from interior eastern points via New York and New Orleans or Galveston at through rates equal to the all-rail rate from the interior eastern points to the Pacific coast. It thus absorbs the rail rate to New York in that the rate is paid out of the through charge. The Sunset-Gulf route, however, is to be classed with the transcontinental rail lines, and not with the intercoastal water lines—because its rates are the same as those by the all-rail carriers.

Table XV.—Statement showing class and commodity rates from San Francisco to Sacramento, Stockton, Fresno, Reno, Salt Lake City, and Denver.

[Quoted by Division of Tariffs, I. C. C. Rates are in cents per 100 pounds except as noted.]

From San Francisco.	To—					
	Sacramento, Cal.	Stockton, Cal.	Fresno, Cal.	Reno, Nev.	Salt Lake City, Utah.	Denver, Colo.
Classes.						
First	24	10	55	97	154	300
Second	21	10	51	81	131	260
Third	18	9	47	73	115½	200
Fourth	16	9	44	59	96	175
Fifth	13	7	[1] 720	50½	79½	160
A	13	7	[1] 670	50½	79½	140
B	13	[1] 120	[1] 460	41	62	120
C	11	[1] 115	[1] 405	35	56	95
D	9½	[1] 110	[1] 350	31	46	85
E	9½	[1] 105	[1] 295	27	38½	80
COMMODITIES.						
Harvesters and reapers:						
Carload	13	7	[1] 670	50½	79½	125
Less than carload	18	9	47	73	115½	200
Plows and harrows:						
Carload	13	7	[1] 670	50½	79½	125
Less than carload	18	9	47	73	115½	200
Beer:						
Carload	13	7	[1] 720	50	55	100
Less than carload	18	9	47	73	115½	150
Malt extract, carload	13	7	[1] 720	50½	79½	100
Malt extract (in barrels), less than carload	24	10	55	97	154	150
Boots and shoes:						
Carload; Less than carload	24	10	55	97	154	275
Cement (building):						
Carload	11	[1] 115	[1] 405	35	56	95
Less than carload	16	9	44	59	96	175
Cereal breakfast foods:						
Carload	13	7	[1] 720	50½	44	90
Less than carload	16	9	44	59	96	175
Chinaware (val. $20 per cwt.):						
Carload	13	7	[1] 720	50½	79½	160
Less than carload	24	10	55	97	154	300
Cotton underwear:						
Carload; Less than carload	24	10	55	97	154	200

[1] Per 2,000 pounds.

TABLE XV.—STATEMENT SHOWING CLASS AND COMMODITY RATES FROM SAN FRANCISCO TO SACRAMENTO, STOCKTON, FRESNO, RENO, SALT LAKE CITY, AND DENVER—Continued.

From San Francisco.	To— Sacramento, Cal.	Stockton, Cal.	Fresno, Cal.	Reno, Nev.	Salt Lake City, Utah.	Denver, Colo.
COMMODITIES—continued.						
Green coffee:						
Carload	13	7	[1] 720	50½	79½	75
Less than carload	16	9	44	59	96	120
Roasted coffee:						
Carload	13	7	[1] 720	50½	79½	75
Less than carload	16	9	44	59	96	120
Crackers:						
Carload	16	9	44	59	96	175
Less than carload	21	10	51	81	[2] 131	260
Creamery and cheese factory machinery:						
Carload	13	7	[1] 670	50½	79½	150
Less than carload	21	10	51	81	131	260
Cotton sheets and sheeting (cotton piece goods):						
Carload	24	10	55	97	154	110
Less than carload	24	10	55	97	154	160
Stoneware and crockery, carload	13	9	[1] 460	41	62	85
Stoneware and crockery (in hogsheads), less than carload	16	[1] 120	44	59	96	150
Trolley wire (copper):						
Carload	16	9	44	59	96	175
Less than carload	21	10	51	81	131	260
Cane-seated chairs, carload	18	9	47	73	70	200
Cane-seated chairs (boxed), less than carload	24	10	55	97	154	300
Window glass, common:						
Carload	13	7	[1] 720	50½	70	125
Less than carload	16	9	44	59	96	175
Mechanics tools (boxed):						
Carload; Less than carload	24	10	55	97	154	300
Harness and saddlery:						
Carload; Less than carload	24	10	55	97	154	300
Steel rails:						
Carload	13	7	[1] 720	[3] 800	[3] 1,025	160
Less than carload	16	9	44	59	96	175
Girders, bars, and plates, No. 11 or heavier:						
Carload	13	7	[1] 720	50½	62	160
Less than carload	16	9	44	59	96	175
Iron and steel blooms and billets:						
Carload	9½	[1] 110	[1] 350	31	46	85
Less than carload	16	9	44	59	96	175
Boiler plate and sheet, No. 11 to 16:						
Carload	13	7	[1] 720	50½	62	160
Less than carload	16	9	44	59	96	175

[1] Per 2,000 pounds. [2] In lots of not less than 5,000 pounds, per 100 pounds, $1.15. [3] Per 2,240 pounds.

TABLE XV.—STATEMENT SHOWING CLASS AND COMMODITY RATES FROM SAN FRANCISCO TO SACRAMENTO, STOCKTON, FRESNO, RENO, SALT LAKE CITY, AND DENVER—Continued.

From San Francisco.	To— Sacramento, Cal.	Stockton, Cal.	Fresno, Cal.	Reno, Nev.	Salt Lake City, Utah.	Denver, Colo.
COMMODITIES—continued.						
Pipe and fittings:						
Carload	13	7	[1] 720	50½	[2] 55 [3] 60	[2] 75 [2] 160
Less than carload	16	9	44	59	96	175
Whisky (in wood):						
Carload	21	10	51	81	100	125
Less than carload	21	10	51	81	131	260
Condensed milk:						
Carload	13	7	[1] 720	50½	75	80
Less than carload	16	9	44	59	96	175
Nails, spikes, and wire:						
Carload	13	7	[1] 720	50½	62	160
Less than carload	16	9	44	59	96	175
Oil well supplies, carload	13	7	[1] 670	50½	79½	140
Oil well supplies n. o. s., less than carload	24	10	55	97	154	300
Paints (in oil):						
Carload	13	7	[1] 720	50½	79½	95
Less than carload	16	9	44	59	96	130
Building paper:						
Carload	13	7	[1] 720	50½	52	60
Less than carload	18	9	47	73	115½	200
Paraffine wax:						
Carload	13	7	[1] 720	50½	60	85
Less than carload	18	9	47	73	115½	175
Pickles (in wood):						
Carload	13	7	[1] 720	50½	77	100
Less than carload	16	9	44	59	96	150
Sewing machines (boxed or crated):						
Carload	18	9	47	73	115½	200
Less than carload	24	10	55	97	154	300
Soap:						
Carload	13	7	[1] 720	50½	63	80
Less than carload	16	9	44	59	96	130
Stamped ware, carload	16	9	44	59	96	175
Stamped ware (nested solid), less than carload	18	9	47	73	115½	200
Stoves (cooking and heating):						
Carload	13	7	[1] 720	50½	79½	160
Less than carload	18	9	47	73	115½	200
Tin plates and sheets:						
Carload	13	7	[1] 720	50½	79½	160
Less than carload	16	9	44	59	96	175
Tobacco (unmanufactured), carload, and less than carload:	16	9	44	59	96	175

[1] Per 2,000 pounds. [2] Applies on pipe, iron or steel. [3] Applies on pipe fittings.

Authority: San Francisco to Sacramento and Stockton per Sou. Pac. Co. I. C. C. 2631; to Fresno per Sou. Pac. I. C. C. 2622; to Reno, Nev., Sou. Pac. I. C. C. 3432; to Salt Lake City Gomph's I. C. C., 57; and to Denver T. C. F. B. I. C. C., 926.

Table XVI.—STATEMENT SHOWING CLASS AND COMMODITY RATES FROM SEATTLE TO SPOKANE, WALLA WALLA, BUTTE, AND HELENA.

[Quoted by Division of Tariffs, I. C. C. Rates are in cents per 100 pounds, except as noted.]

From Seattle, Wash.	To—							
	Spokane, Wash.		Walla Walla, Wash.		Butte, Mont.		Helena, Mont.	
Classes:								
First	135		109		180		180	
Second	120		91		153		153	
Third	95		77		126		126	
Fourth	80		65		108		108	
Fifth	65		52		90		90	
A	65		52		90		90	
B	55		46		72		72	
C	44		35		54		54	
D	36		26		45		45	
E	26		20		36		36	
COMMODITIES.	*C. l.*	*L. c. l.*	*C. l.*	*L. c. l.*	*C. l.*	*L. c. l.*	*C. l.*	*L. c. l.*
Harvesters and reapers, plows and harrows	65	95	52	77	90	126	90	126
Beer	35	95	35	77	75	126	75	126
Malt extract	35	135	35	109	90	180	90	180
Boots and shoes	135	135	109	109	180	180	180	180
Cement (building)	20	80	20	65	40	108	40	108
Cereal breakfast foods	25	80	25	65	55	108	55	108
Chinaware, value $20 per hundredweight	65	135	52	109	90	180	90	180
Cotton underwear	135	135	109	109	180	180	180	180
Green coffee	65	80	52	65	90	108	90	108
Roasted coffee	65	80	52	65	90	108	90	108
Crackers	80	120	65	91	108	153	108	153
Creamery and cheese factory machinery	65	120	52	91	90	153	90	153
Cotton sheets and sheetings	135	135	109	109	180	180	180	180
Stoneware and crockery	35	80	35	65	72	108	72	108
Trolley wire (copper)	80	120	65	91	108	153	108	153
Cane-seated chairs (l. c. l., boxed)	60	135	60	109	115	180	115	180
Common window glass	65	80	52	65	90	108	90	108
Mechanics' tools (boxed)	135	135	109	109	180	180	180	180
Harness and saddlery	135	135	109	109	180	180	180	180
Steel rails	50	80	50	65	80	108	80	108
Girders, bars, and plates, No. 11 or heavier	65	80	52	65	80	108	80	108
Iron and steel blooms and billets	36	80	26	65	45	108	45	108
Boiler plate and sheet, No. 11 to 16	65	80	52	65	80	108	80	108
Pipe and fittings	65	80	52	65	90	108	90	108
Whisky	120	120	91	91	153	153	153	153
Condensed milk	65	80	52	65	105	108	105	108
Nails, spikes, and wire	65	80	52	65	90	108	90	108
Oil-well supplies (l. c. l., n. o. s.)	65	135	52	109	90	180	90	180
Paints	40	80	40	65	90	108	90	108
Building paper	55	95	55	77	90	126	90	126
Paraffine wax	65	95	52	77	90	126	90	126
Pickles (l. c. l., in wood)	65	80	52	65	90	108	90	108

TABLE XVI.—STATEMENT SHOWING CLASS AND COMMODITY RATES FROM SEATTLE TO SPOKANE, WALLA WALLA, BUTTE, AND HELENA—Continued.

From Seattle, Wash.	To—							
	Spokane, Wash.		Walla Walla, Wash.		Butte, Mont.		Helena, Mont.	
COMMODITIES—continued.	*C. l.*	*L. c. l.*	*C. l.*	*L. c. l.*	*C. l.*	*L. c. l.*	*C. l.*	*L. c. l.*
Sewing machines (boxed or crated)	95	135	77	109	126	180	126	180
Soap	65	80	52	65	90	108	90	108
Stamped ware	80	95	65	77	108	126	108	126
Stoves (cooking and heating)	65	95	52	77	90	126	90	126
Tin plates and sheets	65	80	52	65	90	108	90	108
Tobacco (unmanufactured)	80	80	65	65	108	108	108	108

Authority: From Seattle to Spokane and Walla Walla, per N. P. Ry., I. C. C. 4805; to Butte and Helena, per N. P. Ry., I. C. C. 4961.

B.—EFFECT OF WATER COMPETITION ON RATES TO AND FROM INTERIOR POINTS.

Neither the trunk line nor the transcontinental railways have favored the shipment of commodities from the Middle West to the Atlantic seaboard for carriage thence by water to the Pacific coast. The policy of the railways, generally, under the leadership of the western lines, has been to hold to the all-rail lines the traffic to the Pacific coast both from the Atlantic seaboard and from interior points.

The rivalry of the railways from the Central West to the Atlantic with those from the Central West to the Pacific, and the industrial competition of the Mississippi Valley with the Eastern States, which can ship to the Pacific coast by water lines, brought about the system of blanket rates for most of the traffic to the west coast from the entire section east of the Missouri. The competition of the rail and water lines at the Atlantic seaboard controlled transcontinental rail rates from the Eastern States, and the railroads and the industries of the Middle West insisted upon reaching the Pacific coast on equal terms with the railroads and industries of the eastern section. Upon some articles the rates from the Central West are lower than from the Atlantic seaboard, there being some grading downward of rates by successive lettered rate groups westward from the Atlantic coast.

The policy of the carriers interested in the transcontinental rail traffic from the East and from the Middle West, and the influence upon rail rates exercised by the intercoastal water lines is concisely explained by the Interstate Commerce Commission in the decision in the Spokane case. The commission, speaking through Mr. Prouty, says: [1]

> Carriers maintain the same transcontinental rate from Chicago as from New York, not by reason of the direct effect, but rather as an indirect result of water competition. The reason for this will be best understood by an actual illustration. Assume that a building requiring the use of a large amount of structural steel is to be erected in San Francisco. That steel is manufactured both at the seaboard and in Chicago. That which is made at the seaboard can be taken by water from the point of origin to the point of destination, and the rate at which it can move is therefore determined by water competition.
>
> The cost of producing steel is the same at both points. In order, therefore, that the producers may stand an equal chance in competing for this business it is necessary that the rate from both points should be the same, and the business can not move from Chicago unless the rate from that point is as low as from the seaboard.
>
> The Atchison, Topeka & Santa Fe Railway begins at Chicago. If this steel is bought at Chicago and moves by that line, the entire freight money is retained by it; if, upon the other hand, the steel is bought at New York, moved by some line to Chicago, and there delivered to the Santa Fe, that line receives only a part of the through charge. The service performed by it is the same in either case, but the amount of its compensation is larger when the freight originates at Chicago. It is therefore for the interest of that line to name a rate from Chicago which will originate the business at that point instead of allowing it to originate upon the seaboard. The interest of the line from New York to Chicago is that the business should be taken up at New York, and as a compromise it is finally agreed to apply the same rate from both these points. This clearly shows how water competition, if it does not actually extend to the interior point, may and does dictate the rate from that point.
>
> What would be true of the steel entering into the construction of this building is true also of almost every article of commerce which moves between the East and the West. The Middle West to-day manufactures nearly everything which is produced upon the Atlantic seaboard, and the effect of this policy of the railroads has been to make the Middle West the almost exclusive market of origin for the intermountain country and largely for the Pacific coast itself.

The effect of water shipments upon the interior has, as Commissioner Prouty states, been indirect rather than direct. The tonnage of transcontinental traffic carried from the Mississippi Valley to the Atlantic seaboard for

[1] 21 I. C. C. Reps., 422.

shipment thence by water to the west coast has been relatively small, but the actual or possible shipment of a relatively large volume of commodities by water from the Atlantic coast has controlled the rail rate from the Central West to the Pacific. Water competition has exercised less influence upon eastbound rail rates from the western section to the Middle West and the East, but even on eastbound traffic most rates are blanketed over the entire region east of the Missouri River. There is more grading by distance of eastbound than of westbound rates, but the difference between the eastbound and westbound transcontinental rate systems is one of degree, not of kind or of principle.

Such has been the past effect of intercoastal water transportation upon the rates of the transcontinental all-rail lines. There remains for consideration the influence that the Panama Canal may be expected to exercise upon the rates and rate policies of the transcontinental railroads.

V.—Probable Adjustment of Transcontinental Rail Rates Resulting from Canal Competition.

The railroad rate system that has been worked out by the transcontinental railroads is a complicated structure that has been evolved slowly. It is the resultant of the interaction of numerous forces, of the competition of rival sections, of rival industries, and of rival carriers. As these forces of competition change, from time to time, the rate system is modified in detail to keep transportation charges adjusted as closely as practicable to economic conditions. The opening of the Panama Canal will so greatly change the industrial relations of different sections of the United States and the competition of the transcontinental railroads and the intercoastal water lines as inevitably to require many changes in the present system of transcontinental rates.

Just what rate policies the railroads will adopt to meet the situation created by the Panama Canal can not be predicted in advance of experience. The railroad companies will solve the problems as they arise and will cross no bridge until it is reached. It is possible, however, to indicate the rate problems which the canal will probably create and to point out the possible policies open to the railroads. Such an analysis of the probable effect of the canal upon transcontinental railroad rates may, moreover, enable the Panama tolls to be fixed with a clearer understanding of their effects.

1. The railroad rates most completely subject to the competition of the intercoastal lines using the canal will be those westbound to the Pacific coast from the section of the United States between the Buffalo-Pittsburgh district and the Atlantic seaboard. Even under present conditions, the transcontinental rail rates between the two seaboards are largely affected by the competition of the routes via the Isthmuses of Panama and Tehuantepec, and it is estimated that one-half of the traffic carried from this eastern section of the United States to the Pacific coast now moves by the water routes. Is it probable that the railroads will endeavor to meet the rates of the intercoastal water lines with the view to holding to the all-rail routes the traffic between the two seaboards? It is hardly to be expected, for the following reasons, that the railroads will make a desperate effort to hold this traffic against the water lines.

In the first place, the tonnage involved constitutes, at the present time, a comparatively small percentage—only 20 to 22 per cent—of the total traffic carried to the Pacific coast by the transcontinental roads—those running from Chicago to the west coast. Only 35 per cent of the through business of these lines originates in this eastern section and in the Buffalo-Pittsburgh territory. In other words, more than two-thirds of the through traffic of the transcontinental lines now comes from the Central West.

In the second place, the system of blanketing rates from the Atlantic seaboard westward to the Missouri River—a system that will probably prevail—will carry through to the Missouri River any rate reductions which the railroad lines may make on traffic from coast to coast, and it is hardly to be expected that the railroads will reduce rates unnecessarily upon two-thirds to four-fifths of their traffic in order to compete more successfully for the remaining minor portion of their possible tonnage. It will be more profitable for the transcontinental rail lines to lose the major portion of their traffic from the Atlantic seaboard section in order to maintain paying rates on the westbound traffic from the middle section of the United States.

In the third place, it is probable that the eastern trunk lines as well as the Pacific lines originating at Chicago and central western points will be opposed to the policy of reducing coast-to-coast all-rail rates to the lowest possible minimum in order to meet the competition of the water lines. It will be to the advantage of the eastern trunk lines to haul traffic from points within 500 miles of the Atlantic to the seaboard for shipment by water rather than to prorate with their western connections low, through all-rail rates from the Atlantic to the Pacific.

2. The transcontinental railroads may be expected to endeavor to hold as much as possible of the traffic from the eastern seaboard States to intermediate points in the Rocky Mountain States. The steamship lines

through the canal, with the cooperation of the Pacific coast jobbers, will endeavor to supply the cities within a thousand miles of the Pacific coast with supplies handled by way of the canal and the Pacific gateways. Up to the present time, the railroads interested in transcontinental traffic have adhered to the policy of charging higher rates to intermediate points in the mountain States than to Pacific coast terminals and have thus assisted in maintaining the Pacific coast cities as the jobbing centers from which many of the supplies required by the mountain States are obtained.

After the canal is opened the railroads will be obliged to decide whether it is wiser to continue to favor the Pacific coast jobbing trade, or, by reduction of rates from the east to the intermountain cities, to cause those cities to secure their supplies directly from the east and not by way of the Pacific. While it is impossible to predict which of these two policies will be deemed wiser, it would seem a priori that the railroads will prefer to supply the intermountain States directly from the eastern sources of supply.

3. The principal eastern termini of the transcontinental railroads are St. Paul, Duluth, Chicago, St. Louis, Kansas City, and Omaha, and these railroads are concerned first of all with the effect which the Panama Canal may have upon the westbound rates from the central section of the country. The rates to the Pacific coast from Chicago and other points as far east as that city, after the opening of the Panama Canal, must meet the through rates by rail-and-water lines via Atlantic and Gulf ports. It is the expectation of the trunk lines that they will be able to divert to the Atlantic seaports transcontinental traffic originating at points as far west as Cleveland and Indianapolis. It will also probably be possible for the railroads to the Gulf to attract some westbound transcontinental traffic to Gulf ports from points as far north as St. Louis. This indicates that the transcontinental lines must reckon with the canal route in making rates from the eastern and southern parts of the Mississippi Valley to the Pacific coast.

4. At the present time the transcontinental railroads have a relatively large and a highly profitable traffic from the Central West to intermediate points in the mountain States. The rates generally being the same from the Middle West as from the Atlantic seaboard to the States in the intermountain section of the far West, the manufacturers and other producers of the Middle West have secured most of the trade of the mountain States. Formerly traffic moved from the Atlantic seaboard around to the Pacific coast and from there inland to the intermountain States. Now it moves mainly by direct rail haul from the Middle West. With the opening of the Panama Canal, an effort will doubtless be made by eastern producers to regain a greater or less portion of the trade of the intermountain States by shipping commodities at low rates through the canal to the Pacific coast for distribution thence through the intermountain States. The Pacific coast jobbers interested in this trade will be able to secure commodities either from eastern producers by way of the canal or from Middle West producers by way of the railroads. It has thus far been deemed profitable by the transcontinental lines to make through rates to the Pacific coast much lower than to intermediate points and thus favor the jobbing trade of the Pacific coast. This policy has been justified by the fact that the low through rates were, at least, slightly profitable, and that the distribution of traffic by rail from the Pacific coast through the mountains at high local rates was highly profitable. It seems probable that the Panama Canal will cause the through rates to the Pacific coast to be so low as to make it more profitable for the railroads to carry traffic from the Middle West directly to intermediate points than to haul it to the Pacific coast for subsequent distribution. This view has been expressed in the following words by the traffic manager of one of the transcontinental railroads:

> The railroads have maintained normal rates to these interior points and have resisted the natural demand for rates insuring direct movement of these commodities from eastern sources of supply, because they knew that they were carrying 85 per cent of the tonnage to Pacific coast terminals, and for that reason their revenue on eastern manufactured goods shipped from Seattle to Walla Walla, Spokane, etc., was not measured by the rate charged for that final movement of the traffic, and so far as the competition of water-borne commodities, including imported merchandise, was concerned, there was consolation in the fact that we were getting a comparatively high rate from Seattle to these interior points.
>
> But we should ask ourselves, what would have been the adjustment of rates to interior points in the absence of these compensating conditions? If the town of Walla Walla uses 10,000 kegs of nails per annum, it is the duty of the railroad traffic manager to make that business contribute as much as possible to the earnings of his railroad. Heretofore we have not worried when we saw these nails coming in from Portland or Seattle, for the reasons above stated, but when we stop carrying the original shipments to Seattle, and when the business from Portland begins to seek the open river route, then we will realize that we must make rates from the east which will insure the direct movement of these commodities to these interior points.
>
> As to the ability of the railroads to do this, I don't see how there can be any question so far as the territory east of the Cascade Mountains is concerned; they may be driven out of the Pacific coast business, but they will stay in the business east of the Cascade Mountains, because they must stay in it so long as it represents any rate over and above the actual cost of the service when considered as additional traffic within the capacity of the railroad, and that is just exactly what it will be.

5. The probable effect of the canal upon eastbound transcontinental rail rates may be briefly considered, because much of the preceding analysis of the relation of the canal to westbound rates is applicable to eastbound charges. The tonnage carried by rail from the Pacific coast through to the Atlantic section east of Pittsburgh and Buffalo is relatively light and consists, in large part, of perishable freight, of which green fruits constitute an important item. It is possible that the steamship lines through the canal will handle some of the green fruits from the west coast to the eastern markets, but in all probability the present methods of shipping and marketing fruit will prevail, and the traffic, in spite of somewhat higher rates, will continue to move mainly by rail. The principal markets for all the products of the west coast are in the Rocky Mountain section and the Mississippi Valley, and the transcontinental railroads will be concerned chiefly in maintaining eastbound rates from the west coast to those sections and will hardly decide to reduce rates on traffic destined to points throughout the eastern half of the United States in order to hold against the steamship lines a portion of the comparatively small tonnage which the railroads haul through from the Pacific to the Atlantic seaboard section.

6. The rates on fruits, barley, fish, lumber, and other west coast products to the Mountain States and to the Mississippi Valley are of prime importance to the transcontinental railroads. The traffic taken from the west coast by rail to the southern and eastern portions of the Mississippi Valley must be secured in competition with the combined water and rail routes by way of Panama and the Gulf or Atlantic ports, but for the major share of the eastbound traffic from the Pacific coast over the mountains the railroads will not be seriously affected by canal competition.

7. The traffic from the mines and ranches of the intermountain States eastbound to the Atlantic coast section comprises a comparatively small tonnage. The rail rates on wool and some other products will, after the opening of the canal, necessarily be influenced by the through rate by rail to the Pacific coast and on by steamship lines through the canal. It is not probable, however, that much traffic will move from points east of the Sierra Nevadas to the Pacific coast for transshipment eastbound through the canal.

8. The principal markets for the productions of the Rocky Mountain States are in the Mississippi Valley. It will not be possible for the canal to divert from the railroads the traffic from the western Mountain States to destinations west of Buffalo and Pittsburgh, nor will the canal have much effect upon the rates which the railroads may charge for this traffic.

9. The general effect of the canal will be to lower transcontinental railroad rates. If the foregoing analysis proves to be sound, it will be the policy of the railroads to allow a portion of the traffic that might be held to the rails to be shipped coastwise through the canal and to maintain rates upon the traffic which can readily be prevented from taking the canal route. It is probable that the railroads will adopt the general policy of surrendering without serious struggle the minor portion of their traffic in order to maintain profitable charges upon the major share of their tonnage. The immediate effect of the canal will be to lessen railroad profits; the ultimate effect may be the enhancement of the prosperity of the railroads. The canal will aid the industries and trade of the United States. Like other transportation facilities, it will create the need of other means of transportation; and, should the transcontinental railroads be obliged to face reduced profits for a period of years, they need have no serious apprehension as to their future prosperity. The railroads connecting the Mississippi Valley and the Pacific coast are among the most profitable lines in the United States. The country they serve is certain to have a large development during the next quarter century, a development that will unquestionably be appreciably aided by the Panama Canal.

VI. Summary of the Probable Effects of the Panama Canal upon Transcontinental Traffic and Rates.

The probable influence of the Panama Canal upon the trade of the eastern and of the central sections of the United States with the western part of the country, and the anticipated effects of the canal upon the carriers interested in that trade may be broadly summarized as follows:

1. The Atlantic section of the United States will obtain a somewhat larger share of the trade of the Pacific coast, and will secure more benefit from the cheap water route than will the Middle West.

2. The inroads upon the trade now possessed by the middle section of the country will, however, probably not be serious; because (a) the Middle West now has a firmly established hold upon the west coast trade; (b) the Middle West producers, aided by their rail carriers to the Pacific coast, will probably be able to compete successfully with eastern producers not located in or near the Atlantic ports. The Middle West will lose a

part but not all of the trade of the Pacific coast seaboard cities, but may be expected to hold nearly all of the trade of the cities in the intermountain States; (c) the trunk lines to the Atlantic seaboard will doubtless aid producers just west of the Alleghenies by making low through rates from places as far west as Cleveland and Indianapolis to the Pacific via the Atlantic ports and the canal. The rail lines to the Gulf likewise will draw trade from Memphis and St. Louis and possibly Kansas City to the Gulf for shipment through the canal to the Pacific coast; (d) the transcontinental rail lines running west from St. Paul, Chicago, St. Louis, and the cities on the Missouri River may be expected to assist in building up the direct trade from the Mississippi and Missouri Valleys to the cities in the intermountain States, and thus to limit the entry of goods from the eastern part of the United States via the Pacific coast into the inland markets of the intermountain States.

The intermountain States will probably secure lower freight rates for their trade with the eastern section of the country and with the Middle West. Instead of cutting deeply into the rates between the eastern part of the United States and the Pacific coast terminals, and thereby, under the ruling of the Interstate Commerce Commission in the Spokane and Reno cases, automatically depressing all rates to intermediate points, the railroads will more probably decide to maintain fairly remunerative through rates to the west coast, to suffer the major share of the coast-to-coast traffic to be supplied by eastern producers and to be carried through the canal, and to make only such reductions in the rates to and from the intermountain territory as may be required to cause that section to continue to trade mainly with the Middle West. The policy of the railroads will probably be to make it advantageous for the intermountain cities to trade less through Pacific coast jobbers and more, without the intervention of middlemen, directly with the central and eastern sections of the country.

3. The canal will assist the Pacific Coast States in trading with the eastern and southern parts of the United States. Much trade not now possible will develop. The importance of the west coast cities as jobbing centers may be lessened by the growth of direct trade between the intermountain States and the sections east of the mountains, but this loss will be more than compensated for by the growth of new trade.

4. The effects of the canal upon American trade and upon rail rates will not be much affected by the exemption of coastwise ships from the payment of Panama tolls. If the nonpayment of tolls were to reduce freight rates by the amount of tolls, the freight rates—which will be from \$6 to \$20 a ton—might possibly be 60 cents a ton lower. That would be of some assistance to the Pacific coast jobbers and large shippers, and would somewhat increase the advantage which the canal will give the East over the Middle West in trading with the west coast.

It is not probable, however, that the exemption of the payment of tolls will appreciably affect the rates charged by the regular steamship lines. The nonpayment or remission of tolls will chiefly aid the owners of the coastwise marine and not the shippers. Most traffic will be handled by the regular lines which will charge common rates fixed in conference, and competition, while not eliminated, will be so regulated as to enable the carriers to keep charges well above the lowest rates at which traffic can profitably be carried. Whether there be tolls or no tolls, the line steamship rates will not be based on cost of service, but will be such as the traffic will bear and increase. Canal tolls, being a part of the cost of service, will not make line steamship rates higher, nor will the omission of tolls cause the freight rates to be lower. This is not true of the rates payable on bulk cargoes of traffic handled in individual vessels operated under charters. Charter rates are competitive, and the few large shippers who can use a chartered vessel will be benefited by being relieved of the payment of canal tolls. As is explained in Chapter XII, it is probable that the payment of tolls by ships engaged in our coast-to-coast trade would affect neither the rates of the regular steamship lines nor the charges of the transcontinental railroads.

CHAPTER V.

THE SUEZ CANAL: ITS DIMENSIONS, AND ITS FINANCIAL AND TRAFFIC HISTORY.

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THE SUEZ CANAL: ITS DIMENSIONS, AND ITS FINANCIAL AND TRAFFIC HISTORY.

In planning for the operation of the Panama Canal and in fixing tolls for its use, the Suez Canal may well be studied as regards past and present dimensions, its traffic, tolls, operating and maintenance expenses, and methods of operation. The Suez Canal has now been operated for about 43 years, and the history of its management ought to be of assistance in the administration of the Panama Canal.

I. Past and Present Dimensions of the Suez Canal.

The Suez Canal was opened for the passage of vessels, November 17, 1869. Its length was 161 kilometers (87 nautical miles), its depth 8 meters (26 feet 3 inches) and its bottom width 22 meters (72 feet 2 inches). The maximum vessel draft authorized was 7.50 meters (24 feet 7 inches). These dimensions were sufficiently large for the time; indeed, the actual draft of the vessels using the canal did not reach the authorized maximum until 1880. The location and main features of the Suez Canal are shown on Plate 4 at the end of this volume.

Two decades passed before the general dimensions of the canal were materially changed, although numerous improvements had meanwhile been carried out. Between 1870 and 1882, various curved sections were straightened; and the "stations" or basins in the canal at which vessels may pass each other were enlarged and their number increased to 13. This work of straightening curves has continued, and the canal has now been so widened through a large part of its length as to render unnecessary many of the former passing "stations."

The policy of increasing the general dimensions of the canal was inaugurated in 1887. Its depth had been increased, by 1890, to 9 meters (29 feet 6 inches) and the authorized vessel draft had become 7.80 meters (25 feet 7 inches). By 1902 the canal depth was increased to 9.50 meters (31 feet 2 inches), and on January 1 of the next year the authorized vessel draft was made 8 meters (26 feet 3 inches). An extensive program calling for a gradual deepening to 10 meters and then to 10.50 was adopted in 1901; then, in 1906, when it was found that the canal depth actually available everywhere exceeded 9 meters, the authorized vessel draft was increased to 8.23 meters (27 feet). By 1908, a depth of 10 meters (32 feet 9 inches) was attained and a maximum vessel draft of 8.53 meters (28 feet) was authorized. In 1909, before the program of 1901 had been fully carried out, new plans were adopted calling for a depth of 11 meters (36 feet 1 inch), and the company expects to attain that depth in 1915. At present the minimum depth is 10 meters.

The original bottom width of 22 meters (72 feet) remained unchanged, except at certain places, until the policy of enlarging the canal was adopted in 1887. By 1898, a bottom width of 30 meters (98 feet 5 inches) was attained; under the program adopted in 1909 the width is being increased to 41 meters (134 feet 6 inches) at the bottom and to 45 meters (147 feet 7 inches) at a depth of 10 meters. At certain points the width will be greater. The successive cross-section dimensions of the canal from 1884 to the present are shown on Plate 5 in the pocket at the end of this volume.

The increase in the depth and width of the canal has been accompanied, as is shown in Table I, by a gradual increase in the draft, beam, and length of the vessels using the waterway. Since 1880, the maximum draft of some of the vessels passing through the canal has been equal to the maximum draft authorized by the canal company, although the majority of the vessels have had less than the authorized draft. In 1910, 94 per cent of the vessels had a draft of less than 8 meters (26 feet 3 inches), 4 per cent of 8.01 to 8.23 meters (27 feet), 1 per cent of 8.24 to 8.38 meters (27 feet 6 inches), and but 53 vessels, or 1 per cent had a draft of 8.39 to 8.53 meters (28 feet). When the depth of 11 meters shall have been established, vessels drawing 31 or 32 feet of water can navigate the canal.

The growth in the size of the vessels using the canal has kept pace with the increase in the dimensions of the waterway. The average net tonnage of the vessels passing through the canal advanced from 898 tons in 1870 to 3,688 tons in 1911.

TABLE I.—MINIMUM DIMENSIONS OF SUEZ CANAL, AND MAXIMUM DIMENSIONS OF VESSELS.

Years.	Depth of canal.	Bottom width of canal.	Maximum draft of vessels.	Maximum width of vessels.	Maximum length of vessels.	Maximum authorized draft of vessels.	Average time of transit.
	Meters.	Meters.	Meters.	Meters.	Meters.	Meters.	H. m.
1869	8	22	6.76	13.50	117	7.50	....
1870	8	22	6.76	13.50	117	7.50	48 58
1871	8	22	7.21	14.93	120	7.50	40 58
1872	8	22	7.19	14.93	120	7.50	42 34
1873	8	22	7.39	14.93	124.90	7.50	42 52
1874	8	22	7.39	14.93	124.90	7.50	41 15
1875	8	22	7.39	14.93	128.01	7.50	40 00
1876	8	22	7.49	14.93	126.15	7.50	38 41
1877	8	22	7.49	16.76	126.15	7.50	39 14
1878	8	22	7.49	15.32	126.15	7.50	37 01
1879	8	22	7.49	15.32	126.15	7.50	36 36
1880	8	22	7.50	15.40	135.78	7.50	38 46
1881	8	22	7.50	15.40	135.78	7.50	45 53
1882	8	22	7.50	15.40	138.99	7.50	53 46
1883	8	22	7.50	15.40	135.78	7.50	48 36
1884	8	22	7.50	15.40	138.91	7.50	41 53
1885	8	22	7.50	20.11	138.91	7.50	43 00
1886	8	22	7.50	20.11	140.20	7.50	36 11
1887	8	(1)	7.50	15.91	141.93	7.50	34 03
1888	8		7.50	20.11	142.79	7.50	30 45
1889	8		7.50	20.11	142.79	7.50	26 44
1890	9		7.80	17.45	147.53	7.80	24 06
1891	9		7.80	18.59	147.53	7.80	23 31
1892	9		7.80	16.28	147.53	7.80	21 16
1893	9		7.80	16.28	147.53	7.80	20 44
1894	9		7.80	21.34	148.13	7.80	19 55
1895	9		7.80	20.42	148.13	7.80	19 18
1896	9		7.80	20.42	159.41	7.80	18 38
1897	9		7.80	22.45	160.45	7.80	17 44
1898	9	30	7.80	22.86	160.45	7.80	18 02
1899	9	30	7.80	20.73	160.45	7.80	18 38
1900	9	30	7.80	22.99	170.86	7.80	18 32
1901	9.50	30	7.82	23.32	170.86	7.80	18 41
1902	(2)	30	8.00	23.77	170.86	8.00	18 02
1903		30	8.00	23.16	170.86	8.00	17 48
1904		30	8.00	21.84	170.86	8.00	18 18
1905		30	8.15	22.86	170.86	8.00	18 35
1906		30	8.23	23.85	170.86	8.23	18 06
1907		30	8.23	22.86	170.86	8.23	17 58
1908	10	30	8.53	22.00	170.86	8.53	17 24
1909	(3)	(4)	8.53	23.47	179.50	8.53	17 13
1910			8.53	22.86	179.50	8.53	16 54
1911			8.53	22.99	179.50	8.53	17 01

[1] Program of widening canal gradually carried out.
[2] Gradual deepening to 10 meters with program calling for 10.50 meters.
[3] 11-meter project adopted 1909.
[4] Widening of canal at certain places with program calling for minimum width of 41 meters at bottom and 45 meters at a depth of 10 meters.

The growth in canal dimensions, together with the increase in the number and size of passing stations or "lay-bys," the straightening of curves, and the improvement in facilities have also had a marked effect upon the average time required to pass through the canal, which declined from 48 hours and 58 minutes in 1870 to 17 hours, 1 minute in 1911. The average transit time of vessels equipped with electric searchlights was 16 hours and 42 minutes in 1910; and for the comparatively few ships not so equipped, and consequently not permitted to pass through at night, the average duration of the passage was 26 hours and 20 minutes.

For 25 years the Suez Canal Co. has been almost constantly enlarging and improving the waterway. The project now being carried, which will give the canal a depth of 36 feet, a minimum bottom width of 137 feet, and a much greater breadth through a large part of the waterway, is well advanced. Plate 4 at the end of this volume shows in detail what will be the dimensions of the canal when the enlargements have been completed. The extensive improvements are being paid for mainly from current revenues, the progressive policy of the company having been made possible by the large revenues resulting from the rapid increase in traffic.

II. Finances of Construction.

The Suez Canal was constructed and has been enlarged and managed by a private corporation, which, as the following figures will show in detail, has invested, from the beginning of construction up to the present time, about $127,000,000, of which about two-thirds have been secured from the sale of securities and about one-third has been taken from earnings. The original capital of the Suez Canal Co., issued in 1859, was 400,000 shares of 500 francs each. These shares partake of the nature of both bonds and stock, for they are entitled to interest at 5 per cent, until redeemed, as well as to participation in the company's profits. Provision is made for their redemption, but when redeemed they continue to share in the profits, and merely lose the interest-bearing feature. December 31, 1911, 378,231 of these shares were in circulation.

In 1875, the British Government, through Lord Beaconsfield, purchased the 176,602 shares held by the Khedive of Egypt, paying £4,000,000 for them. The British Government does not own a majority of the shares, and the Suez Canal is controlled and operated by a French company. The annual dividends and interest paid on the shares have increased from 23.5 francs per share of 500 francs, during the first five years, to 165 francs per share paid in 1911, or from 4.7 per cent to 33 per cent. The shares are closely held, and trading in them is light, but sales are occasionally made on the Paris Bourse. The stock sells at a premium of over 1,000 per cent.

The original shares were sold at par and yielded the company 200,000,000 francs. This did not provide the company with all the funds required, and to secure more capital 333,333 5 per cent notes were sold in 1867–68. Of these notes 99,994 are still outstanding.

There were 100,000 shares given to the "founders." These shares are not stock, but are rather certificates of obligation requiring the company to pay 10 per cent of its profits to the promoters and founders of the original company and their heirs and assigns.

Table II.—SECURITIES OF THE SUEZ MARITIME CANAL CO., ISSUED AND OUTSTANDING, TO DEC. 31, 1911.

Date of issue.	Nature and number of securities issued.	Price at which issued.	Par value.	Amount realized from issue.	Number in circulation in 1911.
		Francs.	*Francs.*	*Francs.*	
1859	400,000 shares	500.00	500	200,000,000.00	378,231
1867–68	333,333 notes, 5 per cent	300.00	500	99,999,900.00	99,994
1871	120,000 thirty-year bonds	100.00	125	12,000,000.00	Redeemed.
1874	400,000 debenture bonds, 5 per cent	85.00	85	34,000,000.00	372,531
1880	73,026 notes, 3 per cent, first series	369.73	500	26,999,961.85	62,944
1887	238,964 notes, 3 per cent, second series	418.47	500	99,999,537.31	232,592
1909	13,276 notes, 3 per cent, third series [1]	472.98	500	6,278,966.00	12,543

[1] Obtained from a part of a loan of 50,000,000 francs, authorized by the general meeting of stockholders in 1901 and 1906.

The general meeting in 1911 authorized the administrative council to increase the amount of this loan from 50,000,000 to 150,000,000 francs, but this privilege has not yet been made use of.

As is shown in Table II, the company has at various times issued notes and bonds. Up to December 31, 1911, the company realized 279,278,365.16 francs from the issue of these notes and bonds. In order to carry out the canal improvement plan adopted in 1909, the stockholders, in 1911, authorized the administrative counci of the company to increase its third series 3 per cent notes from 50,000,000 to 150,000,000 francs, but the notes had not been issued up to the end of 1911.

The aggregate funds realized from the sale of securities—stock, notes, and bonds—up to December 31, 1911, was 479,278,365.16 francs. There is included in this sum secured from the sale of securities the 34,000,000 francs of borrowed funds that were used in 1874 to pay the interest which the company was unable to pay from earnings during the first five years of canal operation. The total net cost of the canal up to December 31, 1911, as shown in the company's balance sheet (Table III), was 662,033,560.33 francs. Of the total invested funds 445,278,365 francs (479,278,365 francs − 34,000,000 francs) were secured from the sale of securities, and 216,755,195 francs were taken from earnings. The total assets of the company are given as 842,919,971.54 francs (Table III).

The earnings and profits of the company are large. The portion of the net profits severally received by the stockholders, the Egyptian Government, the "founders," the administrative officers, and the employees are stated at the bottom of Table III.

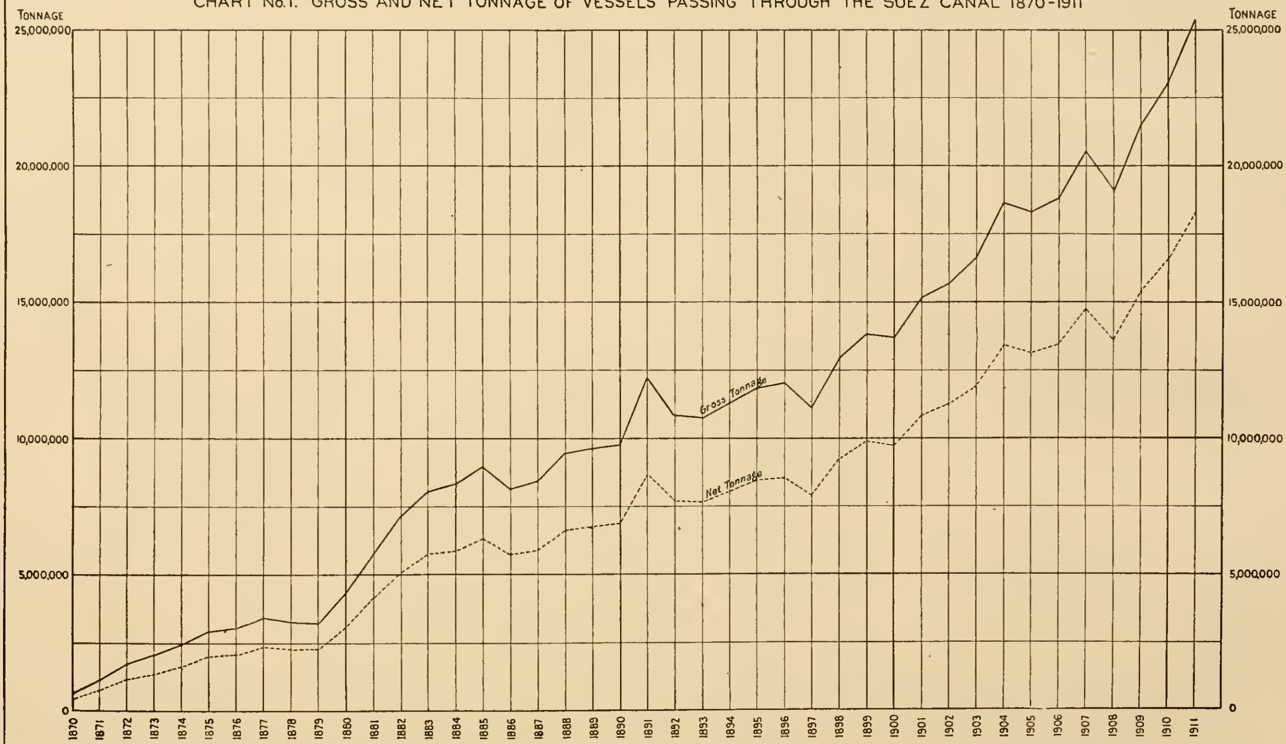
Table III.—ASSETS AND LIABILITIES OF SUEZ MARITIME CANAL CO., DEC. 31, 1911.

Assets.			
Amounts representing net cost of the Suez Maritime Canal to Dec. 31, 1911:			*Francs.*
Total investment according to annual statement, Dec. 31, 1910			656,178,271.26
Investments in enlargement and improvements of the canal during 1911			5,855,289.07
			662,033,560.33
Fluctuating and fixed assets:			
Headquarters—			
Office building of company at Paris	*Francs.* 1,174,921.74		
Furniture	Inventory.	*Francs.*	
		1,174,921.74	
Lands—			
Lands, value	Inventory.		
Chattels	Inventory.		
Buildings	13,487,395.29		
Supplies and implements	106,518.19		
		13,593,913.48	
Transit and navigation—			
Chattels, etc	Inventory.		
Materials and tools in use	2,415,962.77		
		2,415,962.77	
Repairs, materials, and warehouses—			
Chattels	Inventory.		
Materials and tools in use	43,241,418.54		
Miscellaneous supplies	4,141,230.02		
		47,382,648.56	
Waterworks at Port Said, Ismailia, and Suez—			
Miscellaneous	Inventory.		
Conduits, reservoirs, and apparatus (supplies)	5,450,663.83		
		5,450,663.83	
Buildings under construction	570,243.66		
Work under way	2;578,856.33		
		3,149,099.99	
			73,167,210.37
			735,200,770.70
Cash and available resources:			
Cash, bank balances, and credits		21,763,207.76	
Amounts brought forward		5,453,628.35	
Bills, acceptances, and long-term investments		65,015,306.81	
Main agency in Egypt		2,057,932.22	
Various amounts due		13,120,848.05	
Checks		308,277.65	
			107,719,200.84
			842,919,971.54

Liabilities.		
Capital stock, 400,000 shares, at 500 francs of which—	*Francs.*	*Francs.*
378,231 are in circulation	189,115,500.00	
21,769 are redeemed	10,884,500.00	
		200,000,000.00
Consolidation of arrears of interest, 400,000 debenture bonds, at 85 francs:		
372,531 are in circulation	31,665,135.00	
27,469 are redeemed	2,334,865.00	
		34,000,000.00
Loan of 1867, 68,333,333 bonds issued, at 300 francs:		
99,994 are in circulation	29,998,200.00	
233,339 are redeemed	70,001,700.00	
		99,999,900.00
Loan of 1871, 120,000 30-year debenture bonds, at 100 francs, redeemed		12,000,000.00
Loan of 1880, 73,026 3 per cent bonds, first series, issued at various amounts:		
62,944 are in circulation	23,272,335.86	
10,082 are redeemed	3,727,625.99	
		26,999,961.85
Loan of 1887, 238,964 3 per cent bonds, second series, issued at various amounts:		
232,592 are in circulation	97,333,039.21	
6,372 are redeemed	2,666,498.10	
		99,999,537.31
Loan of 1909, 13,098 3 per cent bonds, third series, issued at various amounts:		
12,543 are in circulation	5,932,289.13	
733 are redeemed	346,676.87	
		6,278,966.00
		479,278,365.16
Sinking fund	62,223,935.63	
Insurance and contingent fund	1,500,000.00	
		63,723,935.63
Applied to construction or improvement of canal		151,174,307.30
		694,176,608.09
Statutory reserve		37,752,887.12
Extraordinary reserve		8,000,000.00
Sundry credits:		
Interest, divideuds, and redemptions—		
Matured before Dec. 31, 1911	2,353,158.14	
Matured on Jan. 1, 1912	29,320,298.78	
	31,673,456.92	
Societe Civile for the payment of 15 per cent, Egyptian Government	4,436,619.72	
Bills of exchange payable	48,594.39	
Checks payable	2,618,289.84	
Sundry credits and accounts	6,375,905.65	
		45,152,866.52
Profit and loss:		
Net profit of operations, 1911	87,075,492.95	
Dividends already paid for year	29,577,464.78	
		[1] 57,498,028.17
Carried over to 1911		339,581.64
		842,919,971.54

[1] Balance to be paid.

CHART No. I. GROSS AND NET TONNAGE OF VESSELS PASSING THROUGH THE SUEZ CANAL 1870-1911



STATUTORY DIVISION OF PROFITS.

	Francs.
71 per cent to stockholders	61,823,600.00
15 per cent to the Egyptian Government	13,061,323.94
10 per cent to the founders of the company	8,707,549.29
2 per cent to the administrative officers	1,741,509.86
2 per cent to the employees	1,741,509.86
Total	87,075,492.95

III. Traffic History of the Suez Canal.

The traffic of the Suez Canal during the first two years was relatively small, for the reason that the Suez route is not a practicable one for sailing vessels. At the time of the opening of the canal most of the freight between Europe and the countries on and beyond the Indian Ocean was carried in sailing vessels. Steamers had to be built for the Suez route, and, being much less efficient than freight steamers are to-day, they but gradually took the traffic with the Far East and Australasia from the sailing vessels and the Cape of Good Hope route.

The increase in the traffic of the Suez Canal, however, was relatively large during the first decade, the net tonnage of the vessels that passed through the canal amounting to 2,000,000 in 1875 and to 3,000,000 in 1880. (Table IV and Chart I.) During the following 10 years the traffic rose to 6,800,000 net tons, the gain for the decade being 126 per cent. This was a decade of rapid expansion of the commerce of Great Britain and other European countries with India, the Orient, and Oceania; and the Suez Canal secured, in competition with the Cape route, a steadily increasing share of that commerce.

Table IV.—TRAFFIC OF THE SUEZ CANAL, 1870–1911.

Years.	Gross tonnage.	Net tonnage.	Number of vessels.	Mean net tonnage per vessel.	Mean gross tonnage per vessel.	Total passengers.
1870	654,915	436,609	486	898	1,348	26,758
1871	1,142,230	761,467	765	995	1,493	48,422
1875	2,940,708	2,009,984	1,494	1,345	1,969	84,446
1880	4,344,519	3,057,421	2,026	1,509	2,144	101,551
1885	8,985,411	6,335,752	3,624	1,748	2,479	205,951
1890	9,749,129	6,890,094	3,389	2,033	2,877	161,352
1895	11,833,637	8,448,383	3,434	2,460	3,446	216,938
1900	13,699,237	9,738,152	3,441	2,830	3,981	282,511
1905	18,310,442	13,134,105	4,116	3,191	4,449	252,691
1906	18,810,713	13,445,504	3,975	3,383	4,732	353,881
1907	20,551,982	14,728,434	4,267	3,452	4,816	243,826
1908	19,110,831	13,633,283	3,795	3,592	5,035	218,967
1909	21,500,847	15,407,527	4,239	3,635	5,072	213,122
1910	23,054,901	16,581,898	4,533	3,658	5,086	234,320
1911	25,417,853	18,324,794	4,969	3,685	5,115	275,651

The third decade of the operation of the Suez Canal, 1890–1900, was one of only moderate traffic development. Serious business depressions in different parts of the world during this decade checked the rate of commercial expansion. From 1890 to 1900 the Suez traffic, net vessel tonnage, rose from 6,800,000 to 9,738,000 tons, the absolute increase being less than 3,000,000 tons and the rate of increase 43.2 per cent—only a third of the rate that had prevailed from 1880 to 1890.

Since 1900, the traffic of the Suez Canal has risen rapidly. The net tonnage in 1910 was 16,581,000, 70.2 per cent above the figures for 1900. In 1911, the net tonnage advanced to 18,324,794 tons, or to 69.3 per cent above the figure for 1901. Europe and the eastern part of the United States are building up a large commerce with the countries east of the Suez Canal. The countries of the Indies, Oceania, and the Orient are entering upon the development of their resources and industries with the increasing assistance of western capital; and the consequent expansion of the commerce of those countries is indicated by the rapid growth of the traffic of the Suez Canal.

The frequent enlargements in the dimensions of the canal have permitted the use of larger ships and have favored the growth of traffic. The draft allowed vessels in the canal was increased in 1890 from 24 feet 7 inches to 25 feet 7 inches, in 1902 to 26 feet 3 inches, in 1906 to 27 feet, and in 1908 to 28 feet. By 1915, when the present improvements shall have been completed, vessels drawing between 31 and 32 feet will be permitted to use the canal. The average size of the vessels that passed through the Suez Canal in 1911 was more than four times the average in 1870 and more than double the average in 1885, the mean tonnage per vessel being 898 net tons in 1870, 1,509 tons in 1880, 2,033 tons in 1890, 2,830 tons in 1900, 3,658 tons in 1910, and 3,685 tons in 1911. The number as well as the size of the vessels has increased rapidly each decade, with the exception of the 10 years from 1890 to 1900 when the growth in the world's commerce was at a slackened pace. In 1911, nearly 5,000 vessels—4,969—made use of the canal, an average of nearly 14 per day for each of the 365 days of the year.

The number of passengers through the Suez Canal varies from year to year. The total for 1911—275,651—was somewhat less than the figures for 1900. The maximum for any one year was reached in 1906, when, at the time of the war with Japan, Russia took a large number of naval vessels and troops through the canal. The figures as to passenger traffic are given in Table IV.

Table V shows how the present traffic of the Suez Canal was distributed, in 1909, 1910, and 1911, among the various destinations east of the canal, while Table VI distributes this traffic among the leading regions east of the canal for a period of 16 years. Table VII, compiled from various sources, subdivides the Suez traffic among North-Atlantic countries; it covers a period of 16 years and shows the rate of increase in the traffic to and from the countries named.

TABLE V.—SUEZ CANAL TRAFFIC DISTRIBUTED BY REGIONS BEYOND THE SUEZ, IN NET TONS.

	1911	1910	1909
Red Sea	528,000	368,000	361,000
East Africa	710,000	510,000	454,000
Persian Gulf	324,000	223,000	191,000
West India	3,723,000	3,359,000	3,114,000
East India, Ceylon, and Burma	4,639,000	4,300,000	4,214,000
Dutch Indies	1,657,000	1,287,000	1,121,000
Straits, Siam, and Philippines	674,000	700,000	534,000
China, Cochin China	1,467,000	1,385,000	1,254,000
Japan	2,584,000	2,592,000	2,464,000
Australia	1,904,000	1,704,000	1,545,000
American Pacific coast	106,000	154,000	155,000
Total	18,325,000	16,582,000	15,407,000

TABLE VI.—GROWTH OF SUEZ CANAL TRAFFIC TO AND FROM REGIONS BEYOND THE SUEZ (1895–1911).[1]

Years.	East Africa.	Bombay and West India.	Calcutta and East India.	Straits, Siam, Philippines, and Dutch East India.	China, Cochin China, and Japan.	Australia.	Other regions.	Total.
1895	357,000	2,015,000	2,417,000	1,003,000	1,400,000	840,000	416,000	8,448,000
1896	269,000	1,649,000	2,411,000	1,085,000	1,578,000	871,000	697,000	8,560,000
1900	404,000	1,128,000	2,763,000	1,372,000	2,756,000	864,000	451,000	9,738,000
1905	482,000	2,623,000	3,722,000	1,671,000	2,943,000	995,000	698,000	13,134,000
1910	510,000	3,359,000	4,300,000	1,987,000	3,977,000	1,704,000	745,000	16,582,000
1911	710,000	3,723,000	4,639,000	2,331,000	4,060,000	1,940,000	958,000	18,325,000
Increase 1896–1911 (per cent)	163.9	125.7	92.4	114.8	157.2	118.5	37.4	114.7

[1] See Annual Report of Suez Canal Co., June 3, 1912, p. 17.

TABLE VII.—GROWTH OF SUEZ CANAL TRAFFIC (NET TONNAGE) TO AND FROM EUROPE, EASTERN UNITED STATES, AND OTHER COUNTRIES WEST OF SUEZ, 1895–1911.[1]

Years.	Great Britain.	Germany.	France.	Belgium, Holland, Denmark, Sweden, and Norway.	Greece, Turkey, and Egypt.	Italy and Austria-Hungary.	United States.	Other regions.	Total.
1895	4,614,000	713,000	1,116,000	618,000	399,000	358,000	123,000	507,000	8,448,000
1896	4,119,000	818,000	988,000	626,000	533,000	640,000	194,000	642,000	8,560,000
1900	4,224,000	1,298,000	1,198,000	771,000	362,000	530,000	661,000	694,000	9,738,000
1905	5,865,000	1,571,000	1,573,000	1,196,000	1,014,000	805,000	741,000	369,000	13,134,000
1907	6,626,000	1,807,000	1,679,000	1,430,000	1,004,000	944,000	934,000	304,000	14,728,000
1910	8,202,000	2,370,000	1,611,000	1,783,000	399,000	980,000	843,000	394,000	16,582,000
1911	8,808,000	2,643,000	1,550,000	2,066,000	581,000	940,000	1,295,000	442,000	18,325,000
Increase 1896–1911 (per cent)	113.7	223.0	56.8	230.0	9.0	46.8	567.5	(2)	114.7

1 Compagnie Universelle du Canal Maritime de Suez, Le Canal Maritime de Suez, Tableau 7; British Documents "Commercial No. 3 (1911), The Suez Canal," p. 4; and Statement of Suez Canal Co., Mar. 29, 1912.
2 Decrease.

During the period 1895 to 1911, the countries beyond Suez whose commerce through the canal increased most rapidly were East Africa, China, Japan, and Australia. India and southern Asia, however, make largest use of the canal, less than 40 per cent of the total Suez traffic being contributed by the commerce of the countries east and north of Singapore. The Panama Canal can not invade the main traffic field of the Suez route—the countries of southern Asia, East Africa, the Red Sea, and the Persian Gulf. Their commerce will continue to move via the Suez whatever the tolls of the Panama Canal may be. The competitive region of the two canals lies east of Singapore, and the major share of the commerce of that region with western Europe will continue to move via Suez. It was estimated in Chapter II that about 5 per cent of the trade of Europe with Japan and 10 per cent of Europe's trade with Australia would use the Panama Canal.

TABLE VIII.—NET TONNAGE OF THE SUEZ CANAL, DISTRIBUTED BY NATIONALITY OF VESSELS, 1870–1911.[1]

Flags.	1870 to 1875	1876 to 1880	1881 to 1885	1886 to 1890	1891 to 1895	1896 to 1900	1901 to 1905	1906 to 1910	1911
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
British	72.8	78.1	78.3	77.7	75.2	65.3	62.3	62.3	64.0
German	1.3	1.2	2.6	4.5	7.5	11.4	15.4	15.9	15.2
Dutch	3.3	4.7	3.9	3.7	4.0	4.6	4.5	5.0	5.3
French	10.1	7.3	8.0	6.2	6.0	6.6	6.5	5.5	4.5
Austro-Hungarian	3.9	2.3	1.8	2.0	1.9	2.6	3.5	3.4	3.4
Japanese	(2)	.1	.1	.1	(2)	1.7	1.2	2.0	2.0
Russian	.7	.4	.6	.5	.8	2.0	2.3	1.7	1.7
Italian	.9	2.6	2.2	3.1	1.7	2.1	1.5	1.4	1.1
Danish	.3	.5	.1	(2)	(2)	.3	.4	.7	.6
Swedish	.2	(2)	(2)	(2)	(2)	(2)	(2)	.4	.5
Spanish	1.3	1.7	1.4	1.0	1.0	2.5	.7	.5	.4
Norwegian	.5	.4	.5	.8	1.1	2.0	.8	.5	.3
Ottoman	1.1	.1	.1	.3	.5	.4	.6	.3	.7
Portuguese	.2	.1	(2)	(2)	.3	(2)	(2)	(2)	(2)
American	.1	(2)	(2)	(2)	(2)	.3	.2	.2	(2)
Others	1.3	.5	.4	.1	(2)	.2	.2	.1	.3

1 From Compagnie Universelle du Canal Maritime de Suez, Le Canal Maritime de Suez, Tableau VI; British Documents, Commercial No. 3, (1911), p. 7; Statement of Suez Canal Co., Mar. 29, 1912.
2 Less than 0.1 per cent.

The nationality of the vesesls engaged in commerce via the Suez Canal is shown in Table VIII. Nearly four-fifths of the shipping is under the British and German flags, the British vessels comprising 64 per cent of the total in 1911. The Dutch flag is gaining and the French flag is losing in percentage of the total shipping. The only non-European nation whose shipping makes much use of the Suez Canal is Japan. While the volume of British shipping using the canal has increased absolutely, it includes a smaller percentage of the total tonnage than it did from 1881 to 1885, when 78.3 per cent of all the shipping was British. This is due to the increase of German vessels and to the growth in the tonnage of ships flying the flags of the Netherlands, Japan, and Sweden. The tonnage of French, Austro-Hungarian, Russian, Italian, and Norwegian vessels using the Suez has increased absolutely, but, as in the case of British vessels, has declined in percentage of the total.

IV. Revenues and Expenses of the Suez Canal.

The revenues of the Suez Canal Co. are derived mainly from tolls upon vessels and passengers. The minor sources of income are the charges for berthing or anchorage of ships, for towage and pilotage, and the receipts from certain outside operations. The following "transit dues" and other charges are in force:

1. *The tolls* on vessels since January 1, 1912, have been 6.75 francs ($1.302) per ton net register for loaded vessels, with a reduction of 2.50 francs per ton for vessels in ballast. On the first of January, 1913, the rate becomes 6.25 francs ($1.206) per net ton for loaded vessels. The passenger tolls are 10 francs per passenger above 12 years of age and 5 francs for each child from 3 to 12 years old. For vessels using the canal only between one of the termini and Ismailia, the point at which the railroad from Cairo reaches the canal, the vessel and passenger tolls are one-half the regular through rates.

The passenger tolls have remained unchanged since the beginning, but the vessel tolls have been reduced from time to time since 1874, when the maximum rate of 13 francs ($2.51) per net ton was put in force. The rates charged, and the changes made in the rates, from 1869 to the present are stated in Table IX.

Table IX.—SUEZ CANAL TOLLS ON VESSELS.

Dates.	Tolls per net vessel ton.[1]	Dates.	Tolls per net vessel ton.[1]
Nov. 17, 1869	10 francs.	Jan. 1, 1884	10 francs.
July, 1872	10 francs.[2]	Jan. 1, 1885	9.50 francs.
Apr. 29, 1874	10 francs plus 3 francs surtax.	Jan. 1, 1893	9 francs.
Apr. 15, 1877	10 francs plus 2.50 francs surtax.	Jan. 1, 1903	8.50 francs.
Jan. 1, 1879	10 francs plus 2 francs surtax.	Jan. 1, 1906	7.75 francs.
Jan. 1, 1881	10 francs plus 1.50 francs surtax.	Jan. 1, 1911	7.25 francs.
Jan. 1, 1882	10 francs plus 1 franc surtax.	Jan. 1, 1912	6.75 francs.
Jan. 1, 1883	10 francs plus 0.50 franc surtax.	Jan. 1, 1913	6.25 francs.[3]

[1] Vessels in ballast pay 2.50 francs less per net ton than loaded vessels pay. [2] On gross tonnage. [3] Announced June 3, 1912, to become effective Jan. 1. 1913.

The Suez Canal Co.'s concession provided that the tolls upon vessels should not exceed 10 francs per "ton of capacity," and the statute creating the company specified that whenever the rate of dividends paid exceeds 25 per cent, the rate of tolls should be reduced. The concession stipulated that the tolls should "be collected without exception or favor from all ships under like conditions."

As is explained in the volume upon "The Measurement of Vessels,"[1] there was a serious dispute during the first five years of the operation of the canal as to the meaning of "ton of capacity." The shipping world contended that net register tonnage was meant, while the officials of the company held that either the gross register tonnage or the cargo tonnage capacity of the vessel might be made the basis of tolls. The tolls were first charged upon the net register tonnage of vessels as stated in the ship's papers. The company found this unsatisfactory, because dissimilar rules prevailed in different countries for determining net tonnage, and because the revenues of the company from the tolls upon net tonnage were insufficient. In 1872, the company began charging tolls of 10 francs per gross register ton. This was objected to by the shipping interests of the leading countries of Europe

[1] Report by Emory R. Johnson, 1912, Government Printing Office, Washington.

and the question was made the subject of diplomatic negotiations. The canal company was also proceeded against in the French courts upon complaint of the leading steamship company in France.

The Sultan of Turkey was called upon to rule upon the meaning of the term "ton of capacity," and, in the latter part of 1873, he convened the International Tonnage Commission at Constantinople to decide the question. This commission decided that the Suez tolls should be based upon net vessel tonnage, and formulated a set of rules for determining net tonnage. To enable the canal company to increase its income, the International Commission provided that the company might increase its rate of tolls of 10 francs per net ton by a "surtax" of 3 francs, the surtax to be reduced as the traffic of the canal increased.

When the canal tonnage reached 2,100,000 tons annually the surtax was to decline to 2.50 francs, when the tonnage became 2,200,000 tons the surtax was to be reduced to 2 francs, each increase of 100,000 tons per year bringing about a decrease of 50 centimes in the surcharge. When the annual tonnage became 2,600,000 tons the surtax was to be abolished. Later, in 1876, in an agreement with Great Britain, which had become a large stockholder, the company agreed that the first reduction of 50 centimes in the surtax should be made January 1, 1877, the second January 1, 1879, the third January 1, 1881, the fourth on January 1, 1882, the fifth January 1, 1883, and the sixth January 1, 1884, on which date the surtax ceased and the toll became 10 francs per net ton. The growth of traffic since 1884, especially since 1900, has been so rapid and the revenues of the company have increased so largely that the tolls have been reduced every few years, 50 centimes at a time, until, effective January 1, 1913, the rate, for loaded vessels, has become 6.25 francs ($1.206) per net ton.

2. *Berthing or anchorage dues* are collected at Port Said, Ismailia, and Suez at the rate of 2 centimes per net ton per day, not including the first 24 hours.

3. *Towage.*—When towage is compulsory a charge of 50 centimes per net ton, with a maximum of 2,500 francs, is exacted of steamers whose engines assist, or are in readiness to assist, the tug; and, for steamers whose engines are unable to assist the tug and for sailing vessels of over 400 tons gross register, the charge is 1 franc per net ton, with a maximum of 5,000 francs. When towage is at the request of the vessel's captain the charges are 1 franc per net ton with a minimum of 1,200 francs for steamers whose engines are in readiness to assist the tug, and 2 francs per net ton with a minimum of 2,000 francs for vessels not desiring to assist the tug. For towing vessels one-half of the length of the canal, one-half of the foregoing towage dues are charged. The towage charges for sailing vessels of 400 gross tons or less, and for lighters, dredges, and other floating appliances are fixed by private agreement. For towing vessels to or from the roads, upon application, the charge is 10 centimes per net ton with a minimum of 25 francs; while the charge for greater distances is fixed by private agreement. If vessels require a tug to act as a tender, the charge is 1,200 francs per day for tugs of the first class and 800 francs per day for tugs of the second class. Ships towed or conveyed by approved private tugs belonging to the owners of the ships are required to pay 50 centimes per ton as towage dues.

4. *Pilotage charges.*—For entering or clearing Port Said pilotage is collected from vessels, not going through the canal, at the rate of 25 francs for steamers and 10 francs for sailing vessels by day, and at the rate of 50 francs and 20 francs respectively for steamers and sailing vessels by night. For vessels going through the canal, there is no pilotage charge at Port Said by day; but by night a charge of 25 francs is collected from steamers and 10 francs from sailing vessels. At Suez, no pilotage dues are charged. "When the pilot is kept on board beyond the time required for pilotage proper, a charge of 20 francs per day is due."

5. *Revenue from outside operations.*—The canal company operates a waterworks plant for the filtration and distribution of water throughout the canal zone and at Port Said, Ismailia, and Suez. The company and the Egyptian Government are jointly interested in the improvement, renting, and sale of land in the canal zone, the profits of which are divided between the company and the Government. Some revenue, as is shown below in Table XI, is derived from lands held by the company as sole proprietor. The company receives an annuity paid by the Egyptian Government for the cession of the trolley line from Port Said to Ismailia, and some interest is obtained from invested funds.

Of the total gross receipts of the company in 1911 (138,038,224.74 francs), 134,763,053.95 francs were obtained from "transit and navigation dues," including steamship tolls, passenger tolls, sailing-vessel tolls, pilotage, towage, wharfage and berthing, lease of floating equipment, sundries, and lease of lands in the free zone of Port Said; while the income from all the remaining sources aggregated 3,275,170.79 francs. The receipts have reached this high level despite the frequent reduction in the rate of tolls.

TABLE X.—RECEIPTS AND DISBURSEMENTS OF THE SUEZ MARITIME CANAL CO., 1870 TO 1910.

Years.	Gross receipts.	Transit and navigation receipts.	Receipts other than transit and navigation receipts.	Administration expenses.	Operating expenses.	Maintenance expenses.	Total administration, operating and maintenance expenses.	Net earnings (gross earnings, minus administration, operating and maintenance expenses).	Public charges, including interest, amortization of securities represented by consolidated coupons.	Shares—interest, amortization, and dividends.	Net revenue per share of capital.
	Francs.	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*
1870	9,274,328.87	5,718,757.00	3,555,571.87	1,069,712.33	2,145,797.24	2,759,506.07	5,975,015.64	3,299,313.23	10,541,537.11	10,000,000.00	23.500
1871	13,276,074.50	9,250,458.00	4,025,616.50	961,653.22	2,569,926.36	1,792,986.77	5,324,566.35	7,951,508.15	10,562,154.64	10,000,000.00	23.500
1872	18,325,024.46	16,592,800.00	1,732,224.46	895,617.12	2,368,956.74	1,571,271.73	4,835,845.59	13,489,178.87	11,417,899.87	10,000,000.00	23.500
1873	24,831,126.00	23,199,992.00	1,631,134.00	918,828.66	2,368,927.71	2,064,176.14	5,351,932.51	19,479,193.49	11,729,096.11	10,000,000.00	23.500
1874	26,726,144.71	25,109,290.00	1,616,854.71	943,334.78	2,207,958.21	2,792,984.70	5,944,277.69	20,781,867.02	12,375,193.16	10,000,000.00	23.500
1875	30,844,635.91	29,123,778.00	1,720,857.91	967,955.49	2,415,075.11	2,583,071.44	5,966,102.04	24,878,533.87	13,282,306.05	10,834,313.64	24.920
1876	31,174,694.35	30,154,773.00	1,019,921.35	1,058,604.03	2,214,727.54	2,046,699.32	5,320,030.89	25,854,663.46	13,344,627.23	11,516,393.59	26.059
1877	33,975,648.15	32,952,510.00	1,023,138.15	1,135,009.99	2,328,214.21	2,033,388.06	5,496,612.26	28,479,035.89	13,355,468.33	13,275,806.98	30.292
1878	32,496,335.33	31,292,347.00	1,203,988.33	1,168,234.88	2,207,527.97	1,627,146.44	5,002,909.29	27,493,426.04	13,322,087.60	12,655,822.93	28.902
1879	30,949,148.85	29,876,367.00	1,072,781.85	1,073,595.21	2,016,846.74	1,776,919.25	4,867,361.20	26,081,787.65	13,108,234.84	12,029,490.49	28.048
1880	41,820,899.96	39,992,537.00	1,828,362.96	1,142,618.87	2,160,214.26	1,579,874.75	4,882,707.88	36,938,192.08	13,288,973.92	18,834,775.87	44.754
1881	54,676,189.26	51,737,718.00	2,938,471.26	1,140,662.73	2,167,501.48	1,720,804.48	5,028,968.69	49,647,220.57	13,301,725.71	27,601,737.93	65.769
1882	63,409,593.44	61,075,548.00	2,334,045.44	1,282,387.47	3,164,537.96	1,892,356.27	6,339,281.70	57,070,311.74	13,352,158.21	32,569,212.39	76.855
1883	68,523,344.73	66,137,645.00	2,385,699.73	1,494,031.89	3,463,676.27	1,893,646.36	6,851,354.52	61,671,990.21	13,446,143.48	35,543,839.29	83.136
1884	65,408,294.56	62,638,964.00	2,769,330.56	1,435,712.72	3,243,286.95	1,549,252.68	6,228,252.35	59,180,042.21	13,636,425.01	34,981,639.16	81.954
1885	65,049,945.21	62,474,491.00	2,575,454.21	1,405,655.06	3,625,916.32	1,713,463.48	6,745,034.86	58,304,910.35	13,809,154.52	34,241,074.59	80.642
1886	59,022,626.28	56,798,285.00	2,224,341.28	1,445,634.94	3,070,952.30	2,100,140.90	6,616,728.14	52,405,898.14	13,957,223.29	30,214,572.96	70.692
1887	60,510,328.60	58,125,375.00	2,384,953.60	1,423,056.58	3,522,250.26	1,544,268.73	6,489,575.57	54,020,753.03	13,918,818.65	31,372,331.82	73.442
1888	67,705,348.16	65,242,621.00	2,462,727.16	1,539,570.32	3,818,477.19	1,592,757.44	6,950,804.95	60,754,543.21	13,919,389.75	35,833,002.45	84.478
1889	69,765,492.40	66,592,189.00	3,173,303.40	1,728,468.11	4,300,011.74	1,988,645.05	8,017,124.90	61,748,367.50	13,961,250.11	36,501,702.93	85.894
1890	70,460,910.30	67,425,278.00	3,035,632.30	1,582,725.81	4,241,481.50	2,064,808.59	7,889,015.90	62,571,894.40	13,912,761.16	37,155,127.74	86.751

TABLE X.—RECEIPTS AND DISBURSEMENTS OF THE SUEZ MARITIME CANAL CO., 1870 TO 1910—Continued.

Years.	Gross receipts.	Transit and navigation receipts.	Receipts other than transit and navigation receipts.	Administration expenses.	Operating expenses.	Maintenance expenses.	Total administration, operating and maintenance expenses.	Net earnings (gross earnings, minus administration, operating and maintenance expenses.)	Public charges, including interest, amortization of securities represented by consolidated coupons.	Shares—interest, amortization, and dividends.	Net revenue per share of capital.
	Francs.	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*
1891	86,866,913.55	83,945,564.00	2,921,349.55	1,662,155.48	4,931,146.12	1,695,034.56	8,288,336.16	78,578,577.39	17,020,433.48	44,935,993.70	105.500
1892	77,809,780.77	74,888,561.00	2,921,219.77	1,819,925.03	4,484,779.60	1,844,707.08	8,149,411.71	69,660,369.06	17,565,401.66	39,707,790.73	92.366
1893	73,844,058.53	71,112,183.00	2,731,875.53	1,854,283.98	4,355,745.88	1,907,501.19	8,117,531.05	65,726,527.48	17,484,581.33	38,917,281.09	90.373
1894	76,951,153.91	74,127,056.00	2,824,097.91	1,529,204.90	4,211,539.64	1,817,101.10	7,557,845.64	69,393,308.27	17,706,590.18	38,741,200.00	90.000
1895	80,702,787.35	78,426,110.00	2,276,677.35	1,470,956.03	4,257,569.90	2,235,442.86	7,963,968.79	72,738,818.56	17,856,959.76	39,878,425.00	92.500
1896	82,222,855.26	79,957,518.00	2,265,337.26	1,458,342.21	4,246,196.00	2,486,880.20	8,191,418.41	74,031,436.85	17,886,801.63	40,101,500.00	92.500
1897	75,607,029.40	73,214,220.00	2,392,809.40	1,458,258.57	4,162,985.58	2,580,312.81	8,201,556.96	67,405,472.44	17,988,748.36	39,129,300.00	90.000
1898	87,906,254.99	85,329,654.00	2,576,600.99	1,640,158.49	4,217,225.09	2,331,960.11	8,189,343.69	79,716,911.30	17,931,189.99	43,179,275.00	100.000
1899	94,317,505.30	91,361,299.00	2,956,206.30	1,791,213.34	4,363,194.05	2,473,325.20	8,627,732.59	85,689,772.71	17,945,724.61	46,672,700.00	108.000
1900	93,451,403.12	90,707,007.00	2,744,396.12	1,629,042.31	4,364,264.81	3,033,234.96	9,026,542.08	84,424,861.04	18,338,711.91	46,694,225.00	108.000
1901	103,121,726.38	100,335,210.00	2,786,516.38	1,617,493.82	4,384,888.45	3,352,784.97	9,355,167.24	93,766,559.14	18,109,210.28	53,625,525.00	125.000
1902	106,849,760.29	103,697,625.00	3,152,135.29	1,722,018.79	4,187,775.09	3,753,293.91	9,663,087.79	97,186,672.50	17,105,268.54	53,743,650.00	125.000
1903	106,875,865.95	103,588,090.00	3,287,775.95	1,809,941.33	4,297,666.46	3,959,117.12	10,066,724.91	96,809,141.04	17,101,287.59	55,921,875.00	130.000
1904	119,176,398.45	115,973,621.00	3,202,777.45	1,856,478.17	4,075,708.86	3,930,081.44	9,862,268.47	109,314,129.98	17,095,540.08	60,438,250.00	141.000
1905	117,308,196.82	113,868,133.00	3,440,063.82	1,856,656.82	3,981,977.55	3,727,272.61	9,565,906.98	107,742,289.84	17,086,277.50	60,613,700.00	141.000
1906	111,989,122.98	108,103,060.00	3,886,062.98	2,037,062.09	4,237,190.55	4,693,723.57	10,967,976.21	101,021,146.77	17,080,866.76	60,758,300.00	141.000
1907	120,118,521.06	116,080,115.00	4,038,406.06	2,034,849.73	4,534,283.35	5,413,832.22	11,982,965.30	108,135,555.76	17,072,797.05	60,764,500.00	141.000
1908	111,490,959.54	108,443,099.00	3,047,860.54	2,211,973.61	4,692,815.38	6,702,730.73	13,607,519.72	97,883,439.82	17,063,922.84	60,811,325.00	141.000
1909	123,477,833.88	120,690,583.00	2,787,250.88	2,090,449.89	4,881,290.95	5,030,989.24	12,002,730.08	111,475,103.80	17,284,463.25	65,093,525.00	150.000
1910	133,704,212.09	130,406,217.00	3,297,995.99	2,275,142.89	5,160,932.82	4,863,632.65	12,299,708.36	121,404,503.73	17,383,909.45	68,603,550.00	158.000
1911	138,038,224.74	134,763,053.00	3,275,171.74	2,303,506.70	5,516,697.76	5,729,298.16	13,549,502.62	124,488,722.12	17,376,276.95	71,904,125.00	165.000

The gross earnings and transit and navigation receipts for each year from 1870 to 1911 are shown in Table X and Chart II. The fluctuations in the gross earnings correspond closely to the variations in the transit and navigation receipts, except during the first decade, when the latter increased at a more rapid rate. Throughout the period of declining tolls the gross earnings of the company, as the result of the growth of traffic, have advanced at a rapid rate. During the first decade, gross earnings increased 350 per cent, during the second decade 68.4 per cent, the third decade, 32.6 per cent, and from 1900 to 1910, 43 per cent. During the decade ending in 1911 the gross earnings rose 33.8 per cent. Throughout the history of the Suez Canal, the volume of tonnage has increased more rapidly than the tolls have been reduced.

The increase in net earnings is also shown in Table X and Chart II. The net earnings are the gross earnings minus the expenses of operation, administration, and maintenance. From the net earnings are paid the "public charges"; i. e., the capital charges, interest on securities, and the sums devoted to permanent additions and betterments. During the decade 1900 to 1910, the net earnings increased 43.7 per cent, and during the decade 1901 to 1911, 32.7 per cent.

Table X and Chart III show that the administrative, operating, and maintenance expenses of the company have increased at varying rates. The greatest recent increase has been in maintenance costs, which include a part of the sums spent for enlargement, and which have varied from a minimum of 1,544,269 francs in 1887 to 6,702,731 in 1908. During the decade 1901 to 1911 the outlay for maintenance increased 70 8 per cent, while operating expenses rose 25.8 per cent, and administrative expenses 42 4 per cent. During the same decade the operating, maintenance, and administrative expenses combined increased 44.8 per cent as compared with an advance of 33.8 per cent in gross earnings.

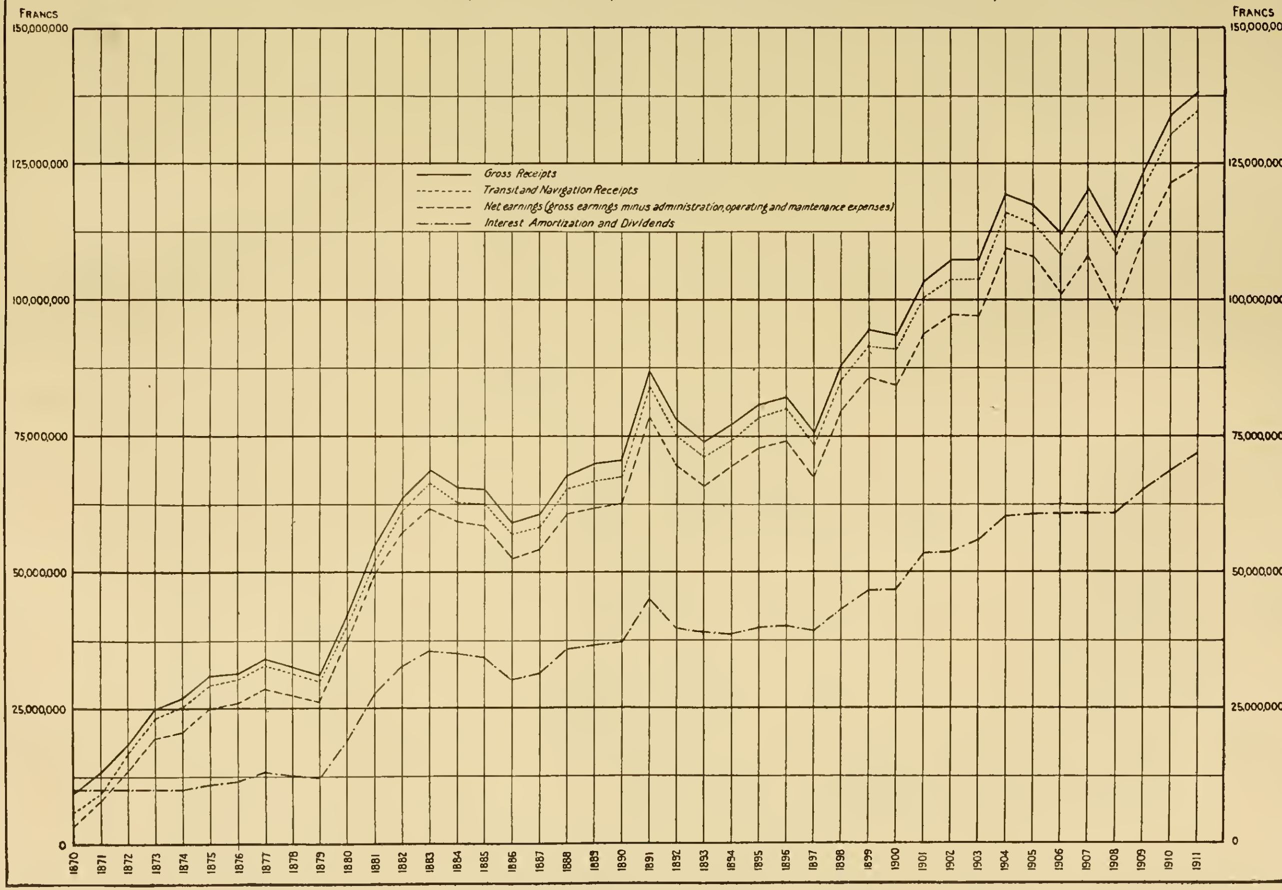
The company's operating ratio, i e., the ratio of gross earnings to the sum of operating, maintenance, and administrative expenses in 1911 was 9.8 per cent, in 1910, 9.19 per cent, and in 1900, 9 6 per cent. It has greatly declined since the earlier years of the canal's history, when the volume of its traffic was small. The operating ratio in 1875, when the work of operating the canal was fairly under way, was 19.3 per cent; in 1870, the first year of the canal's operation, it was 64 per cent.

The "public charges," or the interest upon and amortization of the company's outstanding bonds and notes, have risen from 10,541,537 francs in 1870 to 17,376,276 95 in 1911. During the decade 1901 to 1911 the sums set aside for this purpose declined 4.2 per cent, while during the previous decade they increased 1 4 per cent.

The total sum paid as dividends and for the amortization of the interest upon the company's shares in 1911 was 71,904,125 francs, an increase of 34 per cent over what it was in 1901. During the first decade of the company's operation these dividend and amortization payments increased 88.3 per cent; during the second decade, 97 per cent; the third decade 25.6 per cent, and during the years 1900–1910, 46.9 per cent. The dividends per share of 500 francs were 165 francs in 1911, or 33 per cent. The fluctuations and the large increase in the dividend paid are shown in Table X and on Chart II.

The difference between the gross earnings and the expenditures for administration, operation, maintenance, and capital charges was 35,208,320.17 francs in 1911; and from this were taken the sums devoted to surplus, insurance, permanent additions and betterments, workmen's pensions and relief, founders' profits, and payments to the Egyptian Government. The income and expenses for the year ending December 31, 1911, are shown in detail in Table XI.

CHART No. 2 GROSS AND TRANSIT RECEIPTS, NET EARNINGS, INTEREST AMORTIZATION AND DIVIDENDS, SUEZ CANAL 1870 - 1911



CHAPTER VI.

THE KAISER WILHELM CANAL: ITS TRAFFIC, TOLLS, AND REVENUES.

CHAPTER VI.

THE KAISER WILHELM CANAL: ITS TRAFFIC, TOLLS, AND REVENUES.

I. Location and Dimensions.

The Imperial Government of Germany constructed the Kaiser Wilhelm or Kiel Canal to provide a waterway within German territory connecting the Baltic and North Sea ports of the Empire. The natural route around Denmark is circuitous, dangerous because of storms, and is guarded by foreign powers. The North Sea-Baltic Canal was begun in 1887 and completed in 1895, and, though constructed primarily for military and naval reasons, it has proven to be of great value to the commerce of Germany.

The canal connects Brunsbuettel Harbor, on the Elbe, with Holtenau, on Kiel Bay. As shown by Plate 6 in the pocket at the end of this volume, the waterway passes through lowlands and lakes and along river valleys. The canal is 61 miles long; and, as first constructed, had a minimum breadth of 72 feet (22 meters) at the bottom and 213 feet at the surface and a minimum depth of 29 feet 6 inches (9 meters). The traffic rules of the canal administration permitted vessels to use the canal with a draft of 26.24 feet, beam of 65.60 feet, length of 443 feet, and height of mast 131.2 feet. Locks were provided only at the ends, the canal being at sea level. The cost amounted to about $37,128,000 (156,000,000 marks).

Table I shows the saving in distance effected by the canal for routes between North Sea ports and the Baltic as compared with the sea route around Skagen.

Table I.—Distance saved to and from the Baltic via the Kaiser Wilhelm Canal as compared with the sea route around Skagen.

Between the Baltic and—	Nautical miles saved.	Between the Baltic and—	Nautical miles saved.
Hamburg	424.8	Dunkirk	238.8
Bremen	322.8	London	238.8
Emden	282.8	Hull	180.8
Amsterdam	236.8	New Castle	106.8
Rotterdam	236.8	Leith	83.8
Antwerp	236.8		

The rapid increase in the traffic of the canal and the growth in the size and draft of both merchant and naval vessels made the necessity for enlarging the waterway evident at the end of a decade of operation. The reconstruction of the canal was authorized by the Imperial Parliament in 1907, and work was started in 1909. It is expected that the enlargements will be completed in 1914.

When the improvements now in progress are carried out, the Kaiser Wilhelm or Kiel Canal will have a bottom width of 144.35 feet (44 meters), a surface breadth of 334.64 feet (102 meters), and a minimum depth of 36.08 feet (11 meters). At 10 places the canal is widened for distances of 600 to 1,100 meters, and at one point for a length of 1,400 meters. The two new twin locks at the termini of the canal are to have a usable length of 1,082.67 feet (330 meters), a width of 147.63 feet (45 meters), and a depth, varying with the stage of the water, of 39.37 feet (12 meters) to 45.17 feet (13.77 meters). For only a short portion of but 42 days each year, will the depth be at the minimum of 12 meters. Among the other improvements being made are the enlargement of the outer harbors and the approaches to the locks, the construction of a central electric plant for lighting the canal and for other purposes, the substitution of new and larger bridges for those now crossing the canal, and the building of a drainage and navigation canal between the Old Eider River and the Kiel Canal.

II. Traffic History of the Kaiser Wilhelm Canal.

Though the Kaiser Wilhelm Canal was constructed primarily for military and naval reasons, it has been largely used by commercial vessels. Table II shows the growth in the number and net tonnage of ships using the canal from 1896 to 1910. In the last-named year vessels totaling 7,231,458 net tons, not including war vessels or ships in the service of the canal administration, passed through the canal. The increase since 1896, the first full year of the canal's operation, had been 312 per cent, and the increase during the last decade 70.7 per cent. In 1910, 43,328 vessels passed through the canal, 83.4 per cent of them being vessels flying the German flag. Steamers contributed 76 per cent of the total tonnage, while sailing vessels and unrigged craft made up the remainder. The average tonnage of the steamers was but 278 net tons, and that of sailing and unrigged vessels only 71.6 tons. Only 46.1 per cent of the total number of merchant vessels using the canal were steamers, though they comprised 76 per cent of the net tonnage. The small coasting vessels operated on the North and Baltic seas make large use of the canal and account for most of its traffic.

Table II.—NUMBER AND TONNAGE OF VESSELS USING THE KAISER WILHELM CANAL, CALENDAR YEARS 1896 TO 1910.

	1910	1909	1908	1906	1901	1896
Total number of vessels	43,328	35,326	34,121	34,187	29,470	20,068
Total net tons	7,231,458	6,267,805	6,012,178	6,045,963	4,198,754	1,751,065
Brunsbuettel-Holtenau:						
Number of vessels	21,126	17,091	16,393	16,502	13,492	9,959
Net tons	3,387,034	2,859,647	2,655,220	2,626,628	1,674,266	828,654
Holtenau-Brunsbuettel:						
Number of vessels	22,202	18,235	17,728	17,685	15,528	10,109
Net tons	3,844,424	3,408,158	3,356,958	3,419,335	2,524,488	922,411
German ships:						
Number of vessels	36,163	28,994	27,713	28,148	25,150	17,999
Net tons	4,403,177	3,740,713	3,472,737	3,547,368	2,593,525	1,188,013
Foreign ships:						
Number of vessels	7,165	6,332	6,408	6,039	4,320	2,069
Net tons	2,828,281	2,527,092	2,539,441	2,498,595	1,605,229	563,052
Steamers:						
Number of vessels	19,994	15,596	15,029	15,705	12,117	8,511
Net tons	5,560,002	4,923,116	4,718,832	4,814,589	3,352,300	1,321,311
Steamers (loaded):						
Number of vessels	12,712	10,825	10,833	10,932	8,924	6,036
Net tons	4,739,513	4,208,045	4,053,460	4,116,912	2,956,452	1,127,728
Sail and unrigged craft:						
Number of vessels	23,334	19,730	19,092	18,482	17,353	11,557
Net tons	1,671,456	1,344,689	1,293,346	1,231,374	846,454	429,754
Sail and unrigged craft (loaded):						
Number of vessels	15,135	12,461	12,321	12,364	11,083	7,378
Net tons	1,100,320	875,453	850,833	839,074	588,006	297,265

During the fiscal year ending March 31, 1910, 45,569 vessels, of 7,579,339 net tons, used the canal. Of this tonnage, 5,745,489 net tons consisted of steamers, 685,160 of sailing vessels, and 1,148,690 of barges and lighters. Of the steam tonnage, 2,318,250 tons consisted of regular-line steamers. The average size of all steamers was 273.17 net tons, and only 281 steamers had a tonnage of 1,000 tons or more. The average size of sailing vessels was but 39.3 tons and of barges and lighters 162 tons.

Table III divides the traffic of the canal for the fiscal year 1910 according to its origin and destination. There were 4,034,035 net tons that moved westward from Holtenau to Brunsbuettel, and 3,545,304 in the opposite direction. For the west-to-east shipments the leading points of origin are the ports of the Elbe, German North Sea ports, Dutch, Belgium, and Rhine ports, and the British ports. The chief destinations are the German Baltic, the Finnish, Danish, and Swedish ports, and the towns on the canal and the upper Eider River. In the east-to-west shipments, the German Baltic, Finnish, Swedish, Danish, and upper Eider ports are the important shipping points.

TABLE III.—ORIGIN AND DESTINATION OF KAISER WILHELM CANAL TRAFFIC, FISCAL YEAR ENDING MAR. 31, 1910.

	Origin: Brunsbuettel-Holtenau.		Destination: Holtenau-Brunsbuettel.	
	Number.	Net tons.	Number.	Net tons.
German North Sea ports	1,949	546,057	1,745	506,623
Elbe ports	11,072	1,401,256	11,066	1,404,070
British ports	779	468,059	880	612,960
Dutch, Belgian, and Rhiue ports	1,458	599,394	1,923	985,427
French ports	75	50,349	403	233,740
Other western and southern ports	163	231,837	110	53,939
Canal ports and upper Eider ports	6,694	247,191	7,169	232,828
Lower Eider ports	14	1,161	69	4,448
Total	22,204	3,545,304	23,365	4,034,035

	Origin: Holtenau-Brunsbuettel.		Destination: Brunsbuettel-Holtenau.	
	Number.	Net tons.	Number.	Net tons.
German Baltic ports	9,760	1,534,368	9,288	1,463,277
Finnish ports	1,879	1,220,970	1,244	784,392
Swedish ports	1,995	583,878	1,190	368,579
Norwegian ports	40	2,908	50	9,095
Danish ports	1,919	291,507	3,033	491,461
Canal and upper Eider ports	7,741	399,404	7,231	423,037
Lower Eider ports	31	1,000	168	5,463
Total	23,365	4,034,035	22,204	3,545,304
Grand total	45,569	7,579,339	45,569	7,579,339

The classes of freight traffic passing through the canal—stated in the order of the amount of net tonnage of vessels used in transporting the goods—are package freight, lumber and wood, coal, grain, stone, mixed cargo, iron, and miscellaneous bulk cargo. The number of vessels and net register tonnage required to carry the various classes of freight are shown in Table IV, which covers the fiscal years 1909 and 1910.

TABLE IV.—NUMBER AND NET TONNAGE OF VESSELS EMPLOYED IN TRANSPORTING DIFFERENT KINDS OF FREIGHT THROUGH THE KAISER WILHELM CANAL, FISCAL YEARS ENDING MAR. 31, 1909 AND 1910.

Cargo.	Number of vessels.		Net register tonnage.	
	1910	1909	1910	1909
In vessel loads:				
Coal	1,509	1,344	546,774	477,379
Stone	2,600	2,202	146,868	94,767
Iron	268	231	47,823	41,390
Wood	2,149	2,029	938,830	965,383
Grain	6,301	5,944	546,111	426,110
Cattle	44	....	5,645	....
Other bulk freight	6,563	5,089	1,015,674	782,310
Package freight	6,607	5,956	2,679,709	2,357,245
Mixed cargoes	179	230	87,031	94,587
In ballast	16,752	13,098	1,499,640	1,227,170
Passengers	2,597	2,424	65,234	61,357
Total	45,569	38,547	7,579,339	6,527,698

III. CANAL CHARGES. [1]

I. *Tolls.*—The revenue of the Kaiser Wilhelm Canal is derived mainly from tolls levied on the net register tonnage of vessels using the waterway. On vessels engaged in through traffic, the tolls are graded according to the size or tonnage of the ships. For vessels with cargo, the schedule of tolls is as follows:

		Marks.
For the first 400 net register tons	per net ton	0.60
For each ton above 400 up to 600	do	.40
For each ton above 600 up to 800	do	.30
For each ton above 800 net tons	do	.20
Minimum amount to be paid		10.00

In accordance with the requirements of the imperial law of May 22, 1881, the charges are lower on through German coastwise traffic. On German coastwise vessels not exceeding 50 net tons in size, the tolls are 0.40 mark per net ton, with a minimum of 6 marks per vessel.

For vessels employed in local traffic along the canal, or between a point on the canal and a port on the Elbe or the Baltic, the tolls per net vessel ton are:

	Marks.
(*a*) For passing 1 of the terminal locks	0.20
(*b*) For each section of 5 kilometers or fraction thereof	.01
Minimum after passing 1 terminal lock	4.00
Minimum otherwise	1.00

Vessels not exceeding 50 tons net register engaged in the local coastwise traffic are required to pay for each ton net register:

	Marks.
(*a*) For passing 1 of the terminal locks	0.10
(*b*) For each section of 5 kilometers or fraction thereof	.01
Minimum after passing 1 terminal lock	3.00
Minimum otherwise	1.00

There are, also, various other exceptions to the general local toll schedule. Vessels with clearance papers from any of the water routes crossed by the canal in the Burg-Kudensee Valley pay 0.10 mark per net ton for the section, including 23 kilometers from the Elbe, with a minimum charge of 1 mark. Small open rowboats or sailing boats may use the canal free of charge, but for passing one terminal lock they must pay a toll of 1 mark.

[1] For the complete schedule of charges consult Appendices IV and V of this volume.

If a vessel on the way through the canal makes stops at points along the canal for less than 24 hours at a time, the sum of the charges for the local trips so made shall be equal to the charge for one through trip with cargo.

Vessels empty or in ballast pay the above-mentioned through or local tolls less 20 per cent, regardless of the minimum charges specified in the regular tariffs. Dredges pay 0.60 mark for each gross register ton for a through passage; if moved in the local traffic, dredges pay the regular tolls applicable to vessels engaged in local traffic.

All craft are obliged to pay tolls 10 per cent higher than those named in the foregoing schedules during the winter months from October to March, inclusive.

II. *Towage charges.*—The second source of revenue is the charge for towing unrigged craft, sailing vessels (except small vessels of less than 35 tons going to or coming from stations on the canal or communicating water routes), and such steamers as require the service of tugs. Ordinarily, steamers pass through under their own steam, but the canal officials may use their discretion in ordering a steamer to take a tug. The tariff for towage is as follows:

A. For using regular tugs of the canal administration.

	Marks per net ton.	
	Up to 200 tons net.	For each ton above 200 tons net.
1. Vessels in the through traffic:		
(*a*) With cargo	0.40	0.30
(*b*) Empty or in ballast	.25	.20
(*c*) Coastwise up to 50 net tons, inclusive	.25	....
2. Vessels in the local traffic, for every 5 kilometers or fraction thereof:		
(*a*) With cargo	.02	.015
Minimum	.10	.10
(*b*) Coastwise traffic up to 50 net tons, inclusive	.015	....
Minimum	.10	....
(*c*) Vessels empty or in ballast bear rates named under 2*a* plus those under 2*b* less 20 per cent.		
Minimum	.10	.10

B. For using special tug of canal administration (except when rates in Schedule A are higher):

	Marks.
1. Towing through the canal—	
(*a*) Tugboat, class A (400 to 500 indicated horsepower)	240
(*b*) Tugboat, class B (200 to 300 indicated horsepower)	180
(*c*) Tugboat, class C (180 indicated horsepower)	135
(*d*) Tugboat, class D (100 indicated horsepower)	90
2. Towing through a section of the canal, every 10 kilometers or fraction thereof—	Marks.
(*a*) Tugboat, class A	30.00
(*b*) Tugboat, class B	15.00
(*c*) Tugboat, class C	12.50
(*d*) Tugboat, class D	10.00

C. For towing at Brunsbuettelkoog and Holtenau, independently of towing in the canal, the following charges prevail, unless the foregoing towage charges are less:

	Marks.
1. Towing service up to half hour	5
2. Towing service up to one hour	10
3. Towing service for every subsequent hour	5

D. If the fault or the wish of the master of a vessel causes any delay of more than two hours at beginning or end of its trip, the charges therefor are, for every hour or fraction thereof, according to the charges of B 2.

E. For use of canal administration tugs for assistance in case of accidents, the charge per hour or fraction thereof is:

	Marks.
1. Tugboat, class A	12.00
2. Tugboat, class B	9.20
3. Tugboat, class C	6.50
4. Tugboat, class D	5.20

III. *Pilotage.*—The canal administration decides whether or not a vessel requires a special pilot. The only vessels being definitely exempt from pilotage are such sailing craft as are not towed and small, open, or half-decked steam motor or rowboats. All vessels subject to pilotage are required to pay the authorized pilotage fee upon arrival of the pilot on board ship. A special tariff is published, the fees varying with the distance to and from Brunsbuettelkoog, Nuebbel, and Holtenau, the three pilotage stations. In case the master wishes the pilot to remain on board during a voluntary stop of over two hours, he has to pay a special fee of 1 mark for every hour or fraction thereof.

IV. Various *miscellaneous canal charges* are sources of a small revenue. Masters of sailing or other towed vessels which have not been sealed by the revenue service for the canal trip, or whose cargo has not been classed as free traffic, are required to pay to the pilot for acting as revenue escort a fee of 20 marks for a through passage, and 2 marks for every 10 kilometers or fraction thereof in the case of vessels in the local traffic. In case signals, etc., are rented from the canal office by vessel masters, a fee of from 1 to 6 marks is collected.

V. *Charges for auxiliary services.*—Various charges not directly connected with canal operation are made by the canal administration. For the use of the public loading and unloading docks at Hochdonn, Hohenhoern, Schafstedt, Oldenbuettel, Luhnau, Westerroenfeld, Schestedt, Koenigsfoerde, Landwehr, Levensau, and the inner port of Holtenau, harbor dues are collected according to the following schedule:

	Pfennigs.
For vessels of 6 to 10 cubic meters net capacity	10
For vessels of 11 to 30 cubic meters net capacity	20
For vessels of 31 to 50 cubic meters net capacity	40
For vessels of 51 to 75 cubic meters net capacity	60
For vessels of 76 to 100 cubic meters net capacity	80
For vessels of over 100 cubic meters net capacity	100

In case a vessel, without either discharging or loading cargo, remains at these harbors longer than one week, a ship's demurrage charge is collected for each month or fraction thereof, as follows:

	Marks.
For vessels up to 50 cubic meters net capacity	1.00
For vessels of 51 to 100 cubic meters net capacity	1.50
For vessels of over 100 cubic meters net capacity	2.00

For the use of the docks at Holtenau, at the east entrance of the canal, port dues are collected as follows:

A. 1. For vessels up to 12 cubic meters (inclusive) net capacity:	Pfennigs per vessel.
On entering	10
On leaving	10
If in ballast, or empty, or loaded with certain exempted articles	Free.
2. For vessels of over 12 cubic meters and up to 170 cubic meters (inclusive) net capacity:	
(*a*) When loaded—	Pfennigs per cubic meter, net capacity.
On entering	1
On clearing	1
(*b*) When in ballast or empty—	Pfennigs per each 2 cubic meters, net capacity.
On entering	1
On clearing	1
3. For vessels of over 170 cubic meters net capacity:	Pfennigs per cubic meter, net capacity.
(*a*) When loaded—	
On entering	4
On clearing	4
(*b*) When in ballast or empty—	
On entering	2
On clearing	2
B. For lumber, rafts, etc.:	Pfennigs per cubic meter.
(*a*) Of oak timber and lumber	10
(*b*) Of other kinds of wood	5

Certain exceptions are made to this general tariff. The tariff is printed in full, with exceptions, in Appendix V to this volume.

For the public use of the inner harbor and wharves at Brunsbuettelkoog, the following charges, also subject to certain exceptions, as stated in Appendix V, are made:

A. *Harbor dues*—

	I. For empty or ballasted vessels or vessels loaded with bulk cargoes, or with other cargoes up to 2,000 kilograms, inclusive.	II. For vessels loaded with other commodities to extent of over 2,000 kilograms.
1. For all vessels in the Kiel Canal subject to dues:	*Marks.*	*Marks.*
On entering, per cubic meter, net capacity	0.02	0.04
On leaving, per cubic meter, net capacity	.02	.04
Minimum for each vessel on entering and clearing	.50	1.00
2. For lumber rafts:		
Of oak timber and lumber, per cubic meter	.10	....
Of other woods	.05	....

B. *Ship demurrage*— Marks.

1. Ships which pay harbor dues, when using the harbor longer than one week, for the second week and each succeeding week, per cubic meter net 0.02
2. Ships which do not pay harbor dues, when voluntarily remaining in port longer than one day, for the second and each succeeding day, per cubic meter net .... .02
3. Barges (coal, etc.) remaining for some time, upon wish of the consignee, or which are assigned to a definite anchorage for a considerable time, shall pay such anchorage charges as the canal administration may impose.

C. *Wharfage dues*—

1. For bulk cargoes for each 100 kilograms .... .02
2. For all other cargoes than those specified under 1 and 3 to 10, per each 100 kilograms .... .03
3. For firewood, per cord (cubic meter) .... .045
4. For lumber and timber, per cubic meter .... .15
   For a full vessel load, per cubic meter, net vessel capacity .... .15
5. For brick and roof tiles, per 1,000 .... .06
6. For wagons of all kinds, per wagon .... .70
7. For horses, cattle, and cows, per animal .... .60
8. For colts, calves, sheep, goats, and hogs, per animal .... .30
9. For poultry and young pigs .... .03
10. For rough granite, per cubic meter, net vessel capacity .... .03
    Minimum charge .... .10

Small amounts are realized from the sale of gas by the canal gas plant, the sale of mineral water by the mineral-water plant, and from the operation of the laundry. Revenue is also derived from leases, rents, and police fines.

IV. Receipts and Expenditures.

Table V shows that the total receipts from canal operation—tolls and pilotage, towage, and other canal charges—rose from 971,992.50 marks in the fiscal year 1896 to 2,124,211.20 in 1900 and to 3,559,395 in 1910, an increase of 266 per cent during the entire period and of 67 per cent during the last decade. It will be recalled that the net tonnage using the canal increased 312 per cent during the period 1896 to 1910 and 70.7 per cent during the last decade closing with 1910. The receipts from towage charges rose 30 per cent during the period 1900 to 1910 and from tolls and pilotage 70 per cent, while the receipts from miscellaneous canal charges decreased 52 per cent.

TABLE V.—KAISER WILHELM CANAL—CLASSIFICATION OF RECEIPTS AND EXPENDITURES (FISCAL YEARS).

	1895	1896	1897	1898	1899	1900	1901	1902
A. RECEIPTS.	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*
1. Canal tolls	620,735.09	899,424.60	1,171,594.50	1,477,713.30	1,670,878.30	1,975,834.60	1,970,956.10	2,080,723.10
2. Towage dues	43,823.35	72,086.90	89,275.60	107,297.40	131,820.00	142,954.10	136,374.60	133,107.40
3. Rents for tariff signals and other dues	1,616.62	481.00	....	3,669.60	4,806.60	5,422.50	3,714.40	3,409.60
4. Harbor dues	706.76	3,363.43	1,895.49	2,954.76	3,324.43	4,152.14	4,567.20	5,736.11
5-6. Other receipts (rents, leases, fines, sales, etc.)	15,744.57	41,498.99	37,253.27	42,702.71	39,937.16	46,277.41	53,957.54	58,788.06
Total receipts	682,626.39	1,016,854.92	1,300,018.86	1,634,337.77	1,850,766.49	2,174,640.75	2,169,569.84	2,281,764.27
Receipts from canal operation (total receipts—harbor dues and "other receipts")	666,175.06	971,992.50	1,260,870.10	1,588,680.30	1,807,504.90	2,124,211.20	2,111,045.10	2,217,240.10
B. EXPENDITURES.								
Salaries, pensions, etc., of officials	357,758.56	578,000.86	595,990.77	608,876.57	641,016.71	684,444.99	699,751.52	730,510.20
Wages of laborers (not employed on works of maintenance)	207,395.13	288,836.33	331,778.31	340,825.71	352,965.86	355,830.90	354,237.45	363,504.30
Taxes, rates, per diem, traveling expenses, sick and accident benefits	64,528.80	128,944.99	128,106.79	140,969.51	147,860.55	163,741.12	163,122.35	164,311.81
Maintenance of buildings	1,514.11	10,506.62	21,797.58	13,231.19	20,651.57	29,183.15	20,301.57	20,006.59
Costs of dredging	110,855.12	160,994.50	229,671.53	197,755.96	196,607.37	198,967.71	174,821.20	260,039.20
Maintenance of locks, bridges, and other structures	281,926.63	398,617.92	614,638.77	354,461.45	337,163.36	373,233.76	364,729.80	357,123.51
Materials for running the canal machinery and gas plant	116,356.70	158,140.97	144,944.58	158,941.72	158,992.88	176,309.45	183,435.40	193,423.22
Maintenance of tugs	25,477.69	60,044.42	81,246.02	64,034.89	76,917.32	91,976.57	83,452.61	55,817.63
Materials for running the tugs	78,763.84	96,742.90	130,108.90	172,733.22	231,728.75	388,745.79	422,220.15	339,613.85
Contingent ("unforeseen") expenditures	3,209.79	73,963.23	....	14,906.86	4,632.96	27,295.11	5,218.86	23,000.48
Total expenditures	1,247,786.37	1,954,792.74	2,278,283.25	2,066,737.08	2,168,537.33	2,489,728.55	2,471,290.91	2,507,350.79
Net receipts (+), deficit (−)	−565,159.98	−937,937.82	−978,264.39	−432,399.31	−317,770.84	−315,087.80	−301,721.07	−225,586.52

	1903	1904	1905	1906	1907	1908	1909	1910
A. RECEIPTS.	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*
1. Canal tolls	2,267,030.30	2,420,798.78	2,651,880.50	2,707,873.10	2,937,973.40	2,690,894.40	2,961,567.00	3,370,835.60
2. Towage dues	141,769.20	146,604.90	149,925.30	150,029.60	166,160.80	153,114.30	183,672.70	185,991.60
3. Rents for tariff signals and other dues	2,783.50	3,725.80	4,051.75	3,378.60	2,594.20	2,098.30	2,515.50	2,567.90
4. Harbor dues	4,182.93	4,092.02	3,159.01	4,581.55	4,940.76	6,662.49	10,257.54	12,796.37
5-6. Other receipts (rents, leases, fines, sales, etc	65,916.43	65,498.06	63,852.46	79,687.56	83,835.09	84,303.69	103,928.34	112,380.56
Total receipts	2,481,682.36	2,650,719.56	2,872,869.02	2,945,550.41	3,195,504.25	2,937,073.18	3,261,941.08	3,684,571.93
Receipts from canal operation (total receipts—harbor dues and "other receipts")	2,411,583.00	2,581,129.48	2,805,857.55	2,861,281.30	3,106,728.40	2,846,107.00	3,147,755.20	3,559,395.00
B. EXPENDITURES.								
Salaries, pensions, etc., of officials	742,263.11	776,308.67	818,851.89	845,941.49	881,676.55	913,420.23	1,052,122.18	1,067,152.86
Wages of laborers (not employed on works of maintenance)	370,949.67	403,412.86	410,336.27	445,225.16	435,162.40	483,461.29	475,358.63	490,488.39
Taxes, rates, per diem, traveling expenses, sick and accident benefits	176,524.46	186,399.97	196,063.74	203,472.54	209,617.77	230,093.26	213,186.33	225,390.16
Maintenance of buildings	16,843.00	21,911.29	19,523.51	19,403.06	16,946.24	20,158.53	14,893.95	15,869.55
Costs of dredging	249,059.55	233,250.88	244,071.35	267,453.41	252,044.55	247,374.29	211,006.74	159,551.37
Maintenance of locks, bridges, and other structures	343,823.98	373,729.21	385,701.98	380,511.74	407,831.55	332,769.51	330,877.17	416,652.40
Materials for running the canal machinery and gas plant	186,390.91	177,291.25	190,475.04	207,598.52	209,995.51	215,641.34	216,514.49	219,846.65
Maintenance of tugs	80,945.47	76,145.78	96,845.82	104,509.18	114,173.45	96,601.21	116,202.21	105,522.98
Materials for running the tugs	246,491.94	194,513.56	181,262.40	194,448.72	245,723.56	250,860.58	233,144.72	233,584.56
Contingent ("unforeseen") expenditures	10,565.77	5,134.07	19,232.22	29,004.26	8,710.31	17,727.47	16,907.71	29,752.77
Total expenditures	2,423,857.86	2,448,097.54	2,562,364.22	2,697,568.08	2,781,881.89	2,808,107.71	2,880,214.13	2,963,811.69
Net receipts (+), deficit (−)	+57,824.50	+202,622.02	+310,504.80	+247,982.33	+413,623.36	+128,965.47	+381,726.95	+720,760.24

The entire revenue of the canal administration from all sources—canal and otherwise—increased from 1,016,855 marks in the fiscal year 1896 to 2,174,641 in 1900 and to 3,684,572 in 1910, a gain of 262 per cent during the entire period and of 69 per cent during the last decade.

The aggregate revenue for the fiscal year 1910 included the following items of income:

	Marks.
Canal tolls and pilotage	3,370,835.60
Towage	185,991.50
Other canal receipts	2,567.90
Harbor dues	12,796.37
Receipts from sales	7,066.72
Leases, rents, fines, etc	105,313.84
	3,684,571.93

The expenditures of the canal increased from 1,954,793 marks in the fiscal year 1896 to 2,489,728 in 1900 and to 2,963,812 in 1910, an increase of 51.6 per cent during the period and 19 per cent during the last decade. It was not until 1903 that the annual deficit was changed to a profit. Since that date there has been a growing surplus of revenues over operating expenses.

Table VI itemizes the expenditures for the fiscal year 1910. There were 1,754,306.41 marks expended for personal services and 1,209,505.28 for materials and services not personal.

TABLE VI.—KAISER WILHELM CANAL—EXPENDITURES DURING FISCAL YEAR 1910.

Item.	Marks.	Marks.
For personal services:		
1. Salaries to statutory employees:		
At headquarters	93,822.50	
Construction department	150,013.16	
Operating department	563,221.13	
Allowance for quarters	106,944.78	
2. Wages to workmen, and gratuities for support of workmen and their survivors	490,488.39	
3. Costs of sick, invalid, and accident insurance of workmen	44,231.93	
4. Pensions	62,121.02	
5. Other expenses	243,463.50	
		1,754,306.41
For materials and services not personal:		
1. Dredging	159,551.37	
2. Maintenance of canal structures	416,652.40	
3. Coal and other supplies used in operating canal machinery and gas plant	219,846.65	
4. Maintenance of pilot tugs, towing tugs, lock boats, and service boats	105,522.98	
5. Supplies for operating floating equipment and hire of outside towboats	233,584.56	
6. Other expenses	74,346.32	
		1,209,505.28
Total expenses		[1] 2,963,811.69
Total receipts		3,684,571.93
Net receipts		720,760.24

[1] Not including 61,311.74 marks expended as "nonrecurring" charges, for enlargement of the canal pilot house in Nuebbel, for the workingmen's quarters along the line of the canal, and for damages to the firm of Gegan & Wiegand, for earthwork in original construction of the canal.

Expenditures may be reclassified so as to bring out the total cost of certain services and materials. The cost of pilotage in 1910 was 435.590.22 marks, ferriage 154,671.44, telegrams and telephones 39,017.05, lighting of line 92,079.30, switch operation 59,321,59, dockyard 269,121.14, gas plant 8,231.59, emergency locking pontoons 1,707.90, accident damages 18,552.63, care of sick 55,742.22, and total supply of coal and briquets 849,556. The towage service is still very expensive, its total cost in 1910 being 623,604.96 marks, while the receipts from towage charges amounted to but 185,991.50 marks.

Since 1903 expenses have increased less rapidly than receipts, and the canal has been operated at a small profit amounting, in 1910, to 720,760 marks. After 1914, when the improvements now in progress have been completed, traffic will no longer be retarded by inadequate canal dimensions, and the annual surplus should increase.

The net receipts are not sufficient to pay interest on the investment. No effort is made to levy tolls that will provide for interest charges and for the amortization of the investment of 156,000,000 marks ($37,128,000). The Kiel Canal, unlike the Panama or Suez Canals, does not connect regions of vast traffic, nor does it greatly shorten ocean routes. The sea routes between the Baltic Sea and the leading ports west of the canal are but 83.8 to 428.8 miles longer than the routes via the canal. The tolls are low because the traffic does not warrant heavier charges. For the military services of the canal no charges are made.

The canal has fully justified its construction. Indeed, it has been of such naval and commercial value to Germany that the Government is now spending 233,000,000 marks ($55,454,000), much more than the amount of the original investment, in doubling the size and capacity of the waterway.

[Note.—For statute of German Empire concerning charges for the use of the Kaiser Wilhelm Canal see Appendix III; for schedule of tolls and other charges see Appendix IV; and for schedule of port charges and demurrage see Appendix V. For operating regulations of the Kaiser Wilhelm Canal see Appendix XX to volume on Measurement of Vessels.]

CHAPTER VII.

THE MANCHESTER CANAL: ITS HISTORY, FINANCES, AND TRAFFIC.

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THE MANCHESTER CANAL: ITS HISTORY, FINANCES, AND TRAFFIC.

1. Physical Features.

Years of agitation preceded the construction of the Manchester Ship Canal. The project was a large one, and there was active opposition by the railways and by the industrial and commercial districts with which Manchester competes. Three hundred and twenty-six petitions were presented in Parliament before the authorizing act of 1885 was obtained.

Construction was begun in November, 1887, at which time it was estimated that the total cost would be £8,262,936. The waterway was opened for traffic January 1, 1894, after the expenditure of £14,860,000. The total investment on capital account up to December 31, 1911, was £16,838,957, it having been found necessary to enlarge and deepen the canal and to add docks, warehouses, and other facilities. Of the total original cost up to 1894, £11,750,000 went toward construction expenses, £1,330,000 toward the purchase of land and for compensation, and £1,780,000 for the purchase of Bridgewater Canal property.

The canal is 35½ miles long and extends from Eastham, on the south side of the River Mersey, about 6 miles from Liverpool, to Manchester. Its original depth of 26 feet has been increased to 28 feet. The bottom width is 120 feet; but at Weaver Outfall the width is 180 feet, at Runcorn Bend 150 feet, from Barton Aqueduct to Manchester 170 feet, and from Latchford Locks to Partington Coal Basin, for a distance of about 1 mile, 90 feet. The maximum dimensions of vessels permitted to use the canal are 550-foot length, 61-foot beam, 70-foot height, and 27-foot draft. A map of the canal is presented in Plate 7 in the pocket at the end of this volume.

To overcome the difference of 58 feet 6 inches in level between Eastham and Manchester, there are five sets of locks, the dimensions of which are as follows:

	Small.	Intermediate.	Large.	Rise.	Distance from Eastham Locks.
	Feet.	*Feet.*	*Feet.*	*Ft. in.*	*Miles.*
Eastham (tidal lock)	150 by 30	350 by 50	600 by 80	....	....
Latchford	....	350 by 45	600 by 65	14 6	21
Orlam	....	350 by 45	600 by 65	16	28⅜
Barton	....	350 by 45	600 by 65	15	30⅜
Mode Wheel (Manchester)	....	350 by 45	600 by 65	13	33⅞

The Manchester Canal has excellent connections with barge canals and with railroads, and Manchester has been equipped with efficient port facilities. The Manchester Dock Railways, owned by the canal company, include 80 miles of tracks on and about the Manchester docks and a total mileage, at docks and points along the canal, of 137 miles. The Manchester docks are connected with the London & North Western Railway, the Lancashire & Yorkshire, the Great Northern, the Midland, the Great Central, and the Cheshire Railways. The canal and rail lines make connections at various points between Manchester and Eastham. The canal company quotes shippers through freight rates from aboard the ship at Manchester to interior towns and from interior towns to the ship at Manchester, the charges quoted including the freight rates and all terminal and transfer charges.

The Manchester Canal Co. owns the Bridgewater Canal and makes connections with 13 other barge canals—the Leeds & Liverpool, Bolton & Bury, Rochdale, Ashton, Huddersfield, Stockport, Macclesfield, Calder & Hebble, Peak Forest, Aire & Calder, Trent & Mersey, Weaver Navigation, and Shropshire Union Canal. See Plate 8, in pocket.

Direct connection is made by the Manchester Canal with numerous industrial establishments located on or near the waterway. The company owns the Trafford Park estate near Manchester, and from this estate, 1,183 acres in extent, sites for industrial plants have been sold to a large number of firms whose factories are served both by the canal and by rail lines. The total surplus estate of the canal company includes 2,500 acres.

The Manchester docks estate has an area of 406½ acres, with a water area of 120 acres, and with quays 286½ acres in area and 6½ miles in length. Eight large docks have been constructed and another planned, with dimensions as follows:

	Feet.		Feet.
No. 1	700 by 120	No. 6	850 by 225
No. 2	600 by 150	No. 7	1,160 by 225
No. 3	600 by 150	No. 8	1,340 by 250
No. 4	560 by 150	No. 9	2,700 by 250
No. 5 [1]	980 by 750		

[1] Not yet constructed.

Dock No. 9, recently constructed, has a water depth of 28 feet, a water area of 15½ acres, and sheds, quays, tracks, etc., covering 128½ acres. Five transit sheds, with a total floor space of 22 acres, are located on the south side of this dock, and a large grain elevator is to be erected at the east end. The docks at the port of Manchester are equipped with 53 hydraulic, 61 steam, and 93 electric cranes capable of lifting from 1 to 10 tons each; with one 30-ton steam crane, a pontoon shears capable of lifting 250-ton weights, 6 floating pontoons, 46 locomotives, 37 transit sheds, one of which is a cold-storage shed, and 13 warehouses fitted with improved appliances. At Trafford Park there are four additional warehouses. All wharves are equipped with electric or steam capstans. There is a large grain elevator of 40,000 tons storage capacity, and another of the same size is to be constructed. Two large cattle wharves are provided for the coastwise and foreign cattle trade. All wharves have rail tracks and rail connections, so that freight may be handled directly from cars to steamers and from vessels or sheds and warehouses to railroad cars.

At various points between Manchester and Eastham the canal company provides dock and wharf facilities, and there are private facilities available at numerous places, as, for example, the Stuart Wharf for timber, cattle, etc.; the wharves of the Manchester Dry Docks Co. (Ltd.), of the Union Cold Storage Co. (Ltd.), and of various coal terminals. Many firms have private wharves. See Plate 9, in pocket.

II. The Capital Invested in the Manchester Canal.

The original cost of the Manchester Canal having reached £14,860,000, instead of £8,262,936, as had been estimated, the difference between the actual and estimated cost became so great that the company had much trouble in financing the project. The original capital was mainly subscribed locally by the business interests of the Manchester district, and later appeals to those interests failed to secure the additional funds required. The situation of the company became so acute that the corporation of Manchester finally made a loan of £5,000,000 and acquired control of the management of the canal company. Eleven of the 21 directors of the canal company are appointed by the city and 10 are selected by the shareholders.

The total authorized capital of the company December 31, 1911, was as follows:

Ordinary shares, £10 each	£4,000,000
Perpetual 5 per cent preference shares, £10 each	4,000,000
Manchester Ship Canal Corporation, 3½ per cent preference stock held by corporation of Manchester	1,061,230
Perpetual 3½ per cent first mortgage debentures	1,359,000
4 per cent first mortgage debentures (terminable 1914)	453,000
4 per cent second mortgage debentures (terminable 1914)	600,000
Debenture stock under act of 1904	2,000,000
New mortgage debentures (held by corporation of Manchester)	5,000,000
Mortgage of surplus lands	100,000
Total	£18,573,230

The Manchester Ship Canal (finance) act of 1904 (sec. 12) provides that "all profits of the company after payment of the dividends on corporation preference shares and corporation preference stock shall, notwithstanding anything contained in any of the recited acts or other acts relating to the company, be divisable as follows: Two-thirds to the holders of the preference shares issued in pursuance of the powers of the acts of 1885 and 1887; one third to the ordinary shareholders. Provided that when the said two-thirds due to the holders of preference shares issued in pursuance of the powers of the acts of 1885 and 1887 shall in any year amount to £200,000 all the remaining profits of that year shall be payable to the ordinary shareholders."

The net income of the company is applied to the several accounts in the following order: Interest on first and second debentures, interest on debenture stock, interest on mortgage of surplus lands, rent of No. 8 shed, rent of No. 9 dock and transit shed, and the balance to the city of Manchester on account of interest on its £5,000,000 loan. Until recently the company's earnings have been insufficient to pay the entire interest due on the city's loan. The holders of ordinary and preference shares (common and preferred stock) have as yet received no dividends on their investment.

The total expenditure on capital account to December 31, 1911, amounted to £16,838,957, or slightly less than $82,000,000, and was distributed as follows:

1. Construction of works (including plant and equipment)	£10,992,463
2. Bridgewater canals	1,268,826
3. Land (purchase and compensation)	1,504,060
4. Engineering and surveying	196,232
5. Interest on share and loan capital	1,170,734
6. Parliamentary expenses	197,019
7. General expenses	448,393
8. Interest on debentures discharged by the issue of a like amount of preference stock to the corporation of Manchester	1,061,230
Total capital expenditures	16,838,957
Total capital receipts	17,065,638
Balance	226,681

As item 8 in the preceding table indicates, the canal company has not been able, until recently, to pay all the interest due on the debentures held by the city of Manchester. The interest deficit has been paid by issuing preference stock to the corporation of Manchester. This preferred stock is entitled to 3½ per cent dividends when the earnings warrant. It is to be distinguished from the debenture stock which resembles debenture bonds on which interest is regularly paid after the interest has been paid on the first and second mortgage debentures.

III. Traffic of Manchester Ship Canal.

Though the traffic of the Manchester Ship Canal has been less than was estimated, there has been a steady increase. Table No. I shows that in 1911, 5,217,812 tons of freight used the canal, as compared with 925,659 tons in 1894, the first year of operation. The gain during the decade 1900 to 1910 was 61.3 per cent, although the high figure of 1907, owing to the subsequent commercial depression, had not yet been reached in 1910. The increase during the decade ending in 1911 was 77.3 per cent, more freight being handled in that year than during any previous year in the history of the canal.

Of the total traffic in 1911, 4,894,670 tons consisted of sea-borne traffic, this being an increase of 82.3 per cent over the year 1901. The barge traffic of the canal in 1911 totaled 323,142 tons, and was less than was carried during the later nineties. In view of the connection of the Manchester Canal with as many as 14 barge canals, the barge traffic is surprisingly small.

The total number of vessels entering the canal in 1911 was 6,409 with a net register tonnage of 2,869,641. Since the opening of the canal the annual number of vessels entering has increased 40.8 per cent, and the net tonnage 298.3 per cent. During the last decade the number of vessels entering increased 27.9 per cent, and the net tonnage 97.2 per cent. The Royal Commission on Canals and Waterways (Vol. VII, p. 50) after reviewing the traffic from 1898 to 1905 concludes that "these figures show a rapid and satisfactory progress, and prove what can be done by energy and courage, and with a large expenditure of capital, in favorable circumstances, to create trade."

TABLE I.—NUMBER AND NET TONNAGE OF VESSELS (INCLUDING REPEATED VOYAGES) USING THE MANCHESTER SHIP CANAL, AND TRAFFIC, SEA BORNE, BARGE AND TOTAL, JAN. 1, 1894 TO JAN. 1, 1912.

Years.	Manchester (excluding Runcorn).		Runcorn.		Total.		Sea-borne traffic.	Barge traffic.	Total traffic carried.
	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.	Cargo, tons.	Cargo, tons.	Cargo, tons.
1894	1,315	408,364	3,236	311,791	4,551	720,425	686,158	239,501	925,659
1895	1,752	589,159	3,009	290,045	4,761	879,204	1,087,443	271,432	1,358,875
1896	2,154	787,218	3,002	307,619	5,156	1,094,837	1,509,658	316,579	1,826,237
1897	2,212	839,167	2,920	300,566	5,132	1,139,733	1,700,479	365,336	2,065,815
1898	2,836	1,028,188	2,973	322,240	5,809	1,350,428	2,218,005	377,580	2,505,585
1899	2,705	1,135,074	2,477	260,627	5,182	1,395,702	2,429,168	348,940	2,778,108
1900	2,900	1,230,784	2,462	261,536	5,362	1,492,320	2,784,843	275,673	3,060,516
1901	2,866	1,214,617	2,142	240,382	5,008	1,454,999	2,684,833	257,560	2,942,393
1902	3,167	1,417,155	2,383	289,834	5,550	1,706,989	3,137,348	280,711	3,418,059
1903	3,077	1,526,491	2,205	275,707	5,282	1,802,198	3,554,636	290,259	3,846,895
1904	3,195	1,506,260	2,570	296,153	5,765	1,802,413	3,618,004	299,574	3,917,578
1905	3,454	1,647,774	2,588	314,373	6,042	1,962,147	3,993,110	260,244	4,253,354
1906	3,497	1,767,017	2,507	305,182	6,004	2,072,199	4,441,241	259,683	4,700,924
1907	3,679	1,942,228	2,683	312,657	6,362	2,254,885	4,927,784	282,975	5,210,759
1908	3,486	1,823,294	2,872	343,723	6,358	2,167,017	4,317,965	264,531	4,582,496
1909	3,517	1,818,626	2,781	306,175	6,298	2,124,801	4,290,765	272,636	4,563,401
1910	3,699	1,918,515	2,765	343,301	6,464	2,261,816	4,618,070	319,561	4,937,631
1911	3,784	2,452,647	2,625	416,994	6,409	2,869,641	4,894,670	323,142	5,217,812

The officials of the canal company have, however, repeatedly expressed dissatisfaction with the growth of traffic which so far as facilities are concerned might have been more rapid. The chairman of the board of directors at the general meeting of the company on February 17, 1910, spoke as follows:

If more patriotism could somehow be infused into the mercantile and manufacturing community of this district we should soon have a large expansion of traffic. What I mean with regard to imbuing the mercantile and manufacturing community with local patriotism is this: That they should be determined in every case to back up their own port. If shipowners were made to believe that when they take the risk of running lines of steamers to and from Manchester they would have the wholehearted sympathy and support of the whole mercantile community we should go ahead very much faster. Self-interest is the dominant factor in business, and it is on that ground that I mainly appeal to the mercantile and manufacturing community. It is sheer folly to send their goods by the rival routes merely because they, for the time being, in competition with the Ship Canal, come down to the Manchester Ship Canal cost. But I appeal also on higher grounds. Surely the men of Manchester are not going to incur the stigma of being unable to put the finishing hand to their great work. They have attained celebrity all over the world for converting their inland town into one of the great seaports of the Kingdom. Are they going to clinch their effort by showing the whole world they are determined that their own port, and not rival ports, shall have every ton of traffic they can influence? Manchester men are generally believed to be too farseeing and thorough to do things by halves; and the serious question for our undertaking is "are they going to live up to their reputation?"

The chairman's words point to the chief traffic difficulty of the canal. From the very beginning it has had to compete with the railroads which previously carried nearly all the freight to and from the Manchester district. During the promotion of the canal their policy was to block its construction; and, failing in this, their policy has been to cut their rates to the basis of canal charges in order to hold as much of the traffic as possible and to compel the canal company to operate as a losing venture to its stockholders. The chief competition centers about the traffic to and from the points around Manchester not directly on the canal. Upon such traffic, the canal charges, plus railroad rates, plus handling charges, must compete with the through railroad rate to Liverpool and the handling charges at that terminal. Shipments directly to and from Manchester are sometimes handled by rail from and to coast ports, when the railways are able to provide shippers and consignees with sidings and to offer them favorable through rates.

This competition with rail carriers indicates, however, that the commercial value of the canal is not fully measured by the extent of its traffic. The favorable railroad rates to the coast ports are directly due to the ship canal, and much of the industrial growth of the Manchester district is directly due to the canal. The Royal Commission on Canals and Waterways (Vol. VII, p. 69) asserts that "it is true that this undertaking has not as yet proved sufficiently renumerative to enable dividends to be paid on ordinary share capital. It has, however, fulfilled the object of greatly increasing the commercial prosperity of Manchester. The trade of Manchester was, in the period immediately before the construction of the canal, in a depressed condition. Works were being closed, there was no extension, and the value of property was going down. Since the canal was opened there has been a large increase in the net annual ratable value in Manchester, and there are other signs of increased wealth and prosperity." The report also states (p. 164) "this benefit or indirect return has already been sufficient abundantly to justify the great outlay on the canal. Moreover, the net revenue shows a steady increase, and provides a direct return on a growing proportion of the capital."

The inland city, Manchester, has not only maintained itself as an industrial center, but has become the fourth port in England. The population of Manchester, not including the increase due to the extension of its area to surrounding towns, rose from 644,873 in 1901 to 714,427 in 1910, or 10.79 per cent. The population of Liverpool meanwhile increased from 704,134 to 746,566, or 6.03 per cent. The shipping of Manchester (entrances and clearances) increased from 3,001,000 tons in 1900 to 4,564,000 in 1910, or 52 per cent; those of Liverpool grew from 18,477,000 to 21,828,000, or 18.1 per cent; those of Hull from 6,732,000 to 9,885,000, or 46.8 per cent, and those of London from 30,500,000 to 36,030,000, 18.1 per cent. The shipping using the port of Manchester consists mainly of freight vessels, as the large ocean-going passenger ships dock at coast ports. Nevertheless the increase during the decade 1900–1910, of 65.8 per cent in the seaborne traffic of the Manchester Ship Canal and of 55.8 per cent in the net tonnage of vessels annually entering and clearing the port of Manchester through the canal, does not compare unfavorably with the gain in the shipping at the other great ports of Great Britain. It will be recalled that the traffic of the Suez Canal during that decade increased 70.2 per cent. It is significant that during the decade ending in 1911 the net tonnage of shipping using the Suez Canal increased 69.3 per cent, while during the same period the total freight traffic of the Manchester Canal increased 77.3 per cent, and its seaborne traffic made a gain of 82.3 per cent.

IV. Manchester Canal Tolls and Other Charges.

The receipts of the Manchester Canal Co. are derived from several sources:

1. *From ship dues.*—All vessels using the canal are required to pay "ship dues." These charges are on the net register tonnage of the vessels and upon any space occupied by deck cargo as defined in the merchant shipping acts of Great Britain. The "dues" payable by vessels vary, first, according to the section of the world to or from which the ship using the canal is bound; and, second, according to the section of the canal in which the vessels load or discharge cargo. Vessels bound to and from distant points are obliged to pay higher dues than those entering and clearing the canal ports from or to near-by countries. The canal is divided into three sections, section A including the canal below Runcorn Swing Bridge, section B the canal as far as Latchford Locks, and section C the canal as far as the Manchester Docks. Vessels passing through the entire length of the canal to and from Manchester are charged lower dues than are imposed on ships that load or discharge at ports in sections A or B, the schedule of charges being intended to encourage the trade of Manchester and the utilization of the extensive dock and warehouse facilities there provided.

The schedule of "ship dues" is as follows:

Schedule of ship dues per net register ton, payable on vessels using the Manchester Ship Canal.

	Upon vessels trading between—			Period a vessel may remain in canal, after which rent will be charged.
	Eastham or any of the other River Mersey Estuary Locks and Runcorn Swing Bridge.	Eastham or any of the other River Mersey Estuary Locks and places beyond Runcorn Swing Bridge up to the entrance to Latchford Locks.	Eastham or any of the other River Mersey Estuary Locks and Latchford Locks (including locks) and places above up to Manchester Docks.	
	Section A.	Section B.	Section C.	
	s. d.	*s. d.*	*s. d.*	*Days.*
Between St. David's Head and the Mull of Galloway, including the Isle of Man and the island of Anglesea	0 2	0 2	0 2	14
Between the Mull of Galloway and Duncan's Bay Head, including the Orkney Isles and all the islands on the western coast of Scotland; and between St. David's Head and the Land's End, including the Scilly Islands and the east coast of Ireland from Cape Clear to Malling Head	0 4	0 3	0 2	14
All parts of the east and southern coasts of Great Britain between Duncan's Bay Head and the Land's End, including the islands of Shetland; and all parts of the west coast of Ireland from Cape Clear to Malling Head, including the islands on that coast	0 5	0 4	0 2	14
All parts of Europe to the northward of Cape Finisterré, and to the westward of the North Cape, and without the Cattegat and Baltic Sea, and including the islands of Guernsey, Jersey, Alderney, Sark, the Faro Islands, and Iceland	0 9	0 7	0 4	28
All parts within the Cattegat and Baltic, including the whole of Sweden, the White Sea, and all parts to the eastward of the North Cape; all parts in Europe to the southward of Cape Finisterre without the Mediterranean, Greenland, Davis Straits, Canaries, Western Islands, Madeira, and Azores	1 0	0 9	0 6	28
All parts of the east coast of North America, Newfoundland, the West Indies, the east coast of South America to the northward of Rio La Plata, inclusive; all parts of the west coast of Africa, and islands to the northward of the Cape of Good Hope, and all parts within the Mediterranean, including Gibraltar, the Adriatic, the Black Sea and Archipelago, the islands of St. Helena, Ascension, and the Cape de Verde Islands; and all parts in South America to the southward of the Rio La Plata; in the Pacific Ocean; and in Africa and Asia to the eastward of the Cape of Good Hope	1 3	0 10	0 7½	56

Vessels loading and discharging cargoes consisting exclusively of certain kinds of commodities are charged "differential ship dues," equal to one half the regular rates. Likewise, vessels entering in ballast and loading certain specified commodities, or entering with certain articles and leaving in ballast, are charged the differential ship dues. Small steamers, yachts, launches, and all noncargo-carrying craft are charged "lockage tolls" in lieu of ship dues at the rate of 5s. per lock each way and a minimum lockage charge of £1 1s. Vessels remaining in the canal longer than the maximum free time allowed are required to pay 1 penny per net ton per week, and double this in case they remain longer than six months. The complete Schedule of Ship Dues, together with the rules explaining them, is reproduced in Appendix VI.

2. *Towage charges.*—In case towage is necessary the company furnishes tugs upon request, the charges for towage being according to the following schedule:

Towage charges per tug and conditions for use of the Manchester Canal Co.'s tugs assisting steamers and towing sail vessels within the ship canal

	£	s.	d.
For steamers:			
1. From Eastham locks or any point in section A or B direct to any point in section C, or vice versa	7	10	0
NOTE.—Steamers stopping at Partington to take on coal on returning from Manchester to Eastham locks will not be considered as breaking the direct journey.			
2. From Eastham locks direct to any point in section A or B, or vice versa; also from one point to another in these sections	4	10	0
3. From Manchester docks direct to any point in section C, or vice versa; also from one point to another in this section			
4. Waiting at Eastham locks, per tide	2	0	0

Towage charges per tug and conditions for use of the Manchester Canal Co.'s tugs assisting steamers, etc.—Continued.

EXCEPTIONS.

	£	s.	d.
For steamers:			
5. From Manchester docks direct to any point below Mode Wheel locks and above Barton Aqueduct, or vice versa	2	10	0
6. From one point direct to another between Mode Wheel locks and Barton Aqueduct	2	0	0
7. From one point direct to another in Manchester docks			
8. From one point direct to another within the canal at Ellesmere Port, or at Runcorn			
9. From Eastham locks to Dolphins within the canal at Eastham, or vice versa	1	0	0
10. From one tip to another at Partington coal basin			

NOTE.—As regards services Nos. 6, 7, 8, 9, and 10, when tugs are occupied for more than one hour, an additional charge of 10s. per hour or part of an hour per tug will be made, the service to be calculated from the time the tug is in attendance, as ordered, until the time the service is finished.

For sailing vessels:

From Eastham locks direct to any point in section A, B, or C in the canal, or vice versa, or when proceeding from one point direct to another in the canal, or in the Manchester docks:

If light, 2d. per net registered ton.

If loaded, 3d. per ton upon the weight of the cargo, with a minimum as when light.

These rates will operate until the higher scale under the preceding table for steamers is reached by the charges payable on the tonnage of the vessel, if light, or on the weight of cargo on board, if loaded, when the charges as per the said table will apply.

Detention of tugs attending steamers and sailing vessels.

Per hour or part of an hour, 10s. per tug.

NOTE.—If tug assistance or towage services other than those named above are required, the charges will be by special arrangement.

3. *Tolls on passengers.*—The passenger traffic on the Manchester Canal is very light, because Manchester is an inland port; but tolls are collected on all passengers according to the following schedule:

Manchester Canal tolls on passengers.

When carried between Manchester docks and Eastham, 1s. each single journey.
When carried between Latchford locks and Eastham, 6d. each single journey.
When carried between places not stated above, ½d. per mile per passenger.
Maximum charge (single journey), 1s. per passenger.
Minimum charge (single journey), 1d. per passenger.

4. *Pilotage* within the canal is not compulsory; but when desired, the company, being the official pilotage authority for the canal, furnishes licensed pilots at the following rates of charges:

Manchester Canal pilotage charges.

	£	s.	d.
Vessels up to 300 tons, net register	0	10	0
Vessels over 300 tons and up to 600, net register	1	0	0
Vessels over 600 tons and up to 1,200, net register	1	10	0
Vessels over 1,200 tons, net register	2	0	0

And in addition thereto a sum at the rate of 1s. per mile, or portion of a mile, for the distance navigated when loaded, and 6d. per mile, or portion of a mile, when in ballast.

Vessels moving from one point to another on the canal without leaving or entering the waterway pay one-half of the above pilotage charges and the full mileage rate of 1s. per mile. Additional pilotage charges are collected for extra service or for the extra time pilots may be held by the detention of vessels.

5. *Loading and unloading charges.*—The canal company has the exclusive right to supply the labor required for loading and discharging vessels; but arrangements may be made by the master of the vessel with the canal company to allow the vessel's crew to load and discharge cargo under the regulations prescribed by the canal company. If the canal company supplies the labor, it is entitled to charge for such services "the actual cost of labor, a proportionate cost of the wages of foremen, of office expenses and material, and in addition a sum of 10 per cent on such amounts, and also a premium to cover liabilities for accidents and losses which until further notice will be after the rate of 5 per cent." If the work is performed by the company at cost plus 10 per cent, the vessel owner must reimburse the company for any damages payable for accident; if the work is done for cost plus 15 per cent, the company assumes all risks that may be incurred under the workmen's compensation act.

For the convenience of vessel owners fixed schedules of loading and unloading charges are quoted by the company. General commodities are grouped into seven classes with charges as follows:

Manchester Canal rates for loading and discharging in ordinary working hours.

Class of traffic.	At per ton actual gross weight of 2,240 pounds.	
	Discharging.	Loading and trimming or stowing.
	s. d.	*s. d.*
Class No. 1, in bulk	0 7½	0 11
Class No. 2, in bulk	0 8	0 11
Class No. 3:		
In packages	0 9	1 0
In bulk	1 0	1 3
Class No. 4:		
In packages	1 0	1 3
In bulk	1 3	1 6
Class No. 5:		
In packages	1 3	1 6
In bulk	1 6	1 9
Class No. 6, mixed general cargo	1 0	1 6
Class No. 7, traffic not otherwise specified	[1]	[1]

[1] By arrangement.

There are special schedules of loading and unloading charges for coal, lumber and wood products, grain, pig iron, salt, and pitch. Additional charges are also made for overtime, and for the issue of coal weight certificates, for the use of lifts and cranes, and for whatever extra services may be performed.

6. *Quay porterage charges.*—The canal company has exclusive control of the handling of freight on the wharves, and it publishes a fixed schedule of "quay porterage charges" payable by merchants. Appendix VI to this volume, which contains the entire "Schedule of rates of toll and wharfage payable by merchants," gives in detail the wharfage regulations and the porterage charges applicable to the various commodities handled on the wharves. January 1, 1912, because of increased labor costs, all the porterage charges were increased 10 per cent. No porterage charges are collected when freight is discharged from or to a vessel directly to or from freight cars, trucks, or barges. Such direct handling of freight is encouraged, but is not guaranteed by the company.

7. *Tolls on cargo.*—In addition to the ship dues, etc., levied on the vessel, the Manchester Ship Canal Co. charges tolls on the cargo payable by the consignees and shippers. These tolls upon commodities yield most of the company's revenues, the "ship dues" being made light to induce vessels to come to Manchester. The tolls upon cargo shipped or received at points along the Manchester Canal are fixed with reference to two conditions: (1) The canal, as has been explained, is divided into three sections, and the tolls on cargo are different for each of these sections. (2) Different commodities are charged different tolls. The canal company publishes a schedule of tolls on live stock, one for minerals and merchandise, and another applicable to minerals and merchandise not provided for in the previous schedule. The rates in the last of these schedules are based on the board of trade classification of minerals and merchandise and upon the general railway freight classification, the tolls varying according to the class of freight and the section of the canal in which the goods are loaded or discharged.

General schedule (per ton) of Manchester Canal tolls applicable to minerals and merchandise not provided for in other schedules.

Description of merchandise.	Between Eastham and— Runcorn. A.	Latchford. B.	Manchester C.
	s. d.	*s. d.*	*s. d.*
Class A	0 6	0 9	1 0
Class B	1 0	1 6	2 0
Class C	1 6	2 3	3 0
Class 1	2 0	3 0	4 0
Class 2	2 6	3 9	5 0
Class 3	3 0	4 6	6 0
Class 4	3 6	5 3	7 0
Class 5	4 0	6 0	8 0

The tolls on live stock and on specified minerals and other commodities are stated in Appendix VI.

8. *Miscellaneous charges.*—There are various miscellaneous sources from which the canal company obtains revenue. A "transshipment charge" is collected when goods are transshipped from one vessel to another in company cars or barges. When imported goods are warehoused or yarded by the company at the docks, a "warehousing charge" is collected in addition to the quay porterage charge; but if the company allows goods to remain where landed on the quay, the warehousing rate is substituted for the quay porterage rate. There is a special schedule for the storage of imported goods in the bonded warehouse, and another for the storage of dutiable imported goods in the "customs transit depot," while such goods remain at the docks. If the company is required to perform the service of transportation, it collects a "haulage charge" for use of its cars and dock railways, and for the haulage of the cars. If such cars are detained longer than 24 hours after arrival either in loading or unloading a "demurrage charge" is collected. Goods for export may be left at the dock at the owner's risk for one month free of charge, after which the company may store them and collect for the extra services performed, as well as for storage in the warehouses.[1]

Certain capital receipts are also secured from the sale of land and plants; about £2,200 is annually obtained for supplying water to vessels; and small amounts from renting lights to shipowners, who do not themselves provide lights and attendance.

V. Receipts and Expenses of the Manchester Canal Co.

The total gross receipts of the Manchester Canal, not including the income of the Bridgewater canals, as shown in Table III, have increased from £97,901 in 1894 to £580,841 in 1911. The increase during the decade 1901 to 1911 was 87.6 per cent, being in excess of the rate of growth in the volume of sea-borne traffic.

Table III.—REVENUES AND EXPENSES OF THE MANCHESTER SHIP CANAL (SHIP CANAL DEPARTMENT), 1894–1911.

Years.	Gross receipts.	Operating expenses.	Net revenue.	Years.	Gross receipts.	Operating expenses.	Net revenue.
1894	£97,901	£78,880	£19,022	1903	£397,026	£230,848	£166,178
1895	137,474	115,329	22,145	1904	418,043	240,295	177,748
1896	182,330	182,266	64	1905	449,436	246,746	202,690
1897	204,664	186,550	18,114	1906	498,837	264,185	234,652
1898	236,225	177,727	58,498	1907	535,585	275,814	259,771
1899	264,775	191,164	73,611	1908	506,975	264,842	242,133
1900	290,830	207,079	83,751	1909	534,059	267,384	266,675
1901	309,517	207,455	102,062	1910	555,735	276,749	278,986
1902	358,491	217,537	140,954	1911	580,841	305,977	274,864

(1) For warehousing, transshipment, customs transit depot, and other schedules see Appendix VI.

Table III also states the total working expenses of the ship canal. From £78,880 in 1894, they increased to £305,977 in 1911, or 287 per cent; and during the last decade they have risen 47.4 per cent. The net revenue, or difference between gross receipts and working costs, increased from £19,022 in 1894 to £274,864 in 1911, the gain being 169 per cent for the last decade. The working costs of the canal have, on the whole, increased at a less rapid rate than have the gross receipts, and the net revenue available for interest and dividends has gradually risen. The operating expenses in 1911 were £29,227 in excess of what they were in 1910, because of the prolonged coal strike in Yorkshire, and the net revenue of the company was £4,122 less in 1911 than in the previous year.

Table IV contains the gross income account for the calendar year 1911 of the ship canal and the Bridgewater Canals, separately stated; and states the relative amounts received from the various sources of revenue. On the ship canal but £40,780 was collected from the ship dues, as compared with £409,589 from tolls and wharfage on merchandise, £61,053 on minerals and £1,636 on live stock.

TABLE IV.—GROSS INCOME ACCOUNT OF MANCHESTER CANAL CO., 1911.

Dr. — Expenditures.	£ s. d.	£ s. d.
SHIP CANAL.		
To maintenance	104,356 1 10	
Traffic expenses	99,904 13 10	
General charges	28,648 15 8	
Working of locks, sluices, swing bridges, ferries, etc	22,720 13 9	
Law charges	1,479 11 8	
Working of dock labor, railways, and foreign animal wharf	4,718 4 4	
Parliamentary expenses	135 16 4	
Compensation (accident and losses)	6,973 1 11	
Rates and taxes	16,537 11 5	
Rents	18,904 11 4	
Additional police force during strike at docks	1,598 3 0	
	305,977 5 1	
Balance carried down	274,864 2 5	
	580,841 7 6	
BRIDGEWATER CANALS.		
To maintenance	11,812 4 3	
Traffic expenses	209,354 5 3	
General charges	8,308 10 11	
Law charges	365 17 1	
Rates and taxes	8,344 18 1	
Rents	14,575 5 1	
	252,761 0 8	
Balance carried down	24,373 19 0	
	277,134 19 8	
Balance carried to net revenue account	....	299,238 1 5

Cr. — Receipts.	£ s. d.	£ s. d.	£ s. d.
SHIP CANAL.			
By tolls and wharfage:			
Merchandise	409,589 2 9		
Minerals	61,053 6 8		
Live stock	1,636 0 11		
Passengers	463 3 6		
Ship dues, etc	40,780 4 11	513,521 18 9	
Water supplied to ships	2,244 11 0		
Rents	44,658 2 10		
Sundry receipts (including towage, £16,062)	20,068 7 5		
		66,971 1 3	
		580,493 0 0	
Transfer fees	....	348 7 6	
		580,841 7 6	
Balance brought down (ship canal account)	....	....	274,864 2 5
BRIDGEWATER CANALS.			
By freight and haulage	209,271 0 4		
Tolls, dockage, etc	56,424 2 6		
Porterage, cartage, wharfage, and sundry receipts	29,909 4 8		
		295,604 7 6	
Less paid out	....	28,737 4 6	
		266,867 3 0	
Rents	....	10,267 16 8	
		277,134 19 8	
Balance brought down (Bridgewater account)	....	....	24,373 19 0
			299,238 1 5

The company's heaviest items of expense are for maintenance and traffic. Table V divides the maintenance costs into their four leading accounts.

Table V.—MANCHESTER CANAL, EXPENSES FOR MAINTENANCE OF WAY, WORKS, ETC. (SHIP CANAL), 1911.

	£ s. d.
Salaries, office expenses, and superintendence	6,791 2 4
Dredging	45,245 8 1
Maintenance and renewal of canal and railways	22,701 13 1
Repairs of hydraulic and electric lighting, installations, locks, roads, bridges, and works	29,617 18 4
Total	104,356 1 10

Table VI contains an itemized statement of the "traffic expenses" of the ship canal. This account does not include the same items as does the similarly designated account in the books of American railways; for it includes not only the expenses of developing traffic, but also many of the chief operating expenses. It does not, however, contain the cost of working locks, sluices, swing bridges, and ferries.

Table VI.—MANCHESTER CANAL, TRAFFIC EXPENSES (SHIP CANAL), 1911.

		£ s. d.
Salaries of general superintendent and staff and wages		51,517 10 11
Commission, agencies, etc		11,749 12 0
Printing and stationery		3,327 5 7
Upper Mersey dues		476 9 6
Working of tugs, wages, stores, repairs and renewals, and hire		22,778 0 4
Working of steam launches—wages, stores, repairs, etc		228 18 9
Electric lighting at docks		4,365 7 0
Gas and water		3,335 2 11
Postage, etc		1,026 7 3
Traveling expenses		899 11 2
Clothing		363 14 3
Advertising		1,566 8 2
Miscellaneous		2,534 9 3
		104,168 17 1
Working of dock labor, railways, and foreign animal's wharf:	£ s. d.	
Receipts	175,220 3 6	
Expenditures	170,956 0 3	4,264 3 3
Total		99,904 13 10

Other important sources of expenditure, as shown in Table IV, are general charges, taxes, and rents. General charges include directors' fees, auditors' fees, and public accountants' charges, salaries of secretary and accountant, land agent and staff office expenses, telephone rent, general traveling expenses, and fire insurance.

Table VII, which contains the net revenue account of the company, shows in detail how the net revenue was disposed of during the calendar year 1911:

TABLE VII.—MANCHESTER CANAL CO., NET REVENUE ACCOUNT (1911).

Dr.	£ s. d.	Cr.	£ s. d.
To interest on first mortgage debenturess	65,485 0 0	By balance from previous year's account	2,107 4 2
Interest on second mortgage debentures	24,000 0 0	Balance brought from gross revenue account	299,238 1 5
Interest on 3½ per cent perpetual debenture stock	7,000 0 0	Bankers and general interest	3,349 15 11
Interest on 4 per cent perpetual debenture stock	14,000 0 0		
Interest on mortgage of surplus lands	2,000 0 0		
Interest on new mortgage debentures (corporation of Manchester)	160,000 0 0		
Rent of transit shed, Dock No. 8	6,260 10 0		
Rent of Dock No. 9 and transit sheds	25,000 0 0		
Balance to next half year	949 11 6		
	304,695 1 6		304,695 1 6

Although the company has not, until recently, been able to pay all the interest on the debentures held by the city of Manchester, its position has gradually become stronger. The stockholders of the company have thus far received no dividends on their investment, but many of them are local business men who have gained materially by direct shipments through the canal or by lower railroad rates. The railroad rates on imported goods from Liverpool to Manchester are now about one-third of what they were before the ship canal was opened.

The Manchester Ship Canal Co. has had three difficulties to contend against: The competition with rival carriers, the necessity of making costly improvements, and the expense of keeping the channel clear of silt.

Concerning the effect of railway competition upon the canal charges and receipts the chairman of the board of directors of the canal company is officially reported to have stated at the shareholders' meeting, February 22, 1912, that—

When powers were obtained to construct the ship canal calculations were made showing that at the prevailing charges for transit from Liverpool to Manchester and vice versa the canal could have offered advantages to merchants and left a very nice balance for the company. It was believed that the charges for the district would remain on that scale, but unfortunately for the shareholders competitors would not let their traffic go without a struggle. They put their charges down so that all calculations of revenue were swept on one side. If the Ship Canal Co. had stood still they would never have got any ships; they had to lower their charges just as competitors lowered theirs. Had the shareholders foreseen this keen competition they might never have put their money into the concern, but then the trade of the district, which had gone up by leaps and bounds, would never have made this progress.

Recently the canal company has suffered by not being able, at times, to secure from the railways as many cars as were needed to handle its traffic. At the meeting of the shareholders just referred to, the chairman of the board of directors stated:

We do not wish to add to our stock of wagons, but I feel sure you will agree with your directors that if we find the trade of our port is again being seriously and perhaps permanently injured by a shortage of wagons, steps must be taken to protect the interests of the company. The position is too serious to be trifled with.

Expenditures for the improvement and enlargement of the canal have been necessary, and will be inevitable. The depth of the canal has been increased from 26 to 28 feet; the channel has gradually been widened and additional docks, wharves, warehouses, transit sheds, railroad equipment and tracks, loading and discharging appliances have been constructed. These expenditures have added to the value of the canal, but have increased the financial burdens of the company. Dredging and other maintenance expenses have also been necessary. In the calendar year 1910, £94,394 were spent on canal maintenance, and of this £43,501 were for dredging.

The future of the Manchester Canal is promising. Its traffic and revenues are steadily increasing. The shareholders have not yet received any dividends, but the net amount available for interest and dividends is gradually increasing. It is probable that all the securities will eventually receive an annual income. The Manchester district has developed rapidly since the opening of the canal, and many of the shareholders have been so assisted by the canal in building up their business enterprises as fully to compensate them for their subscriptions to the canal stock.

NOTE.—See Appendix VI for the schedule of ship dues, etc., payable by vessel owners, and Appendix VII for the schedule of rates of toll and wharfage, etc., payable by merchants. For regulations and by-laws of Manchester Ship Canal, see Appendix No. XXI to the volume on The Measurement of Vessels.

CHAPTER VIII.

THE AMSTERDAM CANAL: CONSTRUCTION, COSTS, AND TRAFFIC.

CHAPTER VIII.

THE AMSTERDAM CANAL: CONSTRUCTION, COSTS, AND TRAFFIC.

I. Construction and Physical Features.

Amsterdam is an inland city located on the Zuider Zee. Formerly, when seagoing vessels were small and the depth of the Zuider Zee was sufficient to accommodate them, Amsterdam was a natural seaport; but as the "Zee" gradually became shallower and the size of the ocean vessels larger, the commercial supremacy of Amsterdam was threatened by the competition of Rotterdam, Antwerp, and north German ports. Early in the nineteenth century the agitation began for a canal which would give Amsterdam a direct route to the ocean; and a corporation constructed the North-Holland Canal. Work was begun in 1818 and completed in 1825. The canal was large enough to accommodate the ships employed in the East India trade, the depth of the waterway being from 20 to 23 feet and its width from 100 to 130 feet. The North-Holland Canal, however, had numerous curves, and it was constructed by way of a roundabout route of 52 miles from Amsterdam northward to the North Sea, whereas Amsterdam is less than 17 miles from the sea by a direct line.

The construction of the North-Holland Canal only temporarily met the needs of Amsterdam for an outlet to the sea; and the inadequacy of the North-Holland Canal emphasized the necessity for a larger and more direct channel to the ocean. In 1863, a concession for the construction of the North Sea Canal was granted to Mr. J. G. Jäger, who transferred the grant to the Amsterdam Canal Co. Construction was begun on March 8, 1865, and the canal was opened November 1, 1876.

The waterway extends from Amsterdam westward to Ymuiden, a distance of 16.7 miles. For three fourths of its length, as is shown by plate 10 at the end of this volume, the channel follows the "Y," an arm of the Zuider Zee. To confine the "Y" and to reclaim adjoining land, the "Y" was narrowed by embankments between which the canal channel was dredged. From the "Y" a cut was made through the dunes to the North Sea, where, at Ymuiden, a commodious harbor was constructed. In the construction of the canal, few serious engineering difficulties were encountered; there were no rivers to be crossed, no towns or industrial properties outside of the city of Amsterdam to block the way, and only three bridges to be built. The work consisted mainly of building embankments, of filling in, draining and reclaiming land, and of dredging the channel. The canal engineers found their chief difficulty in constructing the outer harbor and the moles at Ymuiden. The harbor has a length of nearly 5,100 feet, and a clear inner basin about 850 feet across. The day after the false work of the moles was completed it was damaged, and two years later was destroyed. It then became necessary to lay a granite base for the great concrete blocks which were put down, and fastened together with cement and clamped with iron rods.

Three locks of different sizes were built at Ymuiden. Vessels of 443 feet in length, 52 feet beam, and 23 feet draft could pass through the largest lock; but the channel of the canal did not at first permit the passage of vessels of greater than 5 meters (16.4 feet) draft. Although, as originally planned, the canal had a bottom width of 87.7 feet, and depth of 24.6 feet, or 7.50 meters below the Netherlands datum at Amsterdam, these dimensions were not fully attained until 1880. The normal level of the canal, however, is about one-half meter below the normal water level at Amsterdam; and, in consequence, the actual available depth was only 7 meters (22.9 feet).

The canal was not completed according to the original plans. Extensive enlargements and improvements were early decided upon, in order to enable the large ocean vessels, the size of which was constantly increasing, to reach Amsterdam. A larger lock at Ymuiden, to the north of the old locks, the construction of which was begun in 1889, was completed in 1896 with a length of 225 meters (738.08 feet), a breadth of 25 meters (82.02 feet), and a depth of 9.5 meters (31.2 feet). At that time it was the largest canal lock in the world. Plans are being considered providing for a new lock that will be larger than the Panama locks.

The work of deepening the channel was begun in 1881, the plan of the company being to give the canal a depth of 8 meters (26.24 feet) at ordinary water level; but the execution of the work put a severe strain upon the finances of the company, although the traffic had fulfilled expectations and funds had been received both from the State and from the city of Amsterdam. On account of the financial condition of the company, the State took over the canal in 1883, since which date it has been operated as a public waterway. The depth of 8 meters [1] had been attained when the State took the canal.

The total amount expended upon the canal during the years 1865 to 1883 was 39,880,000 florins ($16,032,000) distributed among the various items as follows:

TABLE I.—COST OF NORTH SEA CANAL (1865-1883).

Items.	Florins.	Total.	Dollars.	Total.
Jetties	8,700,000		3,497,400	
Breakwater along the jetties	3,340,000		1,342,680	
Dredging of the port	4,540,000		1,825,080	
Lighthouse and signal lights	310,000		124,620	
Work on port at Ymuiden		16,890,000		6,789,780
Principal canal and lateral canals	10,650,000		4,281,300	
Locks at Ymuiden	1,530,000		615,060	
Drainage of plain	2,265,000		910,530	
Roads, ferryboats, bridges, etc	715,000		287,430	
Swing bridges	830,000		333,660	
Canal and working accessories		15,990,000		6,427,980
Dredging at Schellingmonde	1,184,000		475,968	
Locks and steam engine with pumps, etc	3,161,000		1,270,722	
Work to the east of Amsterdam		4,345,000		1,746,690
Expropriations and indemnities		1,055,000		424,110
Technical administration		1,600,000		643,200
Total		39,880,000		16,031,760

The completion of the large lock at Ymuiden, in 1896, was followed by work to deepen and widen the channel, for which an appropriation was made by the Government in July, 1899. At the same time funds were provided for the construction of new bridges. The city of Amsterdam also contributed 10 per cent to the cost of the improvements. The work was completed in 1905.

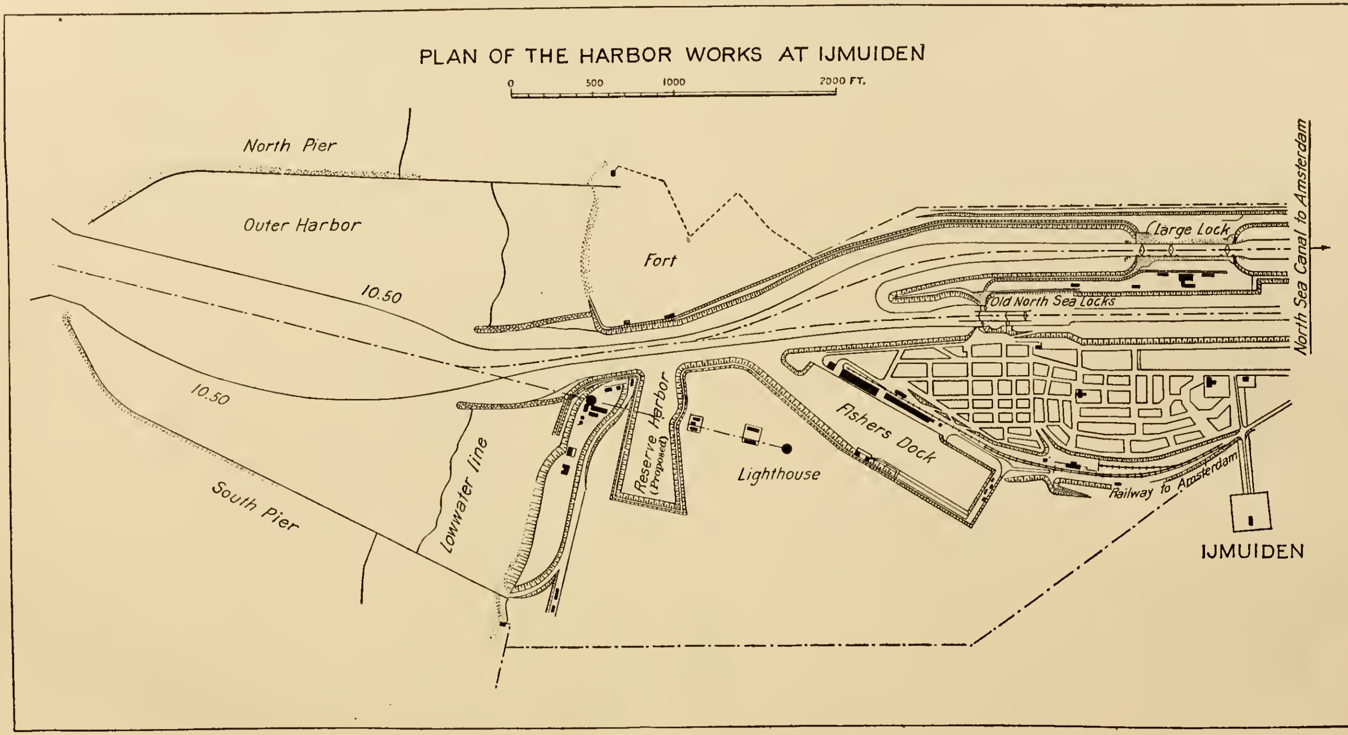
The Ymuiden Harbor and the channel outside of the locks were deepened to 9.80 meters (32.1 feet) below the ordinary North Sea low-water level, and the canal within the locks was deepened to 9.80 [2] meters below the ordinary level of the water in the canal. The normal bottom width of the canal was increased to 50 meters (164 feet), and the width at water level to 120 meters (393.7 feet). At the curves the bottom width is now 60 meters (196.8 feet). The maximum dimensions of vessels passing through the Amsterdam Canal at present are: Length, 220 meters (721.7 feet); breadth, 24 meters (78.7 feet); and draft, 9.20 meters (30.1 feet). The maximum speed for vessels with a draft of 6 meters (19.68 feet) or more is 10.5 kilometers (6.5 miles) per hour. The Amsterdam Canal can now be used by all but a few of the largest seagoing passenger vessels, and it is sufficiently wide to permit large vessels to pass each other at any point, without the need of "lay-bys."

In the year 1896 the fisheries harbor at Ymuiden was opened at a cost of 1,860,000 florins ($747,720). It lies on the south side of the outer canal and has an area of 17½ acres. Alongside the fishers' dock a wharf has been built, with covered fish markets, a storage cellar, coal yards, and other needed facilities. Within a short time Ymuiden became one of the leading fishing ports in Europe. The fishers' docks, the outer channel, and Ymuiden Harbor are charted upon plate C.

[1] This means 8 meters depth at ordinary water. At high water the depth was 8.50 meters when the surface of the water in the canal was at the Amsterdam datum.
[2] 10.30 below the Netherlands water datum at Amsterdam.

34998°—12——10

Plate C.



PLAN OF THE HARBOR WORKS AT IJMUIDEN
0
500
1000
2000 FT.
North Pier
Outer Harbor
Fort
10.50
10.50
South Pier
Lowwater line
Reserve Harbor
(Proposed)
Lighthouse
Fishers Dock
Large Lock
Old North Sea Locks
North Sea Canal to Amsterdam
Railway to Amsterdam
IJMUIDEN

The total amount spent on the improvement of the canal, exclusive of the fisheries harbor, during the period from 1883, when it became a State canal, to 1907, when the main improvements had been completed, was 18,306,411 florins ($7,359,177.22), distributed among the several works according to figures presented in Table II. The total cost of construction and improvement of the canal from its beginning to 1907 was 58,186,411 florins ($23,390,937.22). The small amounts spent upon the canal each year since 1907 are also stated in Table II.

Table II.—CONSTRUCTION AND IMPROVEMENT COSTS OF NORTH SEA CANAL (1883–1911).

	1883–1907		1908		1909		1910		1911	
	Florins.	Dollars.	Florins.	Dollars.	Florins.	Dollars.	Florins.	Dollars.	Florins.	Dollars.
Improvements of jetties	451,307	181,425.41	7,950	3,195.90	190	76.38			7,405	2,976.81
Deepening of the port and outer canal	489,804	196,901.21								
Enlargement of principal canal and lateral canals	3,165,564	1,272,556.73								
New lock at Ymuiden	5,766,583	2,318,166.36								
Replacement of bridge at Velsen by steam ferries	1,017,800	409,155.60								
Replacement of railway bridge by new bridges of greater span	4,748,831	1,909,030.06								
Lighting of channel	185,822	74,700.44								
New installation for drainage to east of Amsterdam	607,523	244,224.25								
Moles at exterior of locks at Zuider Zee, and improvement of the channel	997,044	400,811.69								
Various improvements to the old locks at Ymuiden, to the locks of the Zuider Zee, and to the other canal works	876,133	352,205.47	91,572	36,811.94	69,456	27,921.31	45,684	18,364.97	15,374	6,180.35
Total	18,306,411	7,359,177.22	99,522	40,007.84	69,646	27,997.69	45,684	18,364.97	22,779	9,157.16

To accommodate its trade, the city of Amsterdam has constructed an extensive system of docks and wharves, which are, in reality, a part of the canal; they are its terminal facilities. The eastern dock (consult plate 11 at the end of this volume) is used chiefly by small vessels employed in inland navigation; the western dock is used mainly to accommodate English coal cargoes; and the commercial quay is for large seagoing vessels. The inner dock of the commercial quay facilitates transshipments to lighters and the Rhine barges. Parallel to the commercial quay is the "Y quay," which was originally used by river craft and barges, but has been converted into a second commercial quay. There is an "ore quay" used for the handling and storage of coal and ore; a "railway dock" used by the Holland Railway Co.; an entrepôt dock; a petroleum dock; and a timber dock. There are also naval dockyards, dry docks, yachting berths and shipbuilding yards. The location of other minor docks, the connection of the several docks with the North-Holland Canal, the Merwede (Rhine) Canal, and the Zuider Zee are shown on plate 11. Extensive warehouses are provided by the city, in addition to the private warehouses operated by warehouse companies. The docks are unified by rail connections, and are connected with interior points by the State and private railway systems.

The North Sea Canal and its connection with other waterways and with the railroads are shown on plate 10. The Merwede (Rhine) Canal connects the North Sea Canal (and Amsterdam) with the Rhine, the North-Holland Canal runs to the North Sea through north Holland, the Zaan Canal and River join the North Sea Canal with the city of Zaandam, the Orange Locks with the Zuider Zee, while lateral canals unite the main waterway with Spaarndam, Haarlem, and Hallweg.

II. Traffic of the North Sea Canal.

The gradual increase in the traffic of the Amsterdam Canal is shown in detail in Table III. The gross tonnage of the vessels using it increased from 1,401,128 in 1877 to 8,583,066 in 1911, and the number of vessels during the same period increased from 3,376 to 28,799. During the decade 1901 to 1911, the gross tonnage increased 50.6 per cent and the number of vessels 196 per cent. Of the total gross tonnage in 1911, 7,968,257 tons were of seagoing vessels, the remainder, or 614,809 gross tons, were of fishing and other small craft. In that year there were 4,650 seagoing and 24,149 fishing and other small vessels locked through the locks at Ymuiden. The gross tonnage of the seagoing vessels using the canal increased 43.4 per cent during the decade ending with 1911, although the number of seagoing vessels annually using the canal increased but 4.5 per cent. Of the total vessels locked at Ymuiden in 1911, 14,548 were locked inward and 14,251 outward.

Table III shows also that the gross tonnage entering Amsterdam in 1911 aggregated 3,573,498 gross tons, and was 39.1 per cent in excess of the entrances in 1901 and 316 per cent greater than it was in 1877. In 1911 83.2 per cent of the entire gross tonnage locked inward at the North Sea locks moved through the canal to Amsterdam; but owing to the large number of fishing boats and small vessels engaged in local traffic only 16.2 per cent of the total number of vessels that passed the locks were entered at Amsterdam.

TABLE III.—TRAFFIC OF THE AMSTERDAM CANAL (1877–1911).

Years.	Vessels entering Amsterdam.			Total seagoing vessels locked at North Sea locks.			Fishing and smaller craft locked at North Sea locks.			Total vessels locked at North Sea locks.			Total vessels locked inward at North Sea locks.			Total vessels locked outward at North Sea locks.			Total vessels locked at Zeeburg locks, Merwede Canal.		Total number of vessels locked at Orange locks, entrance to Zuider Zee.
	Number.	Gross tonnage in cubic meters.	Gross tonnage in tons.	Number.	Gross tonnage in cubic meters.	Gross tonnage in tons.	Number.	Gross tonnage in cubic meters.	Gross tonnage in tons.	Number.	Gross tonnage in cubic meters.	Gross tonnage in tons.	Number.	Gross tonnage in cubic meters.	Gross tonnage in tons.	Number.	Gross tonnage in cubic meters.	Gross tonnage in tons.	Number.	Gross tons in cubic meters.	
1877...	1,540	2,432,000	859,363	2,445	3,896,289	1,376,781	931	68,903	24,347	3,376	3,965,192	1,401,128	......	......	......	......	......	......	......	......	90,868
1878...	1,472	3,360,000	1,187,279	2,548	4,348,391	1,536,534	694	28,059	9,914	3,242	4,376,450	1,546,448	1,587	......	......	1,655	......	......	......	......	80,648
1879...	1,526	2,694,000	951,943	2,733	5,181,418	1,830,890	1,280	59,824	21,139	4,013	5,241,242	1,852,029	2,094	......	......	1,919	......	......	......	......	73,879
1880...	1,611	2,947,000	1,041,342	2,958	5,717,986	2,020,490	1,537	146,336	51,708	4,495	5,864,322	2,072,198	2,281	......	......	2,214	......	......	......	......	87,763
1881...	1,685	2,220,000	784,452	3,136	6,142,873	2,170,627	1,467	168,822	59,654	4,603	o,311,695	2,230,281	2,337	......	......	2,266	......	......	......	......	78,399
1882...	1,702	3,505,000	1,238,515	3,191	7,038,639	2,487,152	1,483	77,941	27,541	4,674	7,116,580	2,514,693	2,353	......	......	2,321	......	......	......	......	81,568
1883...	1,607	3,624,000	1,281,565	3,121	7,320,665	2,586,808	2,473	155,610	54,985	5,594	7,476,275	2,641,793	2,821	......	......	2,773	......	......	......	......	91,253
1884...	1,698	3,889,000	1,374,205	3,417	8,045,227	2,842,837	2,019	111,770	39,494	5,436	8,156,997	2,882,331	2,660	......	......	2,776	......	......	......	......	84,629
1885...	1,635	3,923,000	1,386,219	3,213	8,180,103	2,890,496	2,598	144,521	51,067	5,811	8,324,624	2,941,563	3,067	......	......	2,744	......	......	......	......	86,033
1886...	1,576	3,702,000	1,308,127	3,170	7,960,317	2,812,833	2,772	104,048	36,766	5,942	8,064,365	2,849,599	3,090	......	......	2,852	......	......	......	......	85,239
1887...	1,600	3,693,000	1,304,947	3,323	8,111,080	2,866,106	2,933	103,652	36,625	6,256	8,214,732	2,902,731	3,237	......	......	3,019	......	......	......	......	89,437
1888...	1,576	3,824,000	1,351,236	3,335	8,543,001	3,015,195	3,524	120,520	42,586	6,859	8,663,521	3,061,314	3,582	......	......	3,277	......	......	......	......	77,638
1889...	1,642	3,964,000	1,400,706	3,682	8,793,400	3,107,208	3,112	97,611	34,491	6,794	8,891,011	3,141,699	3,560	......	......	3,231	......	......	......	......	84,709
1890...	1,675	4,200,000	1,484,099	3,685	9,287,691	3,281,870	4,067	140,421	49,618	7,752	9,428,112	3,331,488	4,238	......	......	3,514	......	......	......	......	79,766
1891...	1,723	4,576,000	1,616,961	3,814	10,062,795	3,555,758	4,335	164,709	58,201	8,149	10,227,504	3,613,959	4,286	......	......	3,863	......	......	......	......	106,818
1892...	1,632	4,554,000	1,609,187	3,688	10,309,919	3,643,081	4,355	175,219	61,914	8,043	10,485,138	3,704.995	4,507	......	......	3,536	......	......	......	......	94,063
1893...	1,558	4,515,000	1,595,406	3,670	10,027,576	3,543,309	5,168	200,077	70,698	8,843	10,227,653	3,614,007	4,780	......	......	4,063	......	......	28,560	2,546,970	88,991
1894...	1,666	4,936,000	1,744,169	3,960	10,949,161	3,868,962	5,633	245,870	86,879	9,593	11,195,031	3,955,841	5,206	......	......	4,387	......	......	31,049	2,824,159	88,014
1895...	1,676	4,988,000	1,762,544	4,429	11,372,415	4,018,521	6,495	273,691	96,710	10,924	11,646,106	4,115,231	5,772	......	......	5,152	......	......	30,674	2,781,709	71,698
1896...	1,848	5,577,000	1,970,671	4,352	12,399,468	4,381,438	6,439	303,910	107,388	10,791	12,703,378	4,488,826	6,044	6,361,670	2,247,939	4,747	6,331,708	2,240,887	37,283	3,462,778	74,327
1897...	1,940	6,153,000	2,174,204	4,723	13,869,476	4,900,875	4,739	181,832	64,251	9,462	14,051,308	4,965,126	5,087	7,042,807	2,488,624	4,375	7,008,501	2,476,502	37,100	3,671,946	71,060
1898...	1,871	6,076,000	2,146,996	4,537	13,408,147	4,737,861	5,777	257,736	91,072	10,314	13,665,883	4,828,933	5,303	6,845,674	2,418,966	5,012	6,820,209	2,409,967	40,145	4,400,095	74,151
1899...	2,024	7,004,000	2,474,911	5,157	15,434,202	5,453,782	4,831	245,032	86,583	9,988	15,679,234	5,540,365	5,440	7,887,033	2,786,937	4,548	7,792,201	2,753,428	36,722	4,433,357	74,777
1900...	2,111	7,060,000	2,494,699	5,223	15,751,324	5,565,839	4,647	263,746	93,196	9,870	16,015,070	5,659,035	5,113	7,963,170	2,813,840	4,757	8,051,900	2,845,195	44,155	4,737,320	71,667
1901...	2,207	7,270,000	2,568,904	4,447	15,726,767	5,557,161	5,267	394,863	139,527	9,714	16,121,630	5,696,688	5,185	8,035,566	2,839,422	4,529	8,086,064	2,857,266	47,027	5,030,434	68,787
1902...	2,041	7,342,000	2,594,346	4,246	16,222,827	5,732,447	12,320	1,094,523	386,757	16,566	17,317,350	6,119,204	8,451	8,639,644	3,052,877	8,115	8,677,706	3,066,327	48,521	5,363,111	67,407
1903...	1,977	7,228,000	2,554,063	4,017	16,062,090	5,672,120	10,139	739,954	261,467	14,156	16,792,044	5,933,587	7,323	8,396,283	2,966,884	6,833	8,395,761	2,966,703	50,251	5,664,996	72,767
1904...	2,123	7,769,000	2,745,229	4,184	16,852,719	5,955,014	11,690	1,289,082	455,506	15,874	18,141,801	6,410,520	8,262	9,111,558	3,219,631	7,612	9,030,243	3,190,889	50,477	5,922,357	66,674
1905...	2,233	8,042,000	2,841,696	4,393	17,833,694	6,301,659	14,756	1,907,499	674,027	19,149	19,741,193	6,975,686	9,745	9,823,067	3,471,048	9,404	9,918,126	3,504,638	51,073	6,021,125	63,861
1906...	2,373	8,599,000	3,038,515	4,579	18,914,310	6,683,502	21,325	2,088,328	737,925	25,904	21,002,638	7,421,427	12,947	10,482,236	3,703,970	12,957	10,520,402	3,717,457	54,415	6,523,713	67,382
1907...	2,368	8,702,000	3,074,911	4,474	19,055,530	6,733,402	18,085	1,549,450	547,508	22,559	20,604,980	7,280,910	11,452	10,276,286	3,631,196	11,107	10,328,694	3,649,714	52,692	6,569,190	65,262
1908...	2,428	9,620,000	3,399,293	4,586	20,908,262	7,388,078	17,399	1,398,809	494,243	21,985	22,307,071	7,882,321	11,169	11,176,418	3,949,264	10,816	11,130,653	3,933,057	52,236	6,927,425	64,801
1909...	2,388	9,675,000	3,418,727	4,623	21,359,727	7,547,606	25,361	1,717,648	606,942	29,984	23,077,375	8,154,548	15,084	11,472,837	4,054,000	14,900	11,604,538	4,100,548	54,350	7,537,646	62,432
1910...	2,288	10,074,000	3,559,717	4,602	22,187,037	7,839,942	23,307	1,627,595	575,121	27,909	23,814,632	8,415,063	14,056	11,878,722	4,197,428	13,853	11,935,910	4,217,635	57,979	8,358,977	61,733
1911..	2,360	10,114,000	3,573,498	4,650	22,550,167	7,968,257	24,149	1,739,909	614,809	28,799	24,290,076	8,583,066	14,548	12,146,130	4,291,918	14,251	12,143,946	4,291,148	59,148	8,986,501	64,875

The localities from which the vessels entered the canal are indicated by Table IV. The special importance of Amsterdam as an ocean port is in the over-sea trade with the Orient, Australia, and the Americas, 39.9 per cent of the total entrances in 1911 originating in these regions taken together. Twenty-eight and six-tenths per cent of the entrances came from Great Britain, Portugal, and the Atlantic ports of France and Spain. The remaining entrances—31.5 per cent—which include vessels from the Mediterranean and Black Seas, Norway and Sweden, the Baltic Sea, White Sea, and Gulf of Finland, vessels in coasting and inland navigation, and those in miscellaneous short voyages, are classified by country of origin in Table IV.

Table IV.—CLASSIFICATION OF ENTRANCES AT AMSTERDAM.

Origin.	1909		1910		1911		Percent of total in 1911.
	Number.	Gross tonnage in cubic meters.	Number.	Gross tonnage in cubic meters.	Number.	Gross tonnage in cubic meters.	
I. Asia, Australia, and America	308	3,794,391	314	4,091,599	307	4,044,301	39.9
II. Mediterranean and Black Seas, etc	118	515,875	121	639,632	145	753,510	7.5
III. Great Britain, France, Spain (Atlantic coast) and Portugal	1,041	3,070,949	940	2,825,436	963	2,899,104	28.6
IV. Sweden and Norway	128	412,093	132	398,899	117	332,839	3.3
V. Baltic and White Seas, and Finland Gulf, etc	233	849,718	288	977,066	309	1,047,203	10.4
VI. Short voyages	212	603,244	214	661,483	213	632,893	6.3
VII. Coasting and inland navigation	348	428,794	279	480,445	306	403,893	4.0
Total	2,388	9,675,064	2,288	10,074,560	2,360	10,113,743	100.0
Sailing vessels	149	85,055	130	112,625	195	111,879	1.1
Steamships	2,239	9,590,009	2,158	9,961,935	2,165	10,001,864	98.9

The nature of the cargo carried in the vessels entering Amsterdam via the North Sea Canal is shown in Table V. In 1911, 65.3 per cent of the entrances consisted of vessels carrying general and mixed cargoes, 8.5 per cent of vessels loaded with timber, and 6.2 per cent of vessels with coal and coke. The remaining 20.0 per cent of the entrances consisted of vessels carrying grain, rice, linseed, petroleum, ore, phosphate, sugar, porcelain clay, salt, and passengers. There were 348 vessels that entered in ballast.

Table V.—NUMBER OF VESSELS ENTERING AMSTERDAM (FOR THE MOST PART VIA THE NORTH SEA CANAL) CLASSIFIED ACCORDING TO CARGOES.

Kind of cargo.	Number of vessels.			
	1908	1909	1910	1911
General and mixed	1,469	1,455	1,504	1,542
Grain, rice, and linseed	60	55	37	21
Timber	170	186	213	202
Petroleum	29	26	21	19
Ore	15	8	14	6
Coal and coke	252	255	131	146
Passengers	2	1	2	1
Phosphate	7	6	10	10
Sugar	4	5	10	13
Porcelain clay	26	10	28	32
Salt	12	11	11	12
Timber and grain	....	....	....	8
In ballast (without cargo)	382	370	307	348
Total	2,428	2,388	2,288	2,360

The clearance statistics of Amsterdam are less satisfactory, as they do not state the tonnage of vessels leaving the port. Table VI, however, shows the number of vessels clearing to their various destinations. As the trade of the Netherlands with the Orient, Australia, and the Americas consists more largely of imports than of exports, and, as the exports, because of their volume and nature, do not require so large a tonnage, the clearances to these countries comprised but 6.2 per cent of the total in 1911. The clearances to Great Britain, however, aggregated 49.1 per cent, to Germany 16.6 per cent, and to other nearby countries 26.8 per cent.

Table VI.—NUMBER OF VESSELS CLEARING FROM AMSTERDAM, MAINLY VIA THE NORTH SEA CANAL, CLASSIFIED ACCORDING TO DESTINATION.

Destination.	1909		1910		1911	
	Total number.	In ballast.	Total number.	In ballast.	Total number.	In ballast.
Great Britain	1,235	452	1,156	373	1,136	362
Germany	335	20	387	37	383	31
Denmark	16	1	15	1	9	1
Norway	56	2	60	1	54	3
Sweden	23	....	30	7	28	7
Russia	38	14	42	10	38	15
Belgium	22	8	20	7	34	27
France	34	2	33	4	30	1
Spain and Portugal	48	....	42	....	53	1
Italy	36	....	45	....	38	....
Mediterranean, Greece, Turkey, Levant, Danube, and Egypt	50	....	51	....	55	1
Africa	1	....	....	....	....	....
East Indies	76	2	84	2	82	....
West Indies	26	....	27	1	27	1
British Indies	4	4	....	....	....	....
Australia	....	....	2	....	1	....
North America and Canada	25	18	18	14	21	13
South America	32	2	37	3	39	1
North Sea (to fish)	50	50	4	4	3	....
Dutch ports	278	253	255	243	281	261
China	....	....	....	....	....	....
Madeira	....	....	....	....	....	....
Algiers	2	1	....	....	....	....
Austria	1	....	2	....	....	....
Total	2,388	829	2,310	707	2,312	725

In 1911, 1,507 of the vessels clearing from Amsterdam were loaded with general cargo, 12 with coal or coke, 10 with phosphate, and 21 with tar oil.

A large share of the commerce using the North Sea Canal to and from Amsterdam is transshipped at the city. It comes from or is destined to inland points in Europe. The rail and waterway connections of Amsterdam enable the city to retain a share of the through business, even though Rotterdam, Antwerp, and North German ports have become of greater importance in the foreign and coasting trades. Table III, above, shows that the locks at Zeeburg, the Amsterdam terminus of the Merwede Canal, which connects the port with the Rhine River, passed 59,148 vessels, with a gross tonnage in cubic meters of 8,986,501, in 1911; and in the same year the Orange locks, which lead to the Zuider Zee, passed 64,875 vessels. Of the vessels passing through the Merwede Canal, 3,357, with a gross tonnage of 2,016,953 in cubic meters, were Rhine vessels, and the remainder small inland craft.

The types of vessels entering and clearing the North Sea locks are shown in Table VII. Ninety-nine per cent of the seagoing tonnage passing the Ymuiden locks in 1911 was of steamers.

Table VII.—TYPES OF VESSELS PASSING THROUGH THE NORTH SEA LOCKS AT YMUIDEN, 1911.

Type of vessel.	From the sea.		To the sea.	
	Number.	Gross tons (cubic meters).	Number.	Gross tons (cubic meters).
A. Seagoing vessels:				
Sailing vessels	60	92,837	55	100,392
Steamships	2,268	11,177,762	2,267	11,179,176
Total	2,328	11,270,599	2,322	11,279,568
B. Small coasting vessels:				
Tjalks[1]	1,164	151,320	1,119	142,856
Fishing boats	2,653	221,501	2,467	213,640
Other vessels	8,403	502,710	8,343	507,882
Total	12,220	875,531	11,929	864,378
Grand total	14,548	12,146,130	14,251	12,143,946

[1] Flat-bottomed vessels.

The nationality of most of the vessels using the North Sea Canal is shown in Table VIII, which classifies by flags the vessels which entered and cleared at Amsterdam in 1911. The table does not include the vessels that passed through the locks at Ymuiden without entering at Amsterdam. It is also possible that a few of the vessels that are recorded as having entered or cleared at Amsterdam may not have used the North Sea Canal.

Table VIII.—NATIONALITY OF VESSELS ENTERING AND CLEARING AT AMSTERDAM.

Flag.	1910		1911	
	Entered.	Cleared.	Entered.	Cleared.
Dutch	1,155	1,172	1,284	1,237
British	598	598	551	548
German	260	263	250	253
Norwegian	137	139	133	132
Swedish	83	81	69	72
Danish	23	22	33	32
Russian	11	12	15	14
Spanish	1	2	3	3
Italian	1	2	3	4
French	1	1	1	1
Austrian	4	4	4	4
Belgian	14	14	13	11
American	....	....	1	1
Total	2,288	2,310	2,360	2,312

The traffic of the North Sea Canal has not increased so rapidly as has that of other large sea canals. It had a growth of 50.6 per cent in the total gross tonnage and of 43.4 per cent in the gross tonnage of seagoing vessels during the decade 1901 to 1911, as compared with an increase of 69.3 per cent in the net tonnage using the Suez Canal, and increases of 97.2 per cent and 70.7[1] per cent, respectively, in the net tonnage using the Manchester Ship and Kaiser Wilhelm Canals. Amsterdam is less favorably situated than are Rotterdam, Antwerp, and the North German ports for engaging in the transshipment trade with the interior. Though Manchester, like Amsterdam, is an interior port, it is the center of an industrial district of far greater importance than that surrounding Amsterdam.

The importance of the North Sea Canal is, however, not to be measured solely by the relative volumes of traffic handled by it and other ship canals. Its success is shown rather by the fact that the city of Amsterdam has continued to have a large transshipping business and that the city has remained one of the great markets of Europe. Amsterdam has lost ground, relatively to other cities, but its trade has increased greatly. In

[1] Decade 1900 to 1910.

view of Amsterdam's geographical position, the advance of 43.4 per cent in the seagoing tonnage of the North Sea Canal during the decade ending with 1911 is substantial. As stated by the Amsterdam Chamber of Commerce and Industry: "One thing is not open to contradiction—that Amsterdam ranks first among Holland's towns. Although as a transit port she has to yield the palm to Rotterdam, as the staple for Holland's commerce she is the first; as an import harbor for colonial produce she is, for some articles, even the first in Europe."

III. Expenditures and Revenues in Connection with the North Sea Canal.

The Amsterdam Canal was originally constructed by a private company, to which the State and the city of Amsterdam gave financial aid. The company secured revenue from canal tolls and harbor dues, and from the sale of lands which were reclaimed by the "Y" embankments. The silting of the canal channel, however, made the construction and maintenance expenses greater than was anticipated; and the tolls, though so high as to be regarded a burden on trade, did not yield enough revenue to make the company financially solvent. In 1883 the State purchased the canal, in order thereby to safeguard the future development of Amsterdam.

The State did not immediately abolish the canal tolls and harbor dues, although it reduced them in 1885; but in 1890 the tolls on vessels bound for Amsterdam and Zaandam—the two municipalities having made a partial contribution therefor to the State—were abolished, and in 1893 all tolls and all harbor dues at Ymuiden, the canal port maintained by the State, were done away with.

The revenue received from the canal tolls and the Ymuiden Harbor dues from 1876 to 1890 are stated in Table IX. The average annual cost of maintaining and operating the canal during the years 1883 to 1887 was 349,595 florins ($140,537). Most tolls were abolished in 1890.

Table IX.—RECEIPTS FROM NORTH SEA CANAL TOLLS AND HARBOR DUES, 1876–1890.

Year.	Florins.	Dollars.	Year.	Florins.	Dollars.
1876	11,689.96	4,699.36	1884	296,478.52	119,184.36
1877	182,640.95	73,421.66	1885	241,908.73	97,247.31
1878	174,623.29	70,198.56	1886	231,193.07	92,939.62
1879	203,796.48	81,926.18	1887	240,310.30	96,604.74
1880	230,045.96	92,478.48	1888	247,104.71	99,336.09
1881	240,424.10	96,650.49	1889	241,192.13	96,959.24
1882	283,208.66	113,849.88	1890	130,348.89	52,400.25
1883	290,857.43	116,924.69			

The cost of maintaining and operating the Amsterdam Canal is shown in Table X. The chief expense is for maintaining the depth of the channel and the port outside of the locks. The expenditures stated in the table do not include the $7,454,705 that were spent for construction and permanent improvements during the period 1883 to 1911.

Table X.—COST OF OPERATION AND MAINTENANCE OF NORTH SEA CANAL.

	Total, 1883 to 1906.		Annual average.					
			1883 to 1906.		1883 to 1887.		1902 to 1906.	
	Florins.	Dollars.	Florins.	Dollars.	Florins.	Dollars.	Florins.	Dollars.
Maintenance of jetties or moles	354,324	142,438.25	14,763	5,934.73	20,450	8,220.90	13,960	5,611.92
Maintenance of depth of port and canal outside of the locks	5,560,518	2,235,328.23	231,688	93,138.57	233,530	93,879.06	312,190	125,500.38
Maintenance of principal canal and lateral canals:								
Dredging	367,903	147,897.01	15,329	6,162.26	14,770	5,937.54	11,343	4,559.89
Embanking	163,872	65,876.54	6,828	2,744.86	10,765	4,327.53	7,862	3,160.52
Maintaining	257,759	103,619.12	10,740	4,317.48	16,090	6,468.18	12,596	5,063.59
Maintenance of locks, bridges, ferries, buildings, etc	991,756	398,685.91	41,323	16,611.84	26,175	10,522.35	67,740	27,231.48
Operation of locks, bridges, ferries, lighting plant, etc. (wages not included) [1]	527,714	212,141.03	21,989	8,839.58	15,935	6,405.87	43,970	17,675.94
Drainage of water	273,254	109,848.11	11,385	4,576.77	11,880	4,815.96	16,535	6,647.07
Total	8,497,100	3,415,834.20	354,045	142,326.09	349,595	140,577.39	486,196	195,450.79

[1] The expenditures for operation of locks, ferries, etc., do not include wages of the personnel, which, in 1907, amounted to $33,173; in 1908, $34,463; in 1909, $34,371; in 1910, $35,237, and in 1911, $36,725.

TABLE X.—COST OF OPERATION AND MAINTENANCE OF NORTH SEA CANAL—Continued.

	1907		1908		1909		1910		1911	
	Florins.	Dollars.	Florins.	Dollars.	Florins.	Dollars.	Florins.	Dollars.	Florins.	Dollars.
Maintenance of jetties or moles	38,765	15,583.53	31,590	12,699.18	31,590	12,699.18	40,090	16,116.18	28,384	11,410.37
Maintenance of depth of port and canal outside of the locks	337,555	135,697.11	337,555	135,697.11	337,555	135,697.11	337,555	135,697.11	342,036	137,498.47
Maintenance of principal canal and lateral canals:										
Dredging	7,700	3,095.40	2,990	1,201.98	1,250	502.50	19,638	7,894.48	28,735	11,551.47
Embanking	7,027	2,824.86	7,700	3,095.40	7,735	3,109.47	7,702	3,096.20	7,841	3,152.08
Maintaining	12,445	5,002.89	9,552	3,839.90	10,827	4,352.45	9,577	3,849.95	11,838	4,758.88
Maintenance of locks, bridges, ferries, buildings, etc	67,802	27,256.40	75,410	30,314.82	70,535	28,355.07	70,458	28,324.12	107,912	43,380.6
Operation of locks, bridges, ferries, lighting plant, etc. (wages not included)[1]	67,277	27,045.35	82,566	33,191.53	65,415	26,296.83	61,528	24,734.25	66,041	26,548.48
Drainage of water	14,234	5,722.07	11,974	4,813.55	11,731	4,715.86	12,293	4,941.79	8,220	3,304.44
Total	552,805	222,227.61	559,337	224,853.47	536,638	215,728.47	558,841	224,654.08	601,007	241,604.81

[1] The expenditures for operation of locks, ferries, etc., do not include wages of the personnel, which, in 1907, amounted to $33,173; in 1908, $34,463; in 1909, $34,371; in 1910, $35,237, and in 1911, $36,725.

The North Sea Canal, with the exception of two railway bridges, which are under the control of the Holland Railway Company, is State property maintained and operated by the Government. The fisheries dock and two of the covered fish markets at Ymuiden are also managed by the State, a duty of 1 per cent being levied on the amount received from the sale of fish to reimburse the Government for maintaining the market facilities.

Various charges must be paid by those who use the North Sea Canal. Seagoing vessels, while navigating the canal, are required to engage a State pilot, as at any Dutch port. Towage is supplied by private towing companies, which maintain tugs at Ymuiden and collect regular charges based upon the tonnage of the vessels served.

The port of Amsterdam is a municipal port, and the municipality levies dues for the use of the harbor in accordance with the following tariff (Table XI):

TABLE XI.—SCHEDULE OF MUNICIPAL HARBOR DUES AT THE PORT OF AMSTERDAM.

	Per cubic meter of vessel capacity (florins).
I. On seagoing vessels, except those under II, III, and IV:	
1. Steamers	0.0425
2. Other seagoing vessels	.06
II. On seagoing vessels loaded with timber, and on herring boats:	
1. Steamers	.03
2. Other seagoing vessels	.04
III. On seagoing vessels loaded with coal, coke, cast iron, clay, or kaolin, and on sea tugs:	
1. Steamers	.025
2. Other seagoing vessels	.035
IV. On seagoing vessels, loaded with iron ore (not including sulphur ore or pyrite) or with pitch only:	
1. Steamers	.0175
2. Other seagoing vessels	.025

On seagoing vessels with a *mixed cargo*, the dues are levied according to the tariff under which the greater part of the cargo falls. The dues are refunded to vessels which have arrived or sailed empty.

The amount collected as harbor dues from seagoing vessels in 1911 was 376,030 florins ($151,164.06). The collections have in recent years increased, the amounts since 1899 being as follows:

	Florins.		Florins.
1899	237,612.45	1906	312,324.25
1900	243,068.57	1907	316,736.59
1901	260,015.13	1908	348,903.45
1902	272,185.04	1909	357,462.37
1903	273,419.41	1910	377,036.03
1904	287,471.71	1911	376,030.12
1905	295,614.89		

The harbor dues on inland vessels yielded 166,879 florins in 1910 and 170,847 ($68,640.49) in 1911. The combined harbor dues on seagoing and inland vessels, in 1911, produced 546,877 florins ($219,844.55).

The majority of the wharves, quays, warehouses, sheds, cranes, lifts, and other port facilities at Amsterdam are owned and operated by the municipality, and charges for their current use are in accordance with regular tariffs. Some navigation companies, however, lease space and facilities from the municipality, paying a rental for the exclusive use of the space and facilities. There are also private companies which do a warehousing business, handle freight to and from the warehouses, arrange to store goods in bond, and to operate cranes and other port appliances. Their charges and services are regulated by the municipality.

The Amsterdam Canal is a free waterway in that no tolls are charged and no harbor dues are collected by the State for the use of the harbor, or port, of Ymuiden. Pilotage fees are collected by the State, towage charges are made by private companies, harbor dues are collected by the municipality of Amsterdam, and rentals and other charges by the municipality and private companies are exacted for the use of wharves, warehouses, loading and unloading appliances, and for all terminal services rendered.

The North Sea Canal is a waterway constructed and maintained primarily to enable Amsterdam and Holland to retain their old-time place in foreign commerce, and particularly in the trade of East India, where Holland has large territorial possessions. The waterway is of such vital importance to Holland that the State is justified in making the canal practically a free highway. It is the only one of the large ocean-ship canals upon which no tolls are charged; and the distinctly national character of the waterway accounts for the exceptional policy of Holland as regards tolls.

The North Sea Canal bears much the same relation to Amsterdam as the improved channel of the Delaware River bears to Philadelphia or the improvements of the lower Mississippi River bear to New Orleans. All three of these cities, formerly natural ocean ports, were threatened with commercial isolation until each was given an improved or artificial channel to the sea. In the case of Amsterdam, the construction of a canal, instead of the improvement of a river channel was necessary, but the purpose of each improvement was the same—to insure the future growth of a port and trade center upon which the prosperity of its surrounding territory was dependent.

PART TWO.

TOLLS AND REVENUE.

CHAPTER IX.

THE BASIS OR UNIT OF TOLL LEVIES UPON MERCHANT SHIPS AND WAR VESSELS.

CHAPTER IX.

THE BASIS OR UNIT OF TOLL LEVIES UPON MERCHANT SHIPS AND WAR VESSELS.

Canal tolls may be levied either upon the ships that use the waterway or upon the cargo and passengers carried by the vessel. If the tonnage of the ship, as distinct from the tonnage of what is in the vessel, be made the basis of the tolls, the charges may be imposed upon the ship's displacement, its gross tonnage, its net tonnage, or its dead-weight capacity. If the cargo in the ship is taken as the basis of tolls, the unit upon which the charges are imposed may be the long ton, the metric ton, or the measurement ton.

The words ton and tonnage are used with so many different meanings as to confuse the layman without expert knowledge of naval and shipping practice; but the terms must be constantly employed in the following discussion of canal tolls and revenue. It seems desirable to introduce this and the following chapters with a concise definition of the several kinds of tons and of the relation of the different tons to each other. In the volume containing the report upon The Measurement of Vessels will be found a full explanation of each kind of vessel ton and an account of the method by which each kind of tonnage is determined.

Vessel Tonnage.

The displacement tonnage of a vessel is its weight in tons of 2,240 pounds and is equal to the weight of water displaced by the ship when floating. From the plans and drawings required for the construction of a vessel may be calculated the number of cubic feet of water which the ship will displace at any given draft. The weight of a cubic foot of sea water being 35 pounds, the displacement tonnage is readily determined. Displacement tonnage is used to designate the size of war vessels, but is not employed for merchant shipping, except by shipbuilders.

A vessel ton is a purely arbitrary unit—100 cubic feet. The gross tonnage of a vessel is obtained by dividing by 100 the number of cubic feet of the entire closed-in capacity of the ship. A vessel has 1 "gross" ton for each 100 cubic feet of its entire capacity. This method of determining gross tonnage dates from 1854.

To establish a uniform method of measuring and registering vessels, the British Government, in 1852, adopted a method of measuring the cubical capacities of hulls that a Mr. Moorsom had worked out. The British Government wishing to change as little as possible the tonnage of the merchant marine as the figures then stood on the registry books, instructed Mr. Moorsom to submit a plan of applying his method of measuring vessels in such a way as to cause a minimum increase or decrease in the existing registry of ships. The total register tonnage of the British marine, in 1852, was 3,700,000, as then reported to the Government; and Mr. Moorsom found that his system of measuring ships made the total capacity of the hulls of the British fleet 363,412,456 cubic feet. Thus he said that "if the real total capacity in cubic feet is divided by the total register tonnage, the dividend will be the figure by which the capacity in cubic feet must be divided in order to produce this registered tonnage." The ratio of the tonnage as it stood on the British books, 3,700,000 in 1852, to Moorsom's figures for the capacity of British ships, "363,412,456," was 98.22. To simplify the calculation of gross register tonnage, the Government adopted 100 cubic feet, instead of 98.22 cubic feet, as a vessel ton. The vessel ton of 100 cubic feet was made official by the British merchant shipping act of 1854. The Moorsom rules for measuring vessels were adopted by the United States in 1865 and by most countries of the world between 1870–1890.

To determine the net tonnage of a vessel, there is ordinarily deducted from the entire closed-in capacity of the ship the space occupied by the crew, master's cabin, steering and anchor gear below deck, boatswain's stores, chart house, and spaces occupied by propelling power (engines, boilers, shaft tunnel, and coal bunkers). The Suez rules, however, do not make some of these deductions. The subtractions having been made, the net tonnage is ascertained by dividing the number of cubic feet in the remaining space by 100. In an up-to-date freight steamer, as measured by British, American, or German rules, the net tonnage is somewhat less than two-thirds the gross tonnage. In the case of a high-speed passenger vessel so much of the capacity of the ship is taken up with propelling machinery, fixed coal bunkers, crew space, etc., that the net tonnage may be less than half, sometimes not more than one-third of the gross tonnage.

The dead-weight capacity of a vessel is the number of tons of 2,240 pounds that the vessel is capable of carrying when loaded to its maximum draft. Dead-weight capacity is a unit of frequent commercial usage. The number of tons dead-weight that a ship can carry at a designated draft is stated in the dead-weight scale which is shown on the vessel's plan, a copy of which is furnished to charterers when required. This scale shows the dead-weight capacity at various drafts from an empty to a full-laden vessel—a British vessel being fully laden when so loaded as to immerse the hull to the Plimsoll line which the British laws require to be painted on the outside of the hull. The payment for vessels chartered for a period of time is based upon dead-weight capacity, i. e., time charter rates are a certain sum per dead-weight ton per month. The ratio of net tonnage to dead-weight capacity depends upon the type of vessel and upon the rules applied in the measurement of the ship. Ordinarily the dead-weight capacity is from $2\frac{1}{4}$ to $2\frac{3}{4}$ times the net tonnage.

Cargo Tonnage.

The cargo ton is of two classes—weight and measurement. The weight ton employed in ocean commerce is either the English long ton of 2,240 pounds or the metric ton of 2,204.62 pounds. Countries having the metric system of weights and measures have the metric ton, while countries with the English system of weights and measures have the long ton. The English short ton of 2,000 pounds is used for most traffic by rail and by inland waterways within the United States.

A large share of the cargo carried by ocean vessels is shipped not by weight but by measurement tonnage, 40 cubic feet being considered a ton. Grain, minerals, and some other articles regularly move by weight, but manufactures, general merchandise, and, in fact, most kinds of ocean freight, are taken at "ship's option," weight or measurement, and the option taken is ordinarily measurement. It is said that 40 cubic feet was adopted as a measurement ton because a long ton of wheat occupies 40 cubic feet in the hold or berth of a ship. In the statistics of ocean freight both the long ton of 2,240 pounds and the measurement ton of 40 cubic feet are indiscriminately included; and thus it is not possible to ascertain from published statistics of ocean cargo tonnage the actual weight of traffic moved upon the high seas.

Tonnage Ratios.

In loading vessels heavy articles of comparatively small bulk, such as pig iron, steel rails, grain, etc., are placed in the bottom of the ship's hold to steady the vessel. On top of the heavy cargo, package freight or general merchandise is placed in order to make maximum use of the available cargo space in the vessel. The larger the amount of measurement cargo the greater the number of "tons" of paying freight that can be carried. A modern freight steamer of the closed-in shelter-deck type (ship with the space above the upper deck entirely inclosed) can be loaded with measurement cargo of a greater tonnage than its deadweight capacity. A British ship of 4,640 tons gross register (to cite figures regarding an actual ship) has a dead-weight capacity of 8,500 tons. If suitable commodities can be obtained, this ship can be loaded with 9,500 tons of measurement cargo. On the other hand, a ship of the well-deck type (a vessel upon which the space on the main deck between the bridge house and the poop is not inclosed) may have a dead-weight capacity exceeding the number of tons of measurement cargo it can carry. An actual freight vessel of British registry of the well-deck type is reported to have 5,400 tons gross register, a dead-weight capacity of 8,515 tons, and space for 8,500 tons of measurement cargo.

The ratio of the net tonnage of any particular ship to its gross tonnage and to the number of tons of cargo it can carry will vary with the vessel's type of construction and the rules employed in determining net tonnage; but, taking freight steamers as they run, the net tonnage as determined by British rules is about 61 per cent of the gross. The American rules produce a net tonnage averaging 66 per cent of the gross, while the Suez Canal rules make the average net tonnage of all vessels using that canal 72 per cent of the gross. Loaded cargo steamers carry on the average about $2\frac{1}{4}$ tons of dead-weight freight for each ton net. The ratio of net tonnage, gross tonnage and tons of dead-weight freight is as 1 to $1\frac{1}{2}$ to $2\frac{1}{4}$. For example, a cargo steamer of 6,000 tons gross tonnage will measure about 4,000 tons net tonnage and will ordinarily carry about 9,000 tons of dead-weight freight. By combining both weight and measurement cargo in the lading, the ratio of cargo tonnage to net tonnage may be made $2\frac{3}{4}$ to 1.

In the sailing vessel the ratio of net to gross tonnage is much higher, being about 7 to 8, because none of the ship's space is occupied by propelling engines and coal bunkers. The cargo tonnage of a loaded sailing vessel—number of tons of freight—averages about one and two-thirds times the net tonnage. In other words, the ratio of net tonnage, gross tonnage, and cargo tonnage in an up-to-date sailing vessel is about 7 to 8 to 12. A sailing vessel of 2,100 tons net tonnage will measure about 2,400 tons gross and will be capable of carrying about 3,500 tons of dead-weight freight.

The ratio of cargo tonnage (tons of freight carried) to the net tonnage of the shipping, including both sail and steam, actually employed in the commerce of the world was shown by an investigation made in 1899 to be about $1\frac{3}{4}$ to 1. The ratio was found to be somewhat different in the commerce of different sections of the world, a fact that would naturally result from differences in cargo handled and in the extent to which vessels could be operated with full lading instead of light or in ballast.

Basis of Tolls on Merchant Vessels.

The tolls levied for the use of the canal will be charges exacted in return for the services rendered by the canal. The tolls must not exceed, and for most shipping should be less than, the saving or benefits vessels derive from taking the Panama instead of some other route. In deciding upon the basis of canal charges and upon the rate of tolls to be levied two considerations should control the decision—what a ship can afford to pay and what is the most equitable basis upon which to impose the charges the vessel can afford to pay. The succeeding chapters of this volume attempt to indicate what tolls may wisely be charged at Panama. The basis upon which the toll should be levied, i. e., the unit upon which the rate of toll should be charged—whether a ship ton or a freight ton—is discussed in detail in the volume on The Measurement of Vessels; but it is desirable in this connection to consider or review briefly the principles that should be followed in imposing tolls upon the shipping or commerce that uses the canal.

The basis of tolls upon a merchant vessel should be the ship's earning capacity. Tolls must be paid from the revenues obtained by vessels engaged in transporting freight and passengers over the route through the canal. The measure of a ship's earning capacity is the space available for carrying freight and passengers, and tolls should be levied upon that capacity accurately determined by scientific rules.

Net tonnage, when accurately determined, is the measure of a ship's freight and passenger capacity, and is thus the fairest basis upon which to levy tolls. It is the universal practice of the nations of the world to levy tonnage taxes and most other vessel charges upon net tonnage. Canal tolls at Suez and elsewhere are, with minor exceptions, levied upon this basis. The rules followed by different nations in determining net register tonnage vary, because it is more or less definitely the policy of every country so to measure vessels as to lighten the tonnage taxes and other charges payable by shipping at home and foreign ports. National measurement rules are not so applied as to determine accurately the capacity of vessels to carry freight and passengers. The rules enforced by the Suez Canal Co., however, are framed and applied with the purpose of ascertaining the earning capacity of vessels, and thus the Suez rules afford a more scientific measure of the tonnage of vessels than do the national rules enforced in any country.

Net, instead of gross, tonnage should be made the basis of Panama tolls, not only because net tonnage when accurately determined is the true measure of the ship's earning capacity; but also because, if gross tonnage were made the basis of canal charges, the best and fastest vessels would be unfairly discriminated against in comparison with the slower and less desirable types of ships. If tolls were levied upon gross tonnage, vessels would have to pay charges upon the spaces occupied by machinery, bunkers, light and air wells, crew quarters, and other nonrevenue-producing parts of the vessel. Such spaces occupy a large share of the capacity of high-powered vessels, which would be at a disadvantage in the matter of canal tolls, as compared with ships having low-powered engines. Moreover, if spaces required for the comfort and health of the crew were not exempted from tolls the tendency would be to reduce such spaces to a minimum in order to increase the earning capacity of the vessel.

A practical objection to adopting gross tonnage as the basis for tolls is the fact that no canal administration nor any country now makes gross tonnage the basis of tonnage taxes or other charges. Moreover, the several national rules for determining gross tonnage are not uniform, and the adoption of gross tonnage as the basis of tolls at Panama would not obviate the necessity of formulating and applying a new set of measurement rules. The shipping world is accustomed to levies based upon net tonnage, and it would hardly be desirable to adopt a different basis at Panama, unless it could be shown that commerce would thereby be materially benefited. It is not believed that any such advantage to commerce can result from the adoption of gross tonnage as the basis for Panama tolls.

The displacement tonnage of a vessel is subject to much the same objection that gross tonnage is as a basis for the levy of canal tolls. The displacement tonnage of a ship is easily determined, and charges based upon displacement could be collected with minimum administrative difficulty; but the charges would bear with undue severity upon the fast vessels with "fine" lines. A freight vessel may have a "coefficient of fineness" of .8, whereas passenger vessels may have such sharp lines as to have a "coefficient of fineness" of .65. The full-shaped freight carrier will transport a maximum load with a minimum draft. A passenger steamer built for speed has a large displacement in comparison with the cargo carried or with earning capacity. Thus, in the case of freight vessels, different types of construction would result in vessels having different cargo capacity for the same displacement. Briefly stated, tolls based upon displacement would discriminate unfairly against fast ships and would be unjust as between different types of freight vessels.

Railroad companies charge freight rates based upon the weight of the commodities transported; but such a basis for canal tolls would in most cases be neither practicable nor desirable. It would not be feasible to charge tolls upon the weight of cargo in the ship, because ordinarily the ship's manifest does not indicate the weight of cargo in the vessel. As has been explained, some goods are shipped by weight, others by measurement, and thus a special calculation would be necessary in the case of most vessels to determine the number of weight tons of freight subject to tolls. Calculations to determine weight tonnage or the total weight and measurement tonnage would be expensive to make and might delay the clearance of vessels or their passage through the canal. Moreover, to make the weight of cargo the basis of tolls would be to render fraud easy to practice and hard to detect.

If the vessel's manifest and the calculations of cargo tonnage, whether weight or measurement, made by the vessel owners were accepted by the canal administration without careful checking, a premium would be put upon dishonesty and sharp dealing. It would be necessary for the canal authorities to accept the ship's manifest and the owner's calculations at their face value, because it would be practically impossible to determine whether a ship loaded with miscellaneous cargo, or possibly with a hundred or more varieties of commodities, contained the articles and amounts of freight stated in the manifest. The Manchester Canal Co. levies charges not only upon the ship but also upon the cargo; but that is possible because Manchester is a terminal port at which cargo is loaded and unloaded. In the case of a canal like the one at Suez or at Panama, it would not be practicable to make freight the basis of transit dues.

A conclusive reason against the adoption of the weight of cargo as the basis of canal tolls is that the tolls would bear most heavily upon vessels loaded with cargoes least capable of paying tolls. Articles of least value, such as coal, nitrate, and lumber are heavier than commodities of high value. If cargo tonnage were made the basis of tolls, measurement tonnage as well as weight tons would need to be counted in determining the number of tons upon which tolls are to be levied. A vessel of a given capacity can be loaded with more "tons" of light general merchandise, which is practically always shipped as measurement cargo of 40 cubic feet per ton. A long ton of coal (2,240 pounds) occupies between 40 and 50 cubic feet. The way this works out in practice may be illustrated by reference to a vessel of about 3,000 tons net register, British measurement, which can be loaded with 8,500 tons of dead-weight cargo and 9,500 tons of measurement cargo.

A possible basis upon which to levy Panama tolls would be the dead-weight tonnage of vessels. The difference between the displacement tonnage of a vessel with merely its crew, supplies, and coal on board and the displacement of a vessel loaded to its maximum load line is its dead-weight capacity; and the dead-weight tonnage of any particular ship, when loaded to any given draft, may be read off from the tonnage scale on the ship's displacement curve, a scale that is to be found on every vessel. The advantage of dead-weight tonnage as a basis of tolls is its ease of determination. The reason why it should not be made the basis of Panama charges is that it would unfairly discriminate between different types of vessels and different classes of cargo.

The result of making dead-weight tonnage the basis of toll charges would be the opposite of the result of charging tolls upon displacement. The dead-weight tonnage basis would discriminate unjustly against the freight vessel. Fast passenger ships built on "fine" lines have large earning capacity in comparison with their dead-weight tonnage. They would have less tolls to pay than would have to be paid by smaller slow-going freight steamers. The charges upon the two ships would not be in proportion to their earning capacity or their ability to pay.

Tolls based upon dead-weight tonnage, like those levied upon weight of cargo, would bear most heavily upon the vessels carrying low-grade freight. The heavier the freight per unit of space occupied the smaller is the number of tons with which a vessel can be loaded, the only exception to this being that every vessel must carry enough heavy cargo or ballast in the bottom of the hold to make the ship steady. Vessels loaded mainly with measurement cargo have a maximum number of tons of cargo and a minimum of displacement due to weight, whereas vessels loaded with coal or similar commodities have maximum displacement for a minimum number of tons of freight. Moreover, the freight rates paid on general merchandise carried as measurement cargo are higher than those paid on low-grade bulk freight. Tolls based upon dead-weight tonnage would thus discriminate seriously against vessels carrying low-grade traffic.

The reasons why net tonnage should be made the basis of the tolls charged for the use of the Panama Canal may be summarized as follows:

(1) Net tonnage, scientifically determined, is the measure of a ship's earning capacity or its ability to carry cargo and passengers. Net tonnage does not discriminate unfairly as between different types of ships and as among different classes of cargo.

(2) Owners and masters of vessels are accustomed to paying tonnage taxes, port dues, and canal charges on the basis of net tonnage. It is a basis of charges that is practicable and is acceptable to the shipping interests.

(3) The adoption of net tonnage as the basis of Panama tolls will not cause vessels to be constructed with a view to minimizing light and air spaces or crew accommodations. The charge will be upon the ship's earning capacity; and spaces devoted to the safety and comfort of passengers and crew will, if the rules are properly formulated, be exempted from tolls.

(4) The collection of tolls based upon net tonnage will not present any serious administrative difficulties. Vessels intending to use the canal can readily secure certificates showing their net tonnage as determined by the rules promulgated by the Panama Canal administration. The correctness of the net tonnage shown in the certificate can readily be checked up at the canal. The possibility of fraud will be reduced to a minimum and the imposition and collection of tolls will not delay the passage of any vessel through the canal. While net tonnage is not so easily and certainly determinable as gross tonnage, displacement or dead-weight tonnage, it can be ascertained without serious difficulty and is to be preferred to gross tonnage, displacement, or dead-weight as a basis of tolls. It is the fairest basis upon which to levy canal charges.

The earning capacity of a ship being the space available for the accommodation of freight and passengers, the rules applied in the measurement of vessels should be such as to determine accurately the actual space available for passengers and cargo. The tolls paid by the ship should be based upon the earning capacity thus determined. Adherence to this principle will cause passenger and freight vessels to pay tolls upon the same basis—that is, earning capacity.

The practice at the Suez Canal and some other waterways is to charge tolls both upon the number of passengers carried and upon the net tonnage of the vessels. This practice causes the space occupied by passengers to be subject to two charges, one based upon space and the other upon the number of passengers. The practice is wrong in principle and causes passenger vessels to pay unjustifiably high tolls. It is recommended that there be no passenger tolls charged at Panama and that all merchant vessels be subject to transit dues levied upon the same basis, i. e., net tonnage so determined as to be an exact expression of the ship's earning capacity.

The Basis of Tolls Upon War Vessels.

War vessels differ fundamentally from merchant ships both in use and in construction. A warship has no earning capacity and thus can have no net tonnage. Practically all the space in the vessel is occupied by machinery, armament, and accommodations for the crew.

The size of a warship is indicated by its displacement tonnage, and this is the only measurement applied in practice to naval vessels. The Suez Canal Co., however, requires war vessels, as well as merchant vessels, to pay tolls upon net tonnage. By a complicated and laborious process, the Suez measurement rules are applied to such warships as may pass through the canal; but the figures thus obtained for net tonnage are purely artificial and arbitrary. The requirement of the Suez Canal Co. that naval vessels shall pay tolls upon net tonnage is not defensible in theory and should not be adopted at Panama.

Naval vessels should be charged tolls on the basis of displacement tonnage. Every warship is rated according to its displacement and no measurement will be necessary for the purpose of levying tolls. Colliers, transports, and supply and hospital ships that accompany a fleet or are used for naval purposes should be treated as merchant ships and should be required to pay tolls upon the basis of net tonnage, so measured as to express accurately the earning capacity of the vessels. When applying for passage through the canal, such ships should be required to present the same certificate of measurement that merchant vessels are compelled to show.

CHAPTER X.

COALING FACILITIES AND COAL COSTS VIA THE PANAMA CANAL AND ALTERNATIVE ROUTES.

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INTRODUCTION.

The Panama Canal will reduce the expenses of ocean transportation by shortening the length of routes and by reducing the time required for voyages. Theoretically, the tolls charged at Panama may be made equal to the amount vessels save by using the canal. For most of the commerce passing through the canal, the tolls levied will be much less than the money equivalent of the services rendered by the canal; but, in the case of the trade to and from some sections of the world, the choice of the Panama route will depend upon the tolls charged.

The two factors that will most largely influence the tonnage of traffic through the canal will be the rate of tolls and the relative costs of fuel by the Panama and alternative routes. To the extent that coal can be obtained more cheaply via the Panama Canal than along other routes, the canal will be assisted both in competing for traffic free to move by more than one route and in building up the trade and industries of regions so situated that their commerce is certain to pass through the Panama Canal.

The amount of coal annually consumed by ocean vessels was estimated, in 1912, by the Bureau of Statistics of the Department of Commerce and Labor, to be 75,000,000 tons, valued at over $250,000,000. Some naval coaling stations are maintained by governments for military purposes, but most bunker coal is sold by merchants or companies. Some of these coal companies operate depots at numerous stations in many parts of the world. In a few instances, steamship lines provide coal both for their own use and for public sale, as is done by the Pacific Mail Steamship Co., at Acapulco, Mexico. The Panama Railroad Co., the capital stock of which is owned by the United States Government, sells bunker coal at Colon and Panama, but not in large quantities.

Regular coaling stations have been established along all ocean routes, the location of the stations[1] being indicated on plate 12 at the end of this volume. Along the older trade routes the stations are frequent, while on the newer ocean highways the stations are farther apart. At the larger stations there are often several dealers, each having depots, wharves, lighters, and other loading facilities. Most steamship companies, even the largest ones, do not supply themselves with coal but make an annual contract with some one dealer having coal at convenient stations located on the routes over which the company's vessels are operated. The coal dealers publish annually the prices at which they are willing to contract to supply all coal needed by purchasers. The contract prices are usually somewhat below the current rates at which coal may be bought by the occasional buyer; and the annual agreements usually provide that "should the general current price for equal quality coal be lower at the time of any coaling, steamer is to receive the benefit of such lower price." The contracts, moreover, are usually exclusive, in that the coal merchants agree to furnish all the coal needed and the vessel owners bind themselves to make all their purchases from the dealers with whom they are under contract.

The cost of coal and the price at which it is sold at any particular station depend, first of all, upon the nearness or remoteness of the mines from which the supply is obtained. The stations along the Suez route obtain coal mainly from Wales, England, and Scotland, Welsh coal being most largely sold. The prices are relatively high at the Suez Canal, and higher south and east of the canal. The coal prices along the Suez route do not rise strictly with the increase in distance from Great Britain, but the advance in cost is roughly in accordance with distance until stations are reached at which Japanese and East Indian coal can successfully compete with Cardiff or Durham coals. At Colombo, Welsh coal must compete with that from India and Australia; at Sabang with Indian, Sumatran, and Japanese coal; and at Singapore with Japanese, Indian, Australian, Labuan, and Natal coal. Beyond Colombo and Singapore, Welsh coal is unimportant and Japanese and Chinese coals predominate. In Australia native Newcastle and Southern Australian coals supply the demand; in New Zealand both native and Australian (Newcastle) coals are sold; in South Africa the Natal mines are the source of supply; on the lower west coast of South America coal is secured at Coronel; on the Pacific coast of North America, British Columbia and Washington coals are used; and at stations in the West Indies and on the eastern seaboard of the United States the excellent coal from Pennsylvania, West Virginia, and Alabama is obtainable.

The ocean freight rates determine the distance coal can be transported to supply coaling stations. At some stations coal from distant sources competes with that from relatively near-by points. At Valparaiso,

[1] Plate 12 gives the name and location of some stations at which only oil is sold.

Iquique, Antofagasta, and other points on the west coast of South America some distance from Coronel, the supply is chiefly American, Welsh, and Australian, because of low freights on vessels bound for Chile to secure cargoes of nitrate. At Montevideo, Bahia Blanca, and other points on the east coast of South America south of Brazil the supply comes from Wales and England, because the outbound freights from Great Britain to that section are relatively low.

The relative prices at which different grades of coal are sold at any particular station are determined by the steaming qualities of the coal; and the higher prices paid for best grades sometimes enables such coal as that from Wales to be sold at stations remote from Great Britain in competition with inferior coals obtained from near-by sources. The steaming value of different American coals is shown by the specifications under which the United States Government purchases coal at various points. The specifications provide, among other items, for an agreed number of British thermal units per pound of coal. Table I shows the number of British thermal units of different run-of-mine bituminous coals purchased by the United States Government during 1908, 1909, and 1910.

TABLE I.—CALORIFIC VALUE OF BITUMINOUS COAL PURCHASED BY THE UNITED STATES, 1908–1910.[1]

Commercial name of coal.	Where mined.	British thermal units.	
		As received.	Dry coal.
Pratt Lump	Alabama	13,844–14,399	14,030–14,583
Belle Ellen	do	13,318	13,615
Blocton Cahaba red ash lump	do	14,380	14,658
Georges Creek	Maryland	13,802–14,289	14,213–14,541
Acme	Pennsylvania (Clearfield)	13,861–14,140	14,132–14,477
Sugar Loaf	Pennsylvania (Cambria)	14,237–14,589	14,518–14,813
Atlantic Quemahoning	Pennsylvania (Somerset)	13,834	14,233
Youghiogheny, screened	Pennsylvania (Westmoreland)	12,909	13,510
Pocahontas	Virginia	14,479	14,939
Do	West Virginia	14,135–14,734	14,478–15,157
New River	do	14,183–14,823	14,635–15,160
Kanawha	do	13,422–13,858	13,857–14,304

[1] Bureau of Mines, Government Coal Purchases under Specifications, Bulletin 41, pp. 33–36. Government Printing Office, Washington, 1912.

The United States Bureau of Mines has tested the steaming value of a large number of coals in different sections of the country. Table II shows the minimum and maximum calorific values of the coals tested by the bureau in such districts as lie adjacent to tidewater and supply coal for bunker purposes. The table also gives the results of the tests of some Argentine and Brazil coals.

TABLE II.—CALORIFIC VALUE, IN BRITISH THERMAL UNITS, OF COAL PER POUND.[1]

Designation of coal.	By oxygen calorimeter.		By analysis.	
	Dry fuel.	Combustible.	Dry fuel.	Combustible.
Alabama	11,806–14,449	14,462–15,634	11,648–14,270	14,208–15,556
Florida	10,082	11,003	9,686	10,571
Georgia	12,865	15,647	12,433	15,120
Jamestown	12,607–15,115	15,165–15,921		
Maryland	13,680–14,717	15,676–15,843	13,514–14,798	15,491–15,883
Pennsylvania	13,163–14,886	15,198–15,900	13,212–14,737	14,847–15,812
Rhode Island	11,639	14,001	11,768	14,156
Virginia	12,472–14,936	14,977–15,691	12,461–14,774	14,944–15,544
Washington	11,772–13,243	13,748–14,940	11,614–12,962	13,563–14,663
West Virginia	12,838–15,235	15,126–16,266	12,922–15,305	15,016–16,341
Argentine Republic	5,933– 8,298	12,873–13,614	5,918– 8,458	12,840–13,982
Brazil	9,830–10,028	13,622–13,839	9,847–10,044	13,646–13,861

[1] Bureau of Mines, Steaming Tests of Coals, Bulletin 23, pp. 100–115. Government Printing Office, Washington, 1912.

West Virginia coal, shipped from Norfolk and Newport News, is sold at Colon, Panama, St. Lucia, St. Thomas, and also in small amounts on the west coast of South America above Coronel. It is generally conceded that the steaming value of this Pocahontas and New River coal is about 5 per cent less than that of the Welsh product, and this difference is to be taken into account in comparing prices and costs. No other standard coals sold on a large scale at ocean coaling stations are equal in steaming value to American or Welsh coals.

The influence of the quality of coal upon prices is illustrated by the prices prevailing at Singapore for the several varieties sold at that important station. The 1912 contract price for Welsh coal is 35s. (f. o. b.); for Australian, 24s.; Japan best, 22s. 6d.; Deshergur (Indian), 21s. 6d.; and for Bengal coal, 19s. 6d. The price of Welsh coal is somewhat higher than its steaming value justifies, because warships insist upon Welsh coal, whatever the price may be. The demand is not a purely commercial one.

The efficiency of several kinds of coal is roughly indicated by a statement made by the captain of a vessel who reports that his ship's daily coal consumption is 22 tons of best No. 1 Welsh, 25 tons of Tyne, 29 to 30 of Indian or Japanese, 24 to 25 of Newcastle (Australian), 30 of Chilean, 24 to 25 of New River (West Virginian), and 26 of Alabama coal.[1] Another vessel was reported to have a daily consumption of 25 tons of best Welsh as compared with 26½ tons of Pocahontas, 26 Welsh run-of-mine, 28 of Lancashire or Tyne, and 30 of Indian or Japanese coal. Pocahontas coal is particularly effective in vessels with forced draft, in which class of vessels its steam value is about equal to that of Welsh coal.

The prices of representative coals at various stations during 1912 and 1911 are given in Table III.

TABLE III.—CONTRACT PRICES OF COAL IN 1912 AND 1911 AT SELECTED STATIONS IN DIFFERENT PARTS OF THE WORLD.

Station.	Kind of coal.	Price per ton.		Delivered.
		1912	1911	
Southampton[2]	Welsh	25s. 3d	23s. 10d	Trimmed.
Havre[3]	do	21s. to 24s	19s. to 21s	Do.
Gibraltar[3]	do	22s. to 24s	19s. 6d. to 20s	F. o. b.
Algiers	do	22s. 6d	20s	Do.
Port Said	do	25s. 6d. to 26s	21s. to 22s	Do.
Colombo	do	34s	30s. 6d	F. o. b. and trimmed.
	Bengal	21s. 6d	17s. 3d. to 21s. 6d	Do.
	Natal	25s. 6d	24s. 3d	Do.
Singapore	Welsh	35s	32s	F. o. b.
	Australian	24s. to 25s	25s	Do.
	Japanese	22s. 6d	22s. 3d	Do.
Moji	Good Japan lump	14s	14s. 6d	Trimmed.
	Good Japan run-of-mine	12s. 6d	12s. 6d	Do.
Yokohama	Yubari lump	18s. 6d	20s	Do.
	Yubari run-of-mine	17s	18s. 6d	Do.
Durban (Natal)	Natal	12s. to 14s. 6d	12s. to 14s	F. a. s.
Sydney (New South Wales)[2]	Southern screened	16s	16s. 3d	Trimmed.
Melbourne[2]	Newcastle and Southern	19s. 6d	20s	F. a. s.
Coronel, Chile	Chilean	24s. 6d		Trimmed.
Valparaiso[2]	Welsh (Admiralty)	61s. 9d	57s	F. o. b.
Montevideo	do	43s	38s. 6d	Do.
St. Lucia	New River and Pocahontas	23s	22s. 6d. to 23s	Trimmed.
Newport News and Norfolk	do	$3	$3	F. o. b.
New York	Morrisdale and Clearfield	$3 to $3.25	$3.25	F. a. s.
Comax or Union, British Columbia	Best Comax lump	$5	$5	Trimmed.
Seattle	Carbon Hill steam	$4.15	$4.25 to $4.45	Do.

[1] See statement of Maj. E. T. Wilson, chief subsistence officer, Isthmian Canal Commission. Hearings before the Committee on Interstate and Foreign Commerce, 1912, vol. 1, p. 181.

[2] Prices paid by United States Navy.

[3] Low price, "Thro and thro"; high price "large."

The prices charged for Welsh coal, in 1912, were from 2s. to 10s. above 1911 prices, the usual increase being from 2s. to 4s. The cost of American coals advanced but slightly and in some cases the contract prices were the same each year. At Sydney, New South Wales, Melbourne, Seattle, and Yokohama, where Welsh coal is not largely sold, there was a slight decline in prices. Japanese coal sold for about the same in 1912 as in 1911. The rise in the price of Welsh coal at all coaling stations was due chiefly to the increased cost of coal at Cardiff, caused by the introduction of the eight-hour day at the Welsh mines. Ocean freight rates were also higher in 1912 than in 1911, and this especially affected the prices of coal sold, as Welsh coal is, at stations remote from the sources of supply.

Contracts for the sale of coal stipulate whether the coal is to be delivered "f. o. b." (free on board); "f. a. s." (free alongside ship); or "trimmed." Prices, likewise, depend upon whether the coal is "screened" or "run of mine." Coal sold as "Welsh" or "Cardiff" coal without further designation, at Port Said, for instance, has been run over one screen. Double-screened Welsh coal is termed "Admiralty Welsh," and run-of-mine Welsh or Durham coal is termed "through and through."

The following discussion considers coaling facilities and coal prices along (1) the Suez route; (2) the South African or Cape of Good Hope route; (3) the South American or Magellan route; and (4) the Panama Canal route.

I. Cost and Supply of Coal at Stations on the Routes from Eastern United States and Western Europe to the Far East via the Suez Canal Route.

The amount paid for coal by two freight vessels that made round-trip voyages, during 1911, from New York through the Suez Canal—one ship to China and Japan and the other to the Philippines—are shown in the following statement prepared by a company operating a relatively large fleet. The vessels are steamers of the shelter-deck type, each of 2,927 tons net register, British measurement, and 4,640 tons gross register. Each vessel can carry 8,500 tons deadweight of cargo, or 9,500 tons measurement cargo after deducting "space occupied by coal and 20 per cent for broken stowage." The vessels were operated at 10¼ knots speed, and each had an average coal consumption of 38 tons per day. The number of tons of coal taken at each point and the contract price of coal, trimmed into bunkers, at the different stations were as follows:

STEAMER A, NEW YORK TO JAPAN AND RETURN.

	Coal.	Cost per ton.
	Tons.	
Sailed from New York with	750	$3.25
Replenished at Algiers with	1,050	4.85
Replenished at Sahang with	600	5.25
Replenished at Moji with	500	3.25
(Sufficient to take steamer to Yokohama and hack to Moji, where she commenced replenishing for homeward voyage.)		
Replenished at Moji with	1,100	3.25
Replenished at Sabang with	300	5.25
Replenished at Port Said with	275	5.50
Replenished at Algiers with	700	4.85

STEAMER B, NEW YORK TO THE PHILIPPINES AND RETURN.

	Coal.	Cost per ton.
	Tons.	
Sailed from New York with	750	$3.25
Replenished at Algiers with	1,050	4.85
Replenished at Sabang with	1,000	5.00
(Sufficient to take steamer to Philippines and back to Sabang, where she commenced replenishing for the homeward voyage.)		
Replenished at Sabang with	700	5.00
Replenished at Port Said with	275	5.25
Replenished at Algiers with	700	4.85

It will be noted that neither steamer took coal at the Suez Canal on the outward voyage. Steamer A purchased 275 tons of coal at Port Said for $5.50 per ton, while steamer B paid $5.25 per ton for the same quantity. On the outward trip the maximum quantity of coal was bought at Algiers, where enough Welsh or English coal was secured to take the vessels to Sabang on the Straits of Malacca.

Another company that operates a large fleet between New York and the Orient states that "it is usual for our steamers sailing via Suez to take sufficient coal here (New York) to reach the canal, say 700 tons, although they sometimes bunker en route at Gibraltar, Oran, Algiers, or Malta. At the canal they take on sufficient coal to enable them to reach Singapore, or the first port at which they are calling that they can get Japanese coal. On the homeward trip they coal in Japan for Port Said and again coal at the canal and at one of the western Mediterranean depots for New York."

Contract prices for coal at New York are not uniform for all buyers. One of the companies mentioned above paid $3.25 per ton for 750 tons trimmed into bunkers, while another company paid $3.60. A coal merchant doing a large business quotes contract prices on Morrisdale and Cunard coal for 1912 at $3 per ton f. a. s. at New York, and for $3 trimmed at Philadelphia and Baltimore. At Boston this merchant offers New River and Pocahontas coal, over ship's rail, at $4.25 and Pennsylvania coal at $4, with 15 cents extra for trimming. Another merchant quotes 1912 prices of $3 f. a. s. for Clearfield coal at New York, of $2.95 trimmed at Philadelphia, and of $2.90 trimmed at Baltimore. He sells Pocahontas coal for $3 f. o. b. at Norfolk and New River coal for $3 f. o. b. at Newport News.

An European coal dealer quotes 1912 contract prices for Westphalian coal of 16s. 3d. to 16s. 9d. f. o. b. Bremen. At Hamburg he offers North Country and Westphalian coal at 15s. trimmed and Durham coal at 15s. 6d. He sells Westphalian coal at Antwerp for 13s. 6d. trimmed, and Welsh coal at Havre for from 24s. for "large" to 21s. for "through and through" trimmed. The 1912 prices for the best Welsh coal at Cardiff is 17s. 6d. trimmed.

The first of the large coaling stations passed by a vessel from the United States or western Europe destined for the Suez Canal is Gibraltar, and while many vessels take on a sufficient supply at their port of origin to carry them through to Port Said, some vessels replenish their supply at Gibraltar, where four dealers carry, stored in hulks, an average supply of about 15,000 tons of Welsh and 3,000 tons of Newcastle coal. 1912 contract prices for the former are from 22s. to 24s. and for the latter 21s. The ships are coaled either alongside the hulks or from lighters, for which an additional charge of 60 cents per ton is made.

Coal may be obtained en route from the United States to Gibraltar at St. Michaels, Azores, where two dealers keep in stock about 10,000 tons of Welsh coal, which they deliver to steamers from 25-ton lighters. The contract price at the Azores in 1911 was 26s. 6d., and the 1912 charge is 31s. As these rates are higher than those prevailing at Gibraltar and various other Mediterranean stations, most vessels leave the United States with a sufficient supply of coal to carry them to some Mediterranean station or to the Suez Canal.

At Oran, in Algeria, four dealers keep on hand an average supply of about 3,900 tons of Welsh coal, 8,000 of Scotch and English coal, and 2,500 of Welsh patent fuel briquets, which are manufactured at Mers-et-Kebir. The coal is loaded from lighters, and from 1,200 to 1,500 tons are always kept on lighters for immediate delivery. One of the dealers quotes 1912 contract prices for Durham coal at 21s., and another at 19s. 6d. f. o. b.

Algiers is a large coaling station, with a plentiful supply. The average quantity held in stock by the five dealers of the port is 20,000 tons of Welsh coal, 5,000 tons of Newcastle coal, and 5,000 tons of briquets. The general contract price of Welsh coal in 1911 was 20s., and in 1912 22s. 6d. The contract price of Durham coal in 1912 was 20s.

At Malta several dealers sell coal to steamers, and keep on hand an average supply of about 70,000 tons, consisting mainly of Welsh coal. Smaller amounts of Newcastle and Scotch coal are also sold. About 1,000 tons of briquet coal is usually carried. Loading is effected rapidly, either at the wharf or from lighters. The contract prices of 1912 are the same as at Gibraltar.

At Port Said several large coal companies have depots, their combined sales amounting annually to about 1,250,000 tons. In 1910, 1,251,800 tons of Welsh coal were shipped to Port Said from South Wales and Monmouthshire Port. The contract price quoted by one of the dealers in 1911 was 22s. for Welsh coal f. o. b., but one of the navigation companies above mentioned purchased Welsh coal for 21s. and Durham coal for 17s. 9d. The contract prices of 1912, as first announced by several of the dealers, was 26s. f. o. b. for Welsh coal, and 22s. 6d. for Durham coal; but later notice was given by the Suez Canal Co. that the dealers had agreed upon a contract renewal price of 25s. 6d. for Welsh coal. Vessels are coaled from lighters of 50 to 300 tons burden.

At Suez, the Red Sea terminus of the Suez Canal, there is a large coal depot, at which five dealers sell coal, chiefly Welsh. The cost is higher than at Port Said, the 1912 contract price offered by one of the dealers being 36s. per ton. Vessels usually purchase most of their coal at Port Said. As at Port Said, vessels are coaled at Suez from lighters of from 50 to 300 tons capacity.

Vessels destined to the Far East usually take on a sufficient supply of coal at Port Said or Suez to carry them as far as Singapore; but some ships coal at Perim, Aden, or Colombo. At Perim Welsh coal is sold at fluctuating current prices. At Aden four dealers maintain a large stock of Welsh coal, the price of which in 1911 was 31s. 6d., and in 1912, 34s., delivered to vessels from 100-ton lighters. Colombo is a large coaling station, whose various dealers handle several kinds of coals. Welsh coal competes with the lower-priced Australian and Indian coals of inferior steaming value. The average supply maintained at Colombo includes 25,000 tons of Welsh coal, 20,000 tons of Bengal, and 3,000 tons of Australian. A small amount of Natal coal is sold, and there is a supply of about 4,000 tons of fuel oil. Vessels may take coal either from docks or from lighters. The contract prices in 1912 are 34s. for Welsh coal, 21s. 6d. for Bengal, and 25s. 6d. for Natal. Contract prices in 1911 were 30s. 6d. for Welsh, 24s. 3d. for Natal, and from 17s. 3d. to 21s. 6d. for Bengal coal.

The average supply at Sabang, in the Malacca Straits, includes about 18,000 tons of Bengal coal, 10,000 tons of native Sumatra coal, 5,000 tons of Japanese coal, and but 2,500 tons of Welsh coal. Here, as at Colombo and Singapore, Welsh coal competes with coals from a less distant source. The price paid by the vessels whose fuel costs are given above for the round-trip voyages from New York to the Philippines and Japan in 1911 was $5.25—21s. 6d.—for eastern coal.

At Singapore, which is a much-frequented coaling station for through vessels, over 100,000 tons of coal are usually available. Welsh, Indian, Australian, Natal, Japanese, and Labuan coals are sold, there being 10 dealers in coal and 1 in fuel oil. Vessels are coaled from wharves and lighters. The 1912 contract prices are: Welsh, 35s.; Australian, 24s. to 25s.; Japanese, 22s. 6d.; and Bengal, 21s. 6d. to 19s. 6d.

On voyages to Japan it is customary to take on a sufficient supply at Sabang or Singapore to carry the vessel to one of the Japanese ports. If the ship is bound for China, enough fuel is taken to reach the Chinese destination, where the bunkers are replenished for the return voyage. Beyond Singapore, British coal is of slight importance, for its price makes it available only to war vessels. At various Japanese ports, certain quantities of Welsh coal are kept on hand, but the supply used by freight steamers is almost entirely Japanese. The 1912 contract prices for "Japan best" coal (screened) at Nagasaki is 15s. (trimmed); Karatsu, 14s. 6d; Kobe, 18s. 6d; and Yokohama, 19s. 6d. At Moji, the price for "Japan best" is 14s. 6d., and for "Moji good," 12s. 9d. The prices for unscreened coal in each case are about 1s. 6d. less than the prices here given.

The largest coaling station in southern China is Hongkong, where about 30,000 tons of Japanese coal, 8,000 tons of Welsh, 6,000 tons of Australian, and smaller quantities of Labuan and Indo-China coals and 5,000 tons of fuel oil are kept on hand. The coaling is done from lighters. The 1912 contract price announced by one of the large dealers is 19s. 9d. for "Japan best;" another dealer quotes 19s. 3d. The largest station in northern China is Shanghai, where about 80,000 tons of Japanese coal, 15,000 of Kaiping (China) coal, 5,000 of Australian, 1,000 of Shantung (China), 5,000 of Hongay (China), and 20,000 of Welsh coal, and 2,000 tons of fuel oil are available. One dealer quotes 1912 contract prices for "Japan best" coal at 19s. 3d., and it is chiefly Japanese coal that merchant vessels use, the Welsh coal being used by war vessels and by some of the faster passenger steamers. Kaiping coal is sold at from 12s. 6d. to 15s. per ton trimmed.

Steamers bound for the Philippines usually take on a sufficient supply at Colombo, Sabang, or Singapore to bring them back from Manila to the coaling station. Vessels can, however, obtain at Manila a supply of Pocahontas, Cumberland, Australian, or Japanese coal. Unscreened "Japan best" coal is sold under 1912 contracts at Manila for 20s. 6d. to 22s. 6d.; Australian coal at 22s. 6d. to 23s. 6d.; and Pocahontas and Cumberland coal at somewhat higher prices.

The foregoing details show that vessels using the Suez route to and from the Far East have ample coaling facilities. As is shown in Plate 12, there are numerous coaling stations of the first rank and many others of less importance. No average price prevails for stations over a wide area, because the freight rates on coal vary, and there are many varieties of coal, from different sources of production, sold in competition with each other. British coal is largely used east bound as far as Singapore, but beyond that point Japanese, Indian, Chinese, and Australian coal is mainly used by merchant steamers. The total exports of coal from South Wales and Monmouthshire Port to the leading stations on the Suez route in 1910 were as follows: Algiers, 507,488 tons; Oran, 135,382; St. Michaels, 21,537; Madeira, 135,123; Port Said, 1,251,800; Suez, 28,507; Aden, 143,620; Colombo, 306,408; Singapore, 9,377; Sabang, 4,471; Hongkong, 28,609; and Shanghai, 16,190. The shipments to points beyond Singapore are small, for Welsh coal, even at Singapore, Colombo, and Sabang, is little used except by war vessels.

II. Coal Supply and Costs at Stations along the Routes from Eastern United States and Western Europe to Australia, New Zealand, and African Ports via the Cape of Good Hope Route.

Vessels from the eastern United States and from Europe to Australia and New Zealand choose the Suez, Magellan, or Cape of Good Hope routes. Those taking the Suez route may either take on enough coal at Port Said, Suez, or Aden to last until an Australian port and Australian coal are reached, or a smaller supply may be purchased at the Suez Canal or at Aden, and the bunkers be refilled at one of the stations in the Indian Ocean. Vessels operated from New York to Australia via the Cape of Good Hope are said by a large New York navigation company to coal as follows: "The Australian steamers use the Cape of Good Hope route, and sometimes, but very rarely, coal first at St. Vincent. Usually they take sufficient coal at New York to enable them to reach Durban or Cape Town. There they coal for Australia, where native coal is again obtainable." Ships bound from the United States and Europe to Australia via the Cape no longer coal at St. Vincent as generally as they did before the native coal was mined on a large scale in Natal. The price of coal is higher at St. Vincent than at European or American ports, while native coal available at Durban and Cape Town is relatively cheap.

St. Vincent, however, is still a large coaling station with three large depots, having an average of about 30,000 tons of Welsh coal in stock. Ships are coaled rapidly from lighters of from 50 to 200 tons burden. The 1912 contract price for Welsh coal is 31s., free alongside, as compared with 29s. in 1911.

At Cape Town native Natal coal is sold. The dealers quote 1912 contract prices from 22s. to 23s. (trimmed) for Natal coal, and 40s. for Welsh coal. Cape Town is not a large coaling station, the usual supply on hand being about 1,000 tons of Admiralty Welsh coal, 1,000 tons of Natal coal, and 500 tons of Scotch coal. There are three coal merchants, and there are facilities for coaling either at docks or by lighters.

The largest coaling station on the south African route is Durban. Although off the direct route from the Cape of Good Hope to Australia, many vessels call at Durban because its coal is sold so cheaply. The Natal coal has a lower steaming value than Welsh or Pocahontas coals, but its price is only 12s. to 14s. 6d., f. a. s. at the wharves. The new stores near the docks have capacity for 25,000 tons. Vessels may load coal at the docks with special appliances, or the coal may be lightered to them at the outer anchorage.

Vessels usually take on sufficient Natal coal to run them to their Australian destination, where native coal is available for the return journey. Sydney, the leading port of Australia, is frequented by vessels from all parts of the world and is a coaling station of the first rank, its supply being obtained cheaply from Newcastle, New South Wales, and other minor local sources. Coal is delivered from lighters, colliers, or wharves.

All of the larger Australian ports have supplies of coal. Adelaide, South Australia, has five dealers with a stock of about 8,000 tons of Newcastle, New South Wales, coal, which may be loaded from lighters or alongside hulks. Albany, Western Australia, provides the coal required by such vessels as regularly trade there, and is an emergency coaling station used when necessary by vessels bound for other Australian ports. Three dealers keep about 3,000 tons of Newcastle coal stored in hulks, alongside of which vessels may replenish their bunkers. At Brisbane, Queensland, ships may coal from lighters or at wharves, an average supply of about 5,000 tons of Australian coal being kept in stock. At Fremantle, Western Australia, four dealers keep on hand an average total of about 12,000 tons of Newcastle coal. Vessels may coal from lighters or from hulks. At Hobart, Tasmania, three dealers have an average supply of 2,500 tons of Newcastle coal, which is loaded from lighters. Melbourne, Victoria, has an average stock of 25,000 tons of Newcastle coal, sold by eight dealers, who supply vessels either at wharves or from lighters. Newcastle, New South Wales, is the great coal-shipping port of Australia, and any quantity of bunker coal may be obtained there at the coal wharves or from lighters.

The price at which the United States Navy can secure coal in 1912 at Sydney is 16s., trimmed, for best Southern screened, and at Melbourne, 19s. 6d. f. a. s. for Newcastle and Southern. The 1912 prices of coal, such as is ordinarily used by merchant vessels, are quoted by a large dealer as follows: Sydney, 12s. 6d. to 14s. 6d.; Melbourne, 19s. 6d.; Adelaide, 23s. to 25s. 6d.; Albany, 25s. 6d.; Fremantle, 25s. 6d.; Newcastle, 8s. 6d.; Brisbane, 10s. 6d. to 15s. 6d.; and Townsville, 26s. to 28s. 6d.

Coal prices at New Zealand stations are higher than in Australia, but coal is available at any of the larger ports. The supply comes from two general sources: (1) Local New Zealand coal is obtained from Westport, which is the largest New Zealand coal shipping port and is also a coaling station where bunker coal is supplied at the wharves and from colliers in the bay; (2) Newcastle (New South Wales) coal is sold at Auckland and some other ports along with New Zealand coal.

At Auckland vessels take on coal when anchored in the stream, the coal being taken directly from Westport and Newcastle colliers. At Dunedin an average supply of about 2,500 tons of New Zealand coal is kept in stock, but on short notice a large supply may be obtained from the mines. Vessels are coaled from hulks and lighters. Three dealers at Wellington keep about 5,000 tons of Westport coal in stock, the coal being put aboard vessels from alongside hulks. Colliers may be ordered from Westport to Wellington on short notice. Lyttleton keeps about 5,000 tons of New Zealand coal in hulks and colliers, and larger quantities may be obtained from Westport colliers on notice of a few days. The 1912 contract prices for New Zealand coal are quoted by a large coal merchant as follows: Wellington, 20s. 9d.; Lyttleton, 21s. 9d.; Auckland, 23s. 9d.; and Port Chalmers (Dunedin), 23s.

III. Coaling Facilities and Coal Costs on the South American or Magellan Route.

The coaling facilities along the South American route are less adequate than on the Suez and South African routes, because native South American coal is not available until Coronel, Chile, is reached. The usual practice of vessels sailing from ports on the eastern seaboard of the United States to points on the west coast of South America is to take on sufficient coal at the port of clearance to carry them to Coronel, where a large supply of inferior Chilean coal is obtainable. Ships may coal at St. Lucia, St. Thomas, or Montevideo, but the price of the American and British coal at those stations is so high that most steamship companies sacrifice as much cargo space as may be necessary to secure room for the coal required for the run to Coronel.

Vessels at Coronel are coaled alongside hulks or from lighters. About 2,000 tons of Australian coal are kept in hulks, but the supply consists mainly of native coal, $1\frac{1}{3}$ tons of which are about equal in steaming value to 1 ton of Welsh coal. The 1912 contract price for Chilean coal at Coronel is 24s. 6d. (trimmed). A large navigation company reported purchases in 1911 at 20s. 6d. ($5), and another at $6 per ton.

A limited supply of bunker coal is kept on hand at other west coast South American ports. Iquique, the great nitrate port, has three dealers who have a supply of 5,000 tons of Australian coal, 5,000 tons of Chilean, and some Welsh coal, all of which they handle from lighters. Antofagasta, another nitrate port, keeps in stock not less than 20,000 tons of Australian coal, which is handled from lighters. At Punta Arenas, on the Straits of Magellan, two dealers keep on hand about 4,000 tons of Welsh and Australian coal, and vessels are coaled from the hulks in which it is stored. At Valparaiso the average supply of its four dealers is 5,000 tons of Australian coal, 3,000 tons of Pocahontas coal, and 4,000 tons of Welsh coal, handled from lighters. Comparatively little native Chilean coal is kept in stock by west coast South American dealers, except at Coronel, most of the coal sold being from the United States, Australia, and Wales, because vessels bound for Chile for nitrate cargoes are eager to carry coal, even at low rates. Moreover, the Chilean coal is not only of inferior quality, but deteriorates rapidly and suffers from handling. For these reasons, Chilean coal is sold mainly at Coronel, which is the leading coaling station on the west coast of South America. In spite of low-freight rates, British and American coals are expensive. The 1911 contract price paid by the United States Navy Department, at Valparaiso, was 51s. f. o. b. and 52s. trimmed, for Pocahontas, New River, Georges Creek, or Admiralty Welsh, at supplier's option. Prices of native coal at Coronel are less than half these figures. The 1912 contract of the Navy Department calls for Admiralty Welsh coal, at 61s. 9d. f. o. b., and 62s. 6d. trimmed. A large dealer reports 35s. as the price of Australian and Welsh coal such as is sold to merchant vessels at Valparaiso and Iquique.

On the return voyage from western South America to the Atlantic seaboard of the United States and Europe, it is customary to start with a small supply of coal in the vessel's bunkers, because the Chilean coal is inferior in quality and the Welsh, Pocahontas, or Australian coals command high prices on the west coast of South America. Vessels coal eastbound at Montevideo, where about 25,000 tons of Welsh coal are kept in stock by four dealers, who handle it over lighters. The contract price for 1912 quoted by various dealers is 41s. ($9.98) free on board. One navigation company reported purchases at 36s. 6d. ($8.87) in 1911, and another at $8.75 per ton; 862,037 tons of Welsh coal were shipped to Montevideo in 1910.

Sufficient coal is taken on at Montevideo to run a vessel bound for the United States to St. Lucia, where the supply is replenished. An average stock of about 6,000 tons of Pocahontas, 5,000 of New River, and 3,000 of Eureka coal is kept on hand at St. Lucia. There are three dealers at whose wharves vessels may be rapidly coaled. Several dealers quote a 1912 contract price of 23s. (trimmed), alongside wharf, for New River and Pocahontas coal. In 1911, coal was sold at St. Lucia to a New York navigation company for 23s. ($5.59), and to another company at $5.30. Vessels may also coal at St. Thomas, where an average supply of 6,000 tons of Pocahontas and 3,000 of Ferndale (Welsh) coal is kept on hand and handled either from wharf or lighters. The 1912 contract price for Pocahontas coal is 22s. free on board alongside wharf.

The following statement, furnished by a company that operated steamers during 1911 from New York via the Straits of Magellan to Callao and return, gives the fuel expenses incurred by a vessel for a round-trip voyage. The figures are for contract prices paid for coal, trimmed into bunkers; and the amount taken at each station is indicated.

	Coal.	Cost per ton.
	Tons.	
Steamer sailed from New York with	1,400	$3.25
Replenished at Coronel with (Sufficient to take steamer to Callao and back to Coronel, where she commenced replenishing for homeward voyage.)	950	6.00
Replenished at Coronel with	1,000	6.00
Replenished at Montevideo with	630	8.75
Replenished at St. Lucia with	350–450	5.30
Completed discharge at New York.		

The average cost per ton for the coal consumed by the above vessel was $5.50.

Another company which operates a large number of vessels between New York and the west coast of South America has furnished the following information concerning the price at which coal was sold at stations along the route via the Straits of Magellan during the six years ending in 1911. The average price paid by the company for this period was $3.73 per ton at New York; $5.83 (20s.) at St. Lucia, West Indies; $8.75 (36s.) at Montevideo; and $5.47 (22s.) in Chile. The average price at Norfolk, Va., during the 6-year period was $3.19. The company states "that the quantity taken at each place varies widely, but the average price paid for coal during the six years has been $4.75 per ton," and this figure is said to allow for the relative inefficiency of Chilean coal, 1⅓ tons of Chilean coal being the equivalent of 1 ton of Admiralty Cardiff.

Concerning the practice of this company as regards the coaling of its vessels, tne statement is made that—

In our service, our custom is to supply the steamers outward with coal sufficient for the entire voyage to Coronel, Chile, 40 days steaming, say 1,200 to 1,400 tons, which reduces productive ship capacity by that much. A smaller proportion is taken on the homeward voyage, the longest interval between coaling ports being 21–22 days. The outward service via the canal would save fully 10 days' steaming, so if a full supply was shipped at loading port it would release 250–300 tons of cargo capacity. How much, if any, saving there would be on the homeward voyage via the canal will depend on what coaling facilities are established, but from the nitrate ports direct to the Isthmus would be a shorter run than from Montevideo to St. Lucia at present, and coal would certainly not be more expensive at Colon than at St. Lucia, so this item would be rather in favor of than against the canal.

Vessels on the outward voyage from Europe to the west coast of South America sometimes start with coal enough to reach Coronel, and at other times they may replenish their supply at Madeira or St. Vincent. On the return journey they take on a smaller supply at Coronel or other west coast ports and recoal usually at Montevideo and St. Vincent or Madeira. The coal supply at St. Vincent was referred to above in connection with the South African route. The 1912 contract price of Welsh coal at Madeira is quoted by various dealers at 23s. (trimmed). The average supply consists of 25,000 tons of Welsh and 4,000 tons of Westphalian coal.

IV. Coaling Facilities and Coal Costs via the Panama Route.

In contrasting the costs of coal along the Panama route with those via alternative routes, the prices at which coal is now being sold at stations on the Panama route and the coaling facilities now existing at these points can not fairly be made the basis of comparison. The Suez, South African, and South American routes are old and are equipped with stations at which coal merchants have a well-established trade, while the stations along the Panama routes west, north, and south of Panama are far apart and relatively unimportant.

The relative fuel expenses incurred by vessels using the Panama and alternative routes will depend, first of all, upon the price at which coal is sold at the canal. Coal of a high grade is to be had at low prices at the Atlantic-Gulf ports of the United States and at West Indian and Caribbean stations. The Panama Canal can be reached from the Atlantic ports of the United States with low fuel expenses. A vessel at New York may take on coal at from $3 to $3.25 f. a. s. and at Newport News or Norfolk at $3 f. o. b.

The quantity required to be taken at New York and Norfolk when clearing for Panama is small and prices are low. A ship sailing from New York to the Suez Canal can start with good inexpensive coal, but the vessel must devote more space to coal than is required on a voyage to Panama. The prices now prevailing at Mediterranean stations for Welsh or Durham coal are from 21s. to 25s. 10d. ($5.11 to $6.34). The 1912 contract renewal price for Welsh coal at Port Said is 25s. 6d. ($6.21) f. o. b.

The prices at which coal is now sold to merchant vessels at Colon and Panama and at Pacific ports north of the Isthmus are high and are no indication of the prices that may be expected to prevail after the opening of the canal. The Panama Railroad Co. sells Pocahontas and New River coal at Colon and Panama to merchant vessels at prices that, in most instances, yield a good profit. It will probably not be the policy of the Government, should it decide to maintain coaling stations for supplying merchant vessels, to charge prices much in excess of actual costs.

At San Francisco, which is now the chief coaling station between Panama and Japan, the 1911 price was $6.90 per ton for Comox (British Columbia) run-of-mine coal. At no point beyond San Francisco and Vancouver on the Panama route to Japan can large quantities of coal be obtained at low prices. A relatively large supply is kept at Honolulu, but the prices during recent years have ranged from $7 to $10.50 per ton. Honolulu, moreover, is not on the direct route between the United States and the Orient, and its coaling station is of service mainly to vessels plying in the trade between the Pacific coast of the United States and Australia.

The coaling stations at San Francisco, Seattle, and Vancouver will in the future bear about the same relation to the route via the Panama Canal to the Orient that the coaling stations at or near the Suez Canal bear to the route from Europe via Suez to the Orient. Vessels leaving the Mediterranean for the East take on enough Welsh or English coal at Mediterranean stations or at the Suez Canal for the long run from Port Said to Colombo or even Singapore. Likewise a vessel leaving San Francisco or Puget Sound takes coal for the voyage across the north Pacific to Japan. The distance across the north Pacific from San Francisco to Yokohama is practically the same as the distance from Suez to Singapore. If in the future the price of coal at San Francisco or Puget Sound is as low as at Port Said, or possibly lower, the use of the Panama route will be greatly aided. Vessels taking the route via the Panama Canal and Yokohama to Hongkong and Manila will secure coal in Japan, while vessels outbound from Europe via Suez to the Orient will be able to buy coal at or near Singapore. Vessels taking the Panama route to the Pacific coast of Asia will have some advantage over vessels taking the Suez route, as regards fuel costs, for the latter part of their voyage, because coal is cheaper in Japan than at Singapore. Likewise for the trip homeward from the Orient by way of the Panama Canal the cheap coal obtainable in Japan will be to the advantage of the Panama, as compared with the Suez, route.

The use of the Panama Canal by vessels engaged in the traffic between Europe and the Orient will depend very largely upon the cost of coal at Colon. The distance from Europe to China and Japan is less via Suez than via the Panama Canal, and if the American route is taken, it will probably be chosen because of the cheaper coal costs. The price of coal at St. Lucia, St. Thomas, and other stations between Europe and the Panama Canal is slightly higher than at Algiers, Oran, and other Mediterranean ports on the way to the Suez Canal. Moreover, the cost of coal at San Francisco and at Vancouver will probably range higher than at Colombo and Singapore. It thus seems evident that if the fuel expenses are less from Europe to the Orient via Panama than via Suez it will be largely because the cost of coal is lower at Cristobal than at Port Said.

In voyages from the Atlantic seaboard of the United States to Australia and New Zealand the advantages of the Panama route as regards coal costs may influence choice of routes. If the Panama route is chosen, vessels will have good, cheap coal from the Atlantic seaboard of the United States to the canal, where they will fill their bunkers with enough coal to make the long run from the canal to New Zealand or to Australia, in both of which countries native coal is cheap. Vessels will probably not coal between the canal and New Zealand, because the prices at Tahiti and other mid-Pacific stations will unquestionably be high and the supply of coal will probably be uncertain. Vessels taking the Cape of Good Hope route instead of the route via Panama from the United States to Australia will doubtless use American coal for the long run to Cape Town or Durban, although this will require the sacrifice of some of the ship's cargo capacity to provide space for coal. At Durban, Natal coal can be gotten as low as 12s. to 14s. 6d. ($2.92 to $3.53) per ton. The advantage to the Cape of Good Hope route resulting from the low price of Natal coal will, however, probably be quite offset by the fact that the distance and time via the Panama route will be less and the amount of coal consumed will be smaller. For the same reasons the coal advantages are with the Panama route as compared with that via the Straits of Magellan to New Zealand.

From Europe to New Zealand, the Panama route is shorter and requires the consumption of less coal; but the Suez route is shorter from Europe to Australian ports. Since coal prices en route to Panama at St. Lucia, St. Thomas, or other stations are slightly above the prices at Gibraltar, Oran, Algiers, or other points en route to the Suez Canal, the saving, if any, in fuel costs via the Panama route will depend mainly upon the prices charged at Colon.' If coal is sold at Colon for less than is charged at Port Said, some vessels will be drawn to the Panama Canal that would otherwise take another route from Europe to Australasia. The largest port in Australia, Sydney, being but 150 miles further from Liverpool via Panama than via Suez, the Panama Canal ought to compete actively with the Suez route for the Australasian-European trade.

The foregoing analysis of coaling facilities and coal prices along the various routes with which the Panama Canal must compete emphasizes the importance of maintaining at Colon and Panama large supplies of coal to be sold at prices as low as they can be made without loss to the canal administration, which obviously ought to be authorized to maintain coaling stations at both termini of the canal. The experience which the Panama Railroad Co., acting for the Isthmian Canal Commission, has had during the period of canal construction in purchasing and distributing coal at the Isthmus indicates the prices at which coal can probably be sold without loss, or with small profit, to the United States. Most of the coal used by the Panama Railroad Co. and the Isthmian Canal Commission has been Pocahontas and New River coal purchased at Norfolk. The prices paid at Norfolk from 1905 to the present time, the amounts purchased each year, and the freight rate from Norfolk to the Isthmus are stated in Table V on page 168.

The Government contract prices for coal delivered at the end of the ship's tackle at the Isthmus have varied somewhat year by year. In 1906–7 the cost of coal at the end of the ship's tackle at the Isthmus was from $4.30 to $4.40; in 1907–8 the cost was from $4.27 to $4.42; in 1908–9, $4.14 to $4.29; in 1909–10, $3.74 to $3.84; in 1910–11, $3.94½; 1911–12, $3.80½, and since the 4th of April, 1912, it has been $4.09½.

The prices now being paid by the Panama Railroad Co. for coal were fixed by contract made April 4, 1912, for a period of two and one-half years. Under this contract the price to be paid for coal at Norfolk is $2.70 per ton, and $1.39½ is to be paid for the transportation of the coal from Norfolk to the Isthmus and the delivery of the coal at the end of the ship's tackle. The contract between the Panama Railroad Co. and the coal company, however, provides that if the commercial price of coal declines between April 1 and June 1 of 1913 or 1914 the price paid for coal by the Panama Railroad Co. is to be reduced to \$2.65 per ton. If the price of \$2.70 at Norfolk prevails through the two and one-half year period, the cost of coal delivered at the end of ship's tackle, at Colon will be \$4.09½. If to this there be added 50 cents per ton to cover overhead charges, storage, and depreciation, and 50 cents a ton as the cost of delivering the coal aboard vessels from cars, lighters, or barges, the price at which the Panama Railroad Co., or the Isthmian Canal Commission, or the canal administration can sell coal without loss, or possibly with a slight profit at Colon up to October 4, 1914, will be \$5.09½; or if the price at Norfolk should be reduced 5 cents a ton, \$5.04½. If the colliers carrying coal through the Panama Canal for delivery at the station at Balboa are required to pay a toll of \$1.20 per net vessel ton, the cost of coal delivered at Balboa will be about 50 cents per ton higher than at Colon or Cristobal. It will thus be possible for the Panama Railroad or the canal authorities to sell coal at Balboa without loss, or with slight profit, for \$5.59½ or (if the Norfolk price is \$2.65) \$5.54½.

The above details concerning the actual cost of coal delivered at the Isthmus of Panama show that coal can be sold from a Government station in Cristobal at about \$5 per ton and from a station in Balboa for about \$5.50 per ton. It should be stated that the allowance here made for overhead charges, depreciation, and lighterage—\$1 per ton—is liberal. These prices compare favorably with the current cost of coal at the Suez Canal. The 1912 contract price of Welsh coal at Port Said is 26s. (\$6.33) per ton, and the price at which coal is sold to companies that renewed previous contracts is 25s. 6d. (\$6.21). It seems certain that coal can be profitably sold by the United States Government at Cristobal for about \$1.20 to \$1.25 less than the price charged at Port Said. This, however, can be brought about only by the maintenance of Government coaling stations at the canal termini and by selling coal at cost, or with but slight profit.

TABLE V.—COST OF COAL TO THE PANAMA RAILROAD CO. AT THE ISTHMUS—CONTRACT PRICES[1] PAID AT NORFOLK, AND CONTRACT RATES FOR FREIGHT FROM NORFOLK TO THE ISTHMUS, 1905–1912.

Years.	Cost of coal at Norfolk.	Maximum quantity contracted for (tons).	Freight from Norfolk to Isthmus.
1905–6		10,000–50,000	\$1.44½
1906–7:			
Apr. 1, 1906, to Aug. 1, 1906	\$2.65	60,000–125,000	1.65
Aug. 1, 1906, to Apr. 1, 1907	2.75		1.65
Additional contract	2.75	60,000	1.65
1907–8:			
Apr. 1, 1907, to Aug. 31, 1907	2.75	350,000	1.52
Apr. 1, 1907, to Mar. 31, 1908	2.90		1.52
1908–9:			
Apr. 1, 1908, to Aug. 31, 1908	2.65	360,000	[2] 1.49
Sept. 1, 1908, to Mar. 31, 1909	2.80		[2] 1.49
1909–10:			
Apr. 1, 1909, to Aug. 31, 1909	2.34	200,000	1.40
Sept. 1, 1909, to Mar. 31, 1910	2.44	200,000	1.40
1910–11	2.60	545,000	1.34½
1911–12	2.51	550,000	1.29½
1912–14 [3]	2.70		1.39½

[1] Contracts have usually run for a year from Apr. 1

[2] With addition of \$25 per steamer for disbursing of colliers at Colon.

[3] Contracts run for two and a half years from Apr. 4, 1912; if between Apr. 1 and June 1 of 1913 or 1914 the commercial price of coal declines below \$2.70, the contract price for the remainder of the contract period shall be \$2.65.

If the price of coal is kept low at Cristobal and Balboa the Panama Canal will have a decided advantage over the Suez Canal as regards fuel costs, especially for vessels engaged in the commerce between the eastern seaboard of the United States and the Orient. The relative expenses for coal via the Panama route and via the Suez Canal for vessels making round-trip voyages between New York and Manila (which is equally distant from New York by the two alternative routes) may be indicated by a concrete illustration.

It was stated above that a steamer of 4,640 tons gross and 2,927 tons net register, British measurement, operated at a speed of 10¼ knots on a round trip, made in 1911, between New York and Manila, by way of the Suez Canal, consumed 4,475 tons of coal, the cost of which was \$20,868.75. Maj. Eugene T. Wilson, Subsistence Officer for the Isthmian Canal Commission, has calculated what the fuel expenses would have been for this vessel had it made the trip during 1911 between New York and Manila by way of the Panama route and paid $4.50 per ton for such coal as was purchased at Colon. Maj. Wilson explains his calculation as follows:

It is assumed that the ship loads at New York and takes on only enough coal to run to Newport News, where she can get the best coal and get it cheaper. I assume, further, that it is not desirable to put into this ship more than 1,050 tons of coal at one time. I assume, also, that her coal consumption is such as to give the ship the usual 20 per cent margin of safety, as far as Yokohama. The quantities and costs of coal would be as follows:

The ship takes on 50 tons at New York at $3.25; proceeds to Newport News and loads 1,050 tons at $3; thence to Colon, burning en route 370 tons, leaving 730 tons in her bunkers, and at Colon purchases 320 tons at $4.50, thus filling her bunkers up again to 1,050 tons. The ship steams thence to San Francisco, burning 610 tons of coal en route, and arriving there with 440 tons in the bunkers. Eight hundred and fifteen tons are required for the run to Yokohama, accordingly the ship takes on at San Francisco 375 tons of Comox (British Columbia) run-of-mine coal at $6.90 per ton. At a Japanese port she buys 900 tons of Japanese coal at $3.40, or 14 shillings per ton. With the 900 tons, she travels down as far as Manila and comes back empty, coaling back for the return voyage at, say Nagasaki or Moji, filling up her bunkers with 1,050 tons at $3.40 per ton. She requires 815 tons from Yokohama to San Francisco, where she arrives with 235 tons. As 610 tons are required from San Francisco to Colon, she buys 375 tons in San Francisco at $6.90, and at Colon 370 tons more at $4.50 to take her home. The amounts paid for coal for the supposed round trip would have been as follows:

COST OF COAL FOR ROUND-TRIP VOYAGE, VIA PANAMA, FROM NEW YORK TO MANILA. 1911 CONTRACT PRICES.

Station.	Tons purchased.	Price per ton.	Total.
New York	50	$3.25	$162.50
Newport News	1,050	3.00	3,150.00
Colon	320	4.50	1,440.00
San Francisco	375	6.90	2,587.50
Total to Yokohama			7,340.00
At Japanese ports	900	3.40	3,060.00
Homeward from Manila:			
Moji	1,050	3.40	3,570.00
San Francisco	375	6.90	2,587.50
Colon	370	4.50	1,665.00
Total homeward			7,822.50
Total for voyage			18,222.50

The above calculation shows that the vessel would have required 4,490 tons for the round-trip voyage between New York and Manila by way of Panama as compared with 4,475 tons that were used on the round trip by way of the Suez Canal. The total fuel expenses for the round trip via Panama, as calculated by Maj. Wilson, would have been $18,222.50, whereas the actual expenses by way of Suez were $20,868.75, the difference in favor of Panama being $2,646.25. The Colon price assumed by Maj. Wilson was $4.50; but even on the basis of a price of $4.75 in 1911, the difference in favor of the Panama route would have been $2,473.75. The lower cost by way of Panama was due (1) to the price of coal at Colon as compared with prices at Port Said and Algiers, and (2) to the lower cost of coal at Japanese ports than at Sabang on the Malacca Straits.

In the above comparison of the fuel expenses by way of the Panama and Suez routes the prices paid for the coal were the contract rates prevailing during 1911, with an assumed price of $4.50 or $4.75 per ton at Colon. If the 1912 contract prices are substituted in place of the 1911 prices in the comparison, and it be assumed that $5 per ton is paid for coal at Colon, the costs of coal by the two alternative routes become those shown in the table on page 170.

The 1912 contract prices and the assumption that coal is sold at Colon at $5 per ton makes the fuel costs for a round trip between New York and Manila for the vessel in question $4,041.75 less by way of a Panama route than via the Suez Canal.

The use of oil as fuel for ocean steamers has made little more than a beginning, and accurate comparisons of oil costs by different routes are hardly possible. Fuel oil is kept in stock at stations on the Suez route, for sale to such oil-burning steamers as are now run on that route. California oil is used by several vessels on the Atlantic and Pacific Coasts of the United States, and some of these oil burners will use the Panama Canal. The large California, Texas, and mid continent oil fields are relatively near the fuel stations along the Panama route and the substitution of oil for coal ought to be of more assistance to the Panama route than to those with which it has to compete. Presumably Russian oil can be sold at a relatively low price at Suez; but along the South African and Magellan routes there are no nearby oil fields of present importance from which stations could be supplied with cheap fuel oil.

The surest method of keeping coal prices low at the Isthmus is for the Government, through the canal administration, to maintain commercial coaling stations at Cristobal and Balboa. The foregoing discussion has emphasized the assistance which cheap coal at the Isthmus will give the Panama Canal in competing for traffic free to move by other routes. Government coaling stations will give the Panama Canal greater traffic and larger revenues.

COMPARATIVE COSTS OF COAL, VIA PANAMA AND VIA SUEZ, FOR ROUND-TRIP VOYAGE FROM NEW YORK TO MANILA. 1912 CONTRACT PRICES.

Station.	Tons purchased.	Price per ton.	Total.
FOR THE ROUND TRIP VOYAGE BETWEEN NEW YORK AND MANILA VIA PANAMA.			
New York	50	$3.25	$162.00
Newport News	1,050	3.00	3,150.00
Colon	320	5.00	1,600.00
San Francisco	375	6.90	2,587.50
Moji	900	3.40	3,060.00
Moji	1,050	3.40	3,570.00
San Francisco	375	6.90	2,587.50
Colon	370	5.00	1,850.00
Total			18,567.00
FOR THE ROUND TRIP VOYAGE BETWEEN NEW YORK AND MANILA VIA SUEZ.			
New York	750	3.25	2,437.50
Algiers	1,050	5.47	5,743.50
Sabang	1,000	5.23	5,230.00
Sabang (return)	700	5.23	3,661.00
Port Said	275	6.21	1,707.75
Algiers	700	5.47	3,829.00
Total			22,608.75

The industrial effects of the canal, moreover, can be made greater by keeping coal prices low at the Isthmus. The countries bordering on the Pacific north and south of Panama are industrially undeveloped. Cheap coal at Panama may be of great assistance to those countries in building up their industries. The development of the countries whose trade will be handled through the canal will increase the canal's traffic and revenues. Cheap coal at Panama will accomplish as much as low tolls might in building up the industries of the countries whose trade will be tributary to the canal. The fact need not be pointed out that the sale of coal at cost will impose no burden upon the United States Government, while low tolls or a reduction in tolls will necessarily lessen the revenues obtained from the operation of the canal.

It will be desirable for the United States Government to maintain coaling facilities at the canal to supply the Navy. The sale of coal to merchant vessels will simply require larger storage accommodations and more loading and unloading machinery. About 1,250,000 tons of coal are now annually sold at Port Said, and, in addition, a small amount is sold at Suez. The traffic of the Suez Canal is much larger at present than that of the Panama Canal will probably be during the early years of its operation, but the coal sales at the Panama Canal would doubtless be heavy. Practically every vessel passing through the Panama Canal will take on coal at Cristobal or Balboa, for the reason that there are no near-by stations with cheap coal to the northward and southward. Vessels west bound through the Panama Canal will fill their bunkers for the long runs beyond, just as vessels east bound through the Suez Canal lay in a full supply of fuel either at a Mediterranean station or at Port Said.

CHAPTER XI.

RELATION OF TOLLS TO THE VOLUME OF TRAFFIC THROUGH THE CANAL.

TOLLS THE TRAFFIC WILL BEAR.

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RELATION OF TOLLS TO THE VOLUME OF TRAFFIC THROUGH THE CANAL. TOLLS THE TRAFFIC WILL BEAR.

INTRODUCTION.

The volume of traffic through the canal must necessarily be affected by the tolls levied upon shipping and passengers. Whatever considerations other than those of revenue may be given weight in deciding what the tolls shall be, it is essential that the charges shall be well within what the traffic will bear. The Government's revenue policy must not seriously limit the use of the canal by the commerce of the world.

The traffic of the Panama Canal may be divided, for the purposes of this inquiry, into two parts, (1) that which originates or terminates clearly within the zone of the canal's influence—commerce that is certain to use the canal—and (2) that which lies on the border of the canal's sphere of influence and which may choose between the Panama route and routes through the Straits of Magellan, around the Cape of Good Hope, or by way of Suez. The Panama route will have a monopoly of the traffic of Hawaii and of the west coast of North and South America with the exception of a small part of the trade of southern Chile, but it so happens that the marginal traffic for which the Panama Canal must compete with other routes is of exceptionally large tonnage and value, comprising the major share of the commerce of Pacific Asia and of Australasia. The ships engaged in the trade of which the Panama route has a monopoly will comprise the larger share of the canal's tonnage; but the marginal traffic is a prize so well worth competing for that it should be given careful consideration in fixing the tolls to be charged at Panama. The volume of traffic and the commercial usefulness of the canal, as well as the revenue obtained from its operation, are dependent upon the transit dues.

The tolls at Panama, in so far as they are a charge for a service, may be made equal to the money equivalent of the services rendered by the canal to the commerce that derives least benefit from the shorter route afforded by the canal. The function of the canal is to shorten ocean routes, and its services to trade and shipping may, in general, be measured by the saving it effects in distances and in sailing time between ports. For some traffic, distances will be shortened so much as to make certain that the canal will be used; the traffic of some sections will unquestionably not take the Panama route; while the trade of some regions will move by way of Panama if the tolls permit.

Neither the tolls that shipping can pay for using the Panama Canal nor the limits that any particular toll will give to the canal traffic zone can be determined solely by comparing distances via the Panama Canal and alternative routes. There are other factors than distance that influence the choice of routes followed by ocean shipping. Vessels are vehicles of commerce operated to secure maximum profits for their owners, who are usually common carriers, but may be producers or merchants who own and manage vessels as a part of their business. Trade requirements determine the routes taken by ocean carriers. Often the most profitable route between the ports of departure and ultimate destination is a circuitous one that will permit cargo to be loaded and discharged at more intermediate ports than can be reached by a direct route. The possible effect of trade requirements upon routes taken by vessels may be illustrated by reference to Chile and Japan. The short route from Europe and New York to the commercially important part of Chile, which is practically all north of 40° south latitude, is through the Panama Canal; but the trade of Punta Arenas on the Straits of Magellan will be large enough to cause some vessels to be dispatched to Chilean ports via the Straits of Magellan. The distance from New York to Punta Arenas via the canal being only 700 miles less than the distance via the east coast of South America, vessels leaving New York with full cargoes, a part of which is for Punta Arenas, may find it more economical to take the Atlantic route outbound. From Punta Arenas the vessels will proceed to the ports along the west coast of South America and return via the canal to New York. For the most part, however, the commerce of South America with both Europe and the Atlantic-Gulf seaboard of the United States will be handled by vessels that use the Panama Canal on both the outward and home bound voyages

Similarly, the short route from Japan to the eastern seaboard of the United States will be by way of the Panama Canal, and vessels sailing from Yokohama or other Japanese ports with full, or nearly full, cargoes will unquestionably take the Panama route; but such ships as are obliged to leave Japan but partly loaded may choose the route past Asia and through the Suez Canal if the prospect of securing cargo at Chinese, East Indian, and Indian ports is better than at ports of the west coast of the United States or at foreign American ports. The fact that a vessel under a foreign flag would not be allowed to carry freight between ports of the United States might also influence a ship to take the Suez route from Japan to our eastern seaboard.

The route taken by vessels outbound for our Atlantic coast from any of the ports from Singapore and Manila on the south to Yokohama on the north will be determined more by the cargo needs of the vessels and by the opportunity to obtain, or to discharge and load, cargo en route than by the relative distances via the Suez and Panama routes from the Asiatic port of departure and the American port of destination. In a less degree, the same will be true of vessels outbound from the Pacific ports of Asia to Great Britain, Holland, Belgium, and Germany.

The cost of coal and the amount of space required for coal bunkers have a large influence upon operating expenses and upon the gross and net earnings of vessels. Other things being equal, vessel owners will select the route upon which coal is cheapest and along which coaling stations are nearest to each other. The ability to secure coal at short intervals en route enables the ship master to minimize bunker space and to use a maximum share of the ship's capacity for paying cargo. Indeed, it is often profitable for a vessel, sailing from a port at which coal is relatively cheap, to take on a comparatively small amount of coal at the beginning of the voyage, and to buy coal at higher prices at stations en route. When cargo is abundant and freight rates are remunerative, bunker spaces will be kept as small as practicable. Steamship managers constantly watch fuel costs, and seek so to adjust the three factors of cost of coal, quantities taken at stations, and the relation of bunker and cargo spaces as to secure maximum profits from the operation of their vessels.

The competition of the Panama and Suez Canals for the traffic of Pacific Asia, the East Indies, and Australasia will be appreciably affected by the cost of coal and the number of stations along the competitive routes; indeed, the relative coal prices and coal facilities via the Panama and alternative routes will have almost as much influence as will tolls upon the volume of traffic through the Panama Canal. The subject was deemed to be of such importance as to require detailed discussion and was considered in the preceding chapter.

Minor Factors Affecting the Use of the Panama Canal.

In addition to the factors of distance, of cargo obtainable at ports of call, of coaling facilities, and of the price of coal at station on the way, there are such minor factors as marine-insurance rates, climatic conditions, prevailing winds and currents, and dangers from storms that will influence the choice which vessels will make between the Panama Canal and some alternative route. Unquestionably, the insurance rates will be somewhat less via Panama than via the Straits of Magellan; but what the difference will be can hardly be determined in advance of the opening of the canal. In general, the climatic conditions will favor the Panama Canal in its competition with the Suez Canal. The excessive heat of the Red Sea is liable to damage some kinds of cargo; and it is said that the heat is such that the stokers are unable to maintain the usual pressure in the boilers. A vessel's speed may thus be reduced a knot or a knot and a half per hour for the long run of 1,310 miles from Suez to Aden. Vessels outbound from Japan for Europe or the Atlantic seaboard of the United States will find favoring winds and currents across the Pacific and through the Panama Canal and opposing winds and currents for a part of the route in the opposite direction. Likewise, the storms of the North Pacific and the Caribbean are less frequent and severe than those of the Indian Ocean and the North Atlantic.

The effect of these minor factors—other than insurance rates—upon the choice of ocean routes will probably not be of much importance although their influence will not be negligible. They are mentioned here not for the purpose of emphasizing them, but rather to call attention to them and to indicate how complex are the forces that determine the routes taken by the ships employed in the world's commerce. While distance is the main determinant of the choice of routes, the possible modifying effect of other factors must constantly be considered.

In seeking the information upon which this discussion is based, special efforts have been made to ascertain from the managers of important steamship lines the probable routes over which their vessels will be operated after the Panama Canal has been opened; but even practical steamship men can not fully determine, in advance of actual experience in using the canal, which routes, and which sequence of intermediate ports, will prove the most profitable for their vessels. As is stated in various parts of this report, there will be a period of possibly two years following the opening of the canal during which commerce will be adjusting itself to the new routes made possible by the waterway across the Isthmus.

In studying the relation of tolls to the volume of traffic through the Panama Canal, attention may be centered upon the commerce of the Atlantic seaboard of the United States and of Europe with the west coast of South America, with Australasia, and with Pacific Asia. The trade of the west coast of North America, both with the Atlantic-Gulf seaboard of the United States and with Europe is so definitely within the canal's traffic zone that the traffic would bear much higher tolls than it would be wise or possible to place upon the shipping engaged in the commerce between the north Atlantic and either Southern Chile or the countries across the Pacific.

I. Relation of Panama Canal Tolls to the Traffic of the Atlantic-Gulf Seaboard of the United States with the West Coast of South America.

The assistance given by the Panama Canal to the traffic between the eastern part of the United States and the west coast of South America will be second only to the aid given to the coastwise commerce between our two seaboards. The distances and the time which the Panama Canal will save for vessels running between the Atlantic-Gulf seaboard of the United States and the ports of the northern and southern sections of the west coast of South America are indicated by the following table. The reduction effected by the canal in the days of sailing time is stated for vessels of 9, 10, 12, 14, and 16 knots speed, the time allowed for passing through the canal being, in each case, one-half a day.

Table I.—DISTANCES AND TIME SAVED VIA THE PANAMA CANAL AS COMPARED WITH THE STRAITS OF MAGELLAN BETWEEN THE ATLANTIC-GULF PORTS OF THE UNITED STATES AND THE WEST COAST OF SOUTH AMERICA.

To—	From New York.						From New Orleans.					
	Distance saved.	Days saved for vessels of—					Distance saved.	Days saved for vessels of—				
		9 knots.	10 knots.	12 knots.	14 knots.	16 knots.		9 knots.	10 knots.	12 knots.	14 knots.	16 knots.
	Miles.						*Miles.*					
Callao	6,250	28.4	25.2	21.2	18.1	15.7	7,245	33.0	29.7	24.7	21.1	18.4
Iquique	5,139	23.3	20.9	17.3	14.8	12.9	6,134	27.9	25.0	20.8	17.7	15.4
Valparaiso	3,747	16.8	15.1	12.5	10.6	9.2	4,742	21.4	19.2	16.0	13.6	11.8
Coronel	3,296	14.7	13.2	10.9	9.3	8.1	4,291	19.4	17.4	14.4	12.3	10.7

The location and trade of the four cities of South America listed in the table make them typical of all the ports of the west coast of that continent. Callao, the chief port of Peru, 1,346 miles from Panama and 2,666 miles from the Straits of Magellan, is so located as to make certain that its commerce with the eastern seaboard of the United States will be able to pay such tolls as may be levied for using the Panama Canal. The same may be said of Iquique and Antofagasta, in northern Chile, the ports from which the heavy nitrate shipments—amounting in 1911 to 2,500,000 cargo tons—are made. Iquique is 1,987 miles from Panama and 2,196 miles from the Straits of Magellan. The time saved by using the Panama Canal on a trip from New York to Callao, for a vessel of 9 knots speed, will be 28.4 days; for a speed of 10 knots, 25.2; of 12 knots, 21.2; of 14 knots, 18.1; and of 16 knots, 15.7. The saving effected by the canal for the trip from New York to Iquique will be, for a vessel of 9 knots, 23.3 days; of 10 knots, 20.9 days; of 12 knots, 17.3 days; of 14 knots, 14.8 days; and of 16 knots, 12.9 days.

The speed at which most freight vessels are now operated is 9 or 10 knots. As ships run at these speeds will save from 28 to 25 days by using the canal between New York and Callao, and 23 to 21 days between New York and Iquique, they could afford to pay heavy tolls to avoid making the trip via the Straits of Magellan—a toll much higher than it would be wise to charge for passing through the canal. As will appear from the following discussion a freight vessel can afford to pay a toll equal to about 10 cents per net register ton for each day saved.

The short tables presented in this section, which are for the most part compiled from the more detailed tables in Chapter I, state the number of days which vessels can save in making designated voyages by using the Panama Canal instead of the shortest alternative route; and, in order to determine what tolls would be the money equivalent of the saving in time effected by the canal, it is necessary to know the per diem operating cost of vessels while they are at sea en route from port of departure to port of destination, i. e., to know how much an owner of a ship saves for each day's reduction in the time of the voyage. This information has been supplied by several companies and the data furnished give the "costs at sea" of vessels of different sizes, types, and speeds. The items included in per diem expenses, in the case of vessels owned by those who operate them, are wages, provisions, and coal, also a proportionate share of the annual maintenance, insurance, interest, and depreciation charges. For vessels operated under time charters (such vessels being manned and provisioned by their owners), the payment per day for the use of the vessel, plus the daily fuel costs at sea, covers the per diem operating expenses.

There may be some question as to what are a ship's expenses at sea. The outlay for wages, provisions, and fuel would of course be included in expenses incurred while a ship is en route between ports. Ought there to be included in expenses at sea a share of the annual maintenance, insurance, interest, and depreciation costs equal to the ratio of the number of days the ship is en route to the number of days in a year? It is believed that per diem costs should include a proportionate share of the annual maintenance, insurance, interest, and depreciation charges; and that for every day a vessel can save by using the Panama Canal its owners profit both by a reduction in the operating expenses incurred for crew and coal and by a reduction in the time the vessel has to be employed in making a voyage and thus in earning the amount received for the transportation service performed. A shortening in the time at sea enables a vessel to make more voyages in a year and increases the revenues from which maintenance, interest, and depreciation charges must be met. Thus the per diem cost at sea (or the per diem saving due to a reduction in time at sea) ought to include the outlay for wages, provisions, and coal, and the proportionate share of the annual maintenance, insurance, interest, and depreciation charges.

In ascertaining the per diem saving effected by a reduction of a vessel's time en route it is necessary, in the case of a vessel operated by its owners, to make a special calculation to determine the per diem maintenance, insurance, interest, and depreciation costs; but in the case of a vessel operated under a time charter such a calculation is not required. The time-charter rate paid by the user to the owner must reimburse the owner not only for the expenses for wages and provisions of the crew (the owner supplies and maintains the crew) but also for his capital outlay. The amount received by the owner from the user of the ship must cover maintenance, insurance, interest, and depreciation as well as wages and food. The user of the vessel ordinarily supplies the fuel. Thus the entire per diem costs at sea (as defined above) of a steamer run under a time charter are the amount paid for the use of the vessel one day plus the daily coal cost.

The following statements are made by officials of companies that have had long experience in the operation of vessels:

(*a*) A company that has for many years run chartered vessels between the eastern seaboard of the United States and the west coast of South America says, in regard to the monthly and daily expenses incurred, that—

> Time charter rates during the period reviewed (period of 6 years preceding 1911) have ranged from 7s. 3d. to 8s. 4d. per net register ton per month. The average or the normal rate would be somewhere between 7s. 9d. and 8s. The lower rate would be conservative. The ordinary high-class "tramp" steamer usually employed by us in this trade (from the eastern United States to the west coast of South America), say 2,500/2,800 tons net register, has consumed about 30 tons of coal per steaming day on an average, taking the different grades of coal, including that supplied at coaling ports on the voyage, and the average cost has been about $4.75 per ton. These steamers are of the type known as 9-knot boats, which in actual performance falls somewhat short of this speed, but averaging about 8½ knots per hour. On the out and home voyage to the north of Peru, which is as far as our service extends, say 5½ to 6 months' time, the steaming days would average about 100. Thus, at 7s. 9d. hire per net register ton (or say 3s. per ton total dead-weight capacity) per month, and 30 tons of coal per day, the cost per steaming day would be to the charterers $330, more or less.

The above statement is that during the six years preceding 1911 the charter rate on slow freight steamers between the eastern part of the United States and western South America was about 8 shillings, or $2, per net register ton per month. The vessel in question, of 2,800 tons net register, would thus cost the charterer $5,600 per month of 30 days. This steamer at sea burns about 30 tons of coal a day, the average cost of which, during the six years, has been $4.75 per ton. The charter rate amounting to $186.66 per day plus the fuel cost of $142.50, or $329.16, represents the outlay per day for the operation of the freight vessel in question. This is equal to

11.7 cents per net register ton or about 4.5 cents per dead-weight ton per day. These vessels are of the shelter-deck type and their registry is British. Their figures for registry do not include the space occupied by the shelter deck and partly for this reason the net register tonnage is low in relation to dead-weight capacity.

(*b*) The expense of owning, operating, and maintaining in service in the trade between the two seaboards of the United States of three typical cargo steamers has been supplied by a firm operating a relatively large number of vessels. The per diem expenses as stated are for the year 1910 and include "victualing and manning, deck and engine supplies, fuel, maintenance, insurance, interest, and depreciation." The vessels being under the American flag, their registry tonnage is in accordance with American rules, which give larger figures than the British rules do. The per diem expenses for the three ships which are run at 11 knots speed are as follows:

Steamer of 3,643 tons net register, coal burner	$372.20
Steamer of 4,016 tons net register, oil burner	455.15
Steamer of 5,636 tons net register, oil burner	490.92

It will be noted that the per diem expense for the first of the three ships was slightly more than 10 cents per net register ton, and that the per diem outlay for the second of the vessels noted was somewhat more than 11 cents per net ton, while the daily outgo for the third and largest of the three vessels was but 8.7 cents. The tonnage of the three vessels amounted to 13,395 net tons. The daily expenses of the three vessels equals $1,318.27. The net daily operating expenses for the three vessels is therefore almost 10 cents per ton net register, American measurement.

(*c*) Another firm which operates a large number of vessels between the eastern seaboard of the United States and the west coast of South America states that the cost at sea "including interest, depreciation, wages, provisions, and coal is $204 for a steamer of 2,016 tons net register (British measurement)—4,814 tons dead-weight capacity—operated at a speed of 9½ knots per hour." The per diem operating expenses amount to exactly 10 cents per ton net register, British measurement.

(*d*) Another company, operating a large fleet of vessels between New York and the west coast of South America, states that a typical, up-to-date, high-class freight steamer of 3,013 tons net register, British measurement, costs $328 per diem to operate, including wages, provisions, coal, interest, and depreciation. The speed at sea averages 10 knots. This vessel is of the shelter-deck type and it has a much lower registry under the British flag than it would have if it were under the American flag. The per diem expenses as given amount to 10.8 cents net register ton. This would be equivalent to somewhat more than 4 cents per dead-weight ton per day.

(*e*) A shelter-deck freight steamer of 2,296 tons net register, British measurement, and 5,984 tons dead-weight capacity, was run during 1911 between New York and the west coast of South America by the firm referred to in the preceding paragraph. This vessel was operated under time charter at the rate of 3 shillings 6 pence ($0.85) per dead-weight ton per month. The speed of the vessel at sea is 9½ knots. The coal consumed daily averaged 19 tons, and all of the coal for the outbound voyage was taken on at Norfolk at a price of $2.75 per ton, trimmed in the bunkers. The foregoing figures give the following per diem cost:

5,984 tons dead weight × 85 cents=$5,086.40, divided by 30 gives per diem charter costs of	$169.55
19 tons of coal, at $2.75	52.25
Total per diem costs	221.80

For the outward voyage, the per diem expenses were 9.6 cents per net register ton per day, or about 3.7 cents per dead-weight ton. The higher coal costs for the return voyage of this vessel would bring the per diem expenses per net register ton and per dead-weight ton, respectively, somewhat above 10 cents and 4 cents.

A large manufacturing concern, which employs its own vessels to market its products in foreign countries, gives information regarding the per diem operating expenses for three vessels, two of the shelter-deck type, one operated through the Suez Canal to Japan and China, and another by the same route as far as the Philippines. A third vessel of the well-deck type was run through the Straits of Magellan to the west coast of South America. In each instance the per diem expenses are for a round-trip voyage made during 1911.

(*f*) The two vessels operated through the Suez Canal are each of 2,927 tons net register, British measurement, 4,640 gross register, 8,500 dead-weight capacity, and 9,500 tons capacity for measurement cargo. The vessels were operated at 10¼ knots speed and had an average coal consumption of 38 tons per day. The per diem operating expenses of these two ships averages $348.86 per vessel, or 11.9 cents per net register ton per day or 4.1 cents per dead-weight ton. The shelter-deck space not being included in the British measurement, these ships have a relatively low net register tonnage as compared with cargo capacity. If measured by American rules the net register tonnage would be so increased as to reduce the per diem operating expenses to 10 cents or less per net ton.

(*g*) The well-deck steamer referred to in the second paragraph above as having made a round trip between New York and the west coast of South America during 1911 has 3,488 tons net register, British measurement, 5,409 tons gross, 8,715 tons dead-weight capacity, and 8,500 tons capacity for measurement cargo. This vessel is operated at a speed of 10 knots and has a coal consumption of 30 tons per day. The per diem expenses for this vessel were $342.91, or about 10 cents per net register ton and 4 cents per dead-weight ton.

In general it may be said that the daily operating expenses for large freight vessels of the most modern type are less than 10 cents per net register ton, British measurement; that for freight steamers of average size and efficiency the operating expenses are about 10 cents per day per net ton, and that for the smaller and older type of freight vessels the expenses are 11 cents and in some instances 12 cents per net ton per day. For vessels of the shelter-deck type the average will usually be over 10 cents per net ton British measurement and slightly under 10 cents per ton American and Suez measurements. "Well-deck" vessels have nearly the same net tonnage by both British and American measurements. Taking ships as they run, the average expense of maintaining a 10-knot freight ship in service is approximately 10 cents per day per net ton, American measurement, and somewhat under 10 cents, Suez measurement.

The foregoing figures regarding per diem costs are in every case for freight vessels, some of them being owned by the company using them, others being operated under time charters. The daily expenses of a passenger ship are necessarily much higher than for a freight vessel. Passenger steamers must be operated at a higher speed than freight vessels, and, as is well known, any increase in the speed of a vessel requires more than a proportional addition to expenses. For a vessel operated over a given route, as between New York and the west coast of South America, the higher its speed the less time it can save by using the Panama Canal instead of a longer route, but the actual economy due to using the canal is greater in the case of a passenger ship than in the case of a freight vessel. This is true not only because per diem expenses increase more rapidly than speed is augmented, but also because a passenger vessel requires a much larger daily outlay while at sea than a freight vessel does. A passenger ship is comparable to a floating hotel, a freight vessel to a floating warehouse.

The expenses incurred by the Panama Railroad Steamship Co. for maintaining the *Cristobal* in service for six round voyages between New York and Colon, made during 194 days of 1911, amounted to $729.93 per day. This includes the following items: Superintendence, wages of crew, fuel, lubrication, stationery, subsistence, stores for departments, other operations, and depreciation. Expenses incurred while the ship is at terminals are not included; but the ship is made to bear its proportionate share, while at sea, of the office superintendence expenses. The *Cristobal* is of 6,195 tons net register and 9,606 gross, American measurement. It is operated at an average speed at sea of 12 knots, with a per diem expense of 11.7 cents per net register ton per day.

The steamship *Panama*, of the Panama Railroad Steamship Co.'s fleet, had per diem expenses of $866.05 on an average, during 6 round voyages made during 147 days of 1911. The items of expense are the same as those of the *Cristobal* as listed in the preceding paragraph. This vessel is of 4,193 tons net register and 5,666 gross register, American measurement. Its speed at sea averages 14½ knots and the per diem expenses equal 20 cents per net register ton. This vessel, which is only two-thirds the size of the *Cristobal*, carries twice as many passengers and is operated 2½ knots per hour faster than the *Cristobal*. For these reasons its daily expenses per net register ton are 70 per cent greater.

It is stated above, in Table 1, that a vessel of 10-knots speed can reach Coronel, Chile, from New York in 13.2 days less time via Panama than via the Straits of Magellan, and it is thus evident that, as far as distance and time control the route taken, vessels of 10 knots speed and per diem expenses of 10 cents per net ton could be charged a toll of about $1.30 per net ton, American measurement, without their being diverted to the route through the Straits of Magellan. New Orleans and the other Gulf ports are so much nearer than New York to the Panama Canal that the traffic between the Gulf seaboard of the United States and western South America will derive greater benefit from the canal, and thus can bear higher tolls, than the traffic between New York and the seaports south of Panama. What is true of New York as regards possible canal tolls on traffic with western South America is true, in a larger measure, of New Orleans.

The first of the estimates above given (par. *a*) of per diem costs of maintaining vessels in service refers to a vessel operated under a time charter. The rates paid by the charterer to the owner of the vessel cover all expenses, except coal, that can be charged against a vessel during the time it is at sea. A freight vessel of 2,800 tons net register with per diem expenses of $330—including wages, provisions, coal, maintenance, insurance, interest, and depreciation—could afford to pay a toll of $1.18 per ton net register to effect a saving of 10 days in length of voyage. Being operated at 9 knots speed, this vessel would save 16.8 days in sailing time by the use of the canal; and this would be equivalent to a toll of $2.04 per net ton as measured. It is evident that a freight vessel, such as is referred to in the first of the above estimates as to per diem costs, would hardly use the Straits of Magellan for the commerce between the eastern part of the United States and any part of the west coast of South America. For a point as far south as Coronel a vessel of 9 knots speed would save 14.7 days on the voyage from New York by using the canal instead of the Straits of Magellan.

The first of the three vessels mentioned (par. *b*) in the second estimate of per diem expenses—a steamer of 3,643 tons net register with per diem expenses of $372.20—could pay a toll of $1.40 per net register ton to effect a reduction of 13.7 days in sailing time at 11 knots speed between New York and Valparaiso.

The second of these three vessels (par. *b*) could pay a toll of $1.55 per net ton to save 13.7 days time, while the third and largest of the three vessels could pay a toll of $1.19 to reduce its sailing time 13.7 days. It is thus evident that these vessels when operated at 11 knots per hour in the trade between the eastern part of the United States and South America would prefer the canal route, although the tolls charged were from $1.19 to $1.55 per ton net register.

The estimate of per diem expenses presented above in paragraph *c* refers to a steamer of 2,016 tons net register, operated at 9½ knots per hour, the per diem expenses being $204, including wages, provisions, coal, interest, and depreciation. Such a vessel would save about 14 days' time by using the canal instead of the Straits of Magellan between New York and Coronel, and as the vessel's per diem expenses are about 10 cents per net ton, it would find the use of the canal economical with the tolls as high as $1.40 per ton net register, British measurement.

The vessels referred to in paragraphs *d*, *e*, and *f* are of the shelter-deck type, while the one mentioned in paragraph *g* is a well-deck vessel, and are of British measurement. Their per diem expenses average about 10 cents per net ton. One of the vessels is operated at a speed of 9½ knots, one at 10¼ knots, the other two at 10 knots. These are typical of the freight vessels that are now employed in the trade between the eastern seaboard of the United States, the Orient, and the west coast of South America, and they probably represent the class of freighters that will be most largely used in that trade after the canal is in service.

The per diem expenses of vessels carrying both freight and passengers are, as stated above, necessarily higher than the daily outlay for freight vessels even when the passenger ships are run at the same speed as the vessels carrying only cargo. Inasmuch as it is necessary to maintain a higher speed for the passenger than for the freight service, passenger vessels can afford to pay relatively high tolls for a comparatively small reduction in the time of the voyage. Such being the case, it is certain that all passenger vessels operated between the United States and the west coast of South America and, as the evidence presented below will show, also passenger vessels between Europe and the west coast of South America will use the Panama Canal instead of the route through the Straits of Magellan.

This brief analysis indicates that it is probable that all the vessels operated between the eastern seaboard of the United States and western South America will take the Panama route instead of the one through the Straits of Magellan unless traffic at Punta Arenas upon the Straits of Magellan shall prove to be important enough to cause some ships to be dispatched outbound or inbound via the Straits. For reasons that will be discussed in considering the traffic of Europe with the west coast of South America, it is not probable that any considerable share of the commerce of the Atlantic-Gulf coast of the United States with western South America would be diverted from the Panama Canal by tolls equal to those levied at Suez.

II. Relation of Panama Canal Tolls to the Traffic Between Europe and the West Coast of South America.

The assistance which the Panama Canal will render the commerce of Europe with the west coast of South America will be less than that derived by the trade of the Atlantic-Gulf seaboard of the United States with Pacific South America. As ships from Europe must cross the Atlantic and practically pass by the United States on the way to Panama, the Canal route reduces the distances and sailing time from Europe to western

South America by smaller percentages than it does the distances and time from the eastern seaboard of the United States to points south of Panama. The actual reduction in distances and sailing time which the use of the canal, instead of the Straits of Magellan, route will accomplish for voyages from representative European ports to ports in the northern, central, and southern sections of the west coast of South America is indicated by Table II.

Table II.—DISTANCES AND TIME SAVED VIA THE PANAMA CANAL AS COMPARED WITH THE STRAITS OF MAGELLAN BETWEEN EUROPEAN PORTS AND THE WEST COAST OF SOUTH AMERICA.

To—	From Liverpool.						From Antwerp.						From Gibraltar.					
	Distance saved.	Days saved for vessels of—					Distance saved.	Days saved for vessels of—					Distance saved.	Days saved for vessels of—				
		9 knots.	10 knots.	12 knots.	14 knots.	16 knots.		9 knots.	10 knots.	12 knots.	14 knots.	16 knots.		9 knots.	10 knots.	12 knots.	14 knots.	16 knots.
	Miles.						*Miles.*						*Miles.*					
Callao......	4,043	18.2	16.3	13.5	11.5	10.0	3,905	17.6	15.8	13.1	11.5	9.7	3,327	14.9	13.3	11.0	9.4	8.1
Iquique....	2,932	13.1	11.7	9.7	8.2	7.1	2,794	12.4	11.1	9.2	7.8	6.8	2,216	9.7	8.7	7.2	6.1	5.2
Valparaiso.	1,540	6.6	5.9	4.8	4.1	3.5	1,402	6.0	5.3	4.3	3.5	3.1	824	3.3	2.9	2.3	1.9	1.6
Coronel....	1,089	4.5	4.0	3.3	2.7	2.3	951	3.9	3.4	2.8	2.3	1.9	373	1.2	1.0	0.8	0.6	0.5

With per diem expenses, including wages, provisions, coal, maintenance, interest, and depreciation, of freight steamers of 10 knots speed, of about 10 cents per ton net register, will the traffic of Europe with western South America north of the agricultural portion of Chile, the chief port of which is Valparaiso, be diverted from the Panama Canal by a toll of $1.20—the Suez rate after January 1, 1913—per net ton? The nitrate ports of northern Chile, Iquique and Antofagasta, from which the exports of nitrate in 1910 amounted to 2,500,000 cargo tons (500,000 tons to the United States and 2,000,000 tons to Europe), for the transportation of which more than 1,000,000 tons net register of ships were required, are within the canal's traffic zone. Vessels of 9 and 10 knots speed will save from 11 to 13 days by taking the canal route from Liverpool and Antwerp to Iquique and 9 to 11 days to Antofagasta (224 miles south of Iquique); and, with per diem sea expenses of 10 cents per net register ton, vessels bound for Iquique would save from $1.10 to $1.30 by taking the canal en route to and from Iquique. Between Antofagasta and Liverpool and Antwerp the shorter distance via the canal route would save a vessel, with per diem expenses per net ton of 10 cents, from $0.81 to $0.99. It will be understood that these savings are only those due to reducing the number of days sailing and do not include other possible economies to be secured by taking the Panama route.

The trade of central Chile with Europe in exports and imports, while not so large in tonnage as the nitrate traffic, is important. The Panama Canal will shorten the route from Liverpool to Valparaiso 6.6 days for 9-knot ships and 5.9 days for vessels of 10 knots speed. The saving in time from Antwerp will be 6 days for 9-knot steamers and 5.3 days for those of 10 knots. Panama tolls ranging from 53 to 82½ cents per net register ton would, if no other factors were involved, offset the advantages which freight vessels of 9 and 10 knots speed would secure by the reduction in the length of the route between Valparaiso and Liverpool and Antwerp.

The shorter distance via Panama is only one of three factors that will cause vessels from Europe to Chile to take the Panama route instead of the one by way of the Straits of Magellan. The Panama route offers greater trade opportunities.

Vessels do not ordinarily proceed directly from Europe to Valparaiso without calling on the way to discharge and load cargo; nor do vessels other than those having full cargoes of grain sail from Valparaiso direct for Europe. For the most part, ships trading between Europe and central Chile call, either on the outbound or homebound trip, or possibly on the voyage in each direction, at several west coast South American ports. At the present time vessels approach the west coast of South America via the Straits of Magellan and proceed northward, touching at such ports as their traffic may require and return via the same route to Europe.

When the canal is opened the natural approach to the trade of the west coast of South America will be via Panama instead of through the Straits of Magellan. There is practically no traffic on the west coast of South America south of Valdivia, which is 1,000 miles north of the Straits of Magellan, and comparatively little south of Valparaiso, which is 1,433 miles from the Straits. A vessel has a long run from the Straits of Magellan before reaching important trade centers, while if the Panama route is taken a call may be made, to mention only a few large ports, at Buenaventura, Colombia, which is about 350 miles south of the canal; at Guayaquil, Ecuador, 793 miles from Panama; at Callao, Peru, 500 miles farther south; and, as the vessels proceed south, at Mollendo, Iquique, Antofagasta, Coquimbo, Valparaiso, Coronel, Valdivia, and various other Chilean ports.

The third factor favoring the Panama route for shipping engaged in the trade between Europe and Chile is the lower fuel cost for voyages from Europe out to Chile and return via Panama than by way of Magellan. The trip via Magellan requires more coal, and the prices of coal at stations along the route are much higher than at Panama or at stations along the Panama route. Careful calculations based upon the coal required by a 10-knot freight steamer, whose daily coal consumption is known to average 30 tons, shows that on a round-trip voyage from Liverpool to Valparaiso the fuel expenses incurred would be about $9,300 in excess of the cost of coal on a round trip by way of Panama. The saving in fuel expenses alone would about equal the amount of tolls which this vessel would have to pay for passing through the canal on its outbound and return voyages.

At Valdivia, which is 40° south of the Equator and practically at the southern margin of the traffic of Chile, a vessel is about equally distant from Liverpool via the Straits of Magellan and the Panama Canal, the distance being slightly less via Magellan. If the vessel has a full cargo, the route to the south through the Straits may be taken; but if the shipmaster desires to secure cargo at intermediate ports, the route northward along the coast and through the Panama Canal will be selected. As is pointed out in the chapter on coal prices via the Panama Canal and other routes, the cost of coal along the Atlantic coast of South America will be high, much higher than at Panama. A vessel *en route* from southern Chile to Europe can save nearly enough in coal costs by taking the Panama route to pay the canal tolls.

While some of the commerce of central Chile with Europe will be handled via the Straits of Magellan, it seems probable that the larger share will be carried by vessels operated through the Panama Canal and up and down the west coast of South America, even though the tolls at Panama are higher than the theoretical saving effected by the canal in shortening distances. The trade opportunities along the west coast of South America and the cheap coal at Panama will draw to the canal route the trade between Chile and Europe.

In the table giving the tonnage of vessels that would have used the Panama Canal in 1909–10, it is assumed that all of the commerce of Europe with the west coast of South America would have taken the canal route. There will be some share of it handled through the Straits, but the tonnage taking that route will be comparatively small. It is not deemed necessary to make any reduction, on account of the traffic through the Straits of Magellan, from the 3,148,400 tons net register of vessels that were found to be engaged during 1909–10 in the trade of Europe with the west coast of South America. A further justification for this decision is the fact that in order to make certain of eliminating all duplications from the records kept by European countries of the entrances and clearances of vessels engaged in their commerce with western South America the official figures were reduced from 4,185,457 tons to 3,148,400. In making this large reduction it was thought best to err on the side of cutting out too much rather than on the side of accepting too large a tonnage of available canal traffic. When one considers the volume and bulky character of the mineral and agricultural exports of the countries of western South America, it seems probable that 3,148,400 tons net register is a conservative statement of the entrances and clearances of shipping employed in 1909–10 between Europe and the Pacific ports of South America.

III. Relation of Panama Canal Tolls to the Traffic Between the Atlantic-Gulf Seaboard of the United States and Australia and New Zealand.

The effect which the Panama tolls may have on the use of the American canal by the trade of Australia and New Zealand with the eastern seaboard of the United States and with northwestern Europe is a question so important as to merit special consideration. The countries of Oceania have a large and rapidly growing foreign trade. Australia's commerce, valued at $550,000,000 in 1909, had increased $200,000,000 during the preceding decade. Meanwhile New Zealand's foreign commerce had risen from $100,000,000 to $175,000,000 in value. The foreign trade per capita of Australia in 1909 was $130 and of New Zealand $170; the per capita value of the foreign commerce of the United States is $35, a little over one-fifth that of New Zealand. The Australasian traffic is a prize for which the Panama Canal may well compete.

The trade of the eastern seaboard of the United States with Australia and New Zealand in 1910 was valued at $46,543,000; in 1900 the value was $27,731,000; the gain for the decade was nearly 68 per cent. In so far as distance is the controlling factor this rapidly increasing commerce will use the Panama Canal. For the Australian commerce the Panama Canal must compete with the Cape of Good Hope route, which is the one now taken from our eastern seaboard to Australia, because the distances (from New York) are practically the same via the cape as via the Suez Canal. The present short route from the Atlantic coast of the United States to New Zealand is by way of the Straits of Magellan. When the Panama Canal is opened the most direct route will be by way of the American Isthmus. The effects which the Panama Canal will have on the distances and steaming time from New York and New Orleans to Australia and New Zealand are stated in Table III.

Table III.—Distances and time saved via the Panama Canal as contrasted with routes via the Suez Canal, the Cape of Good Hope, and the Straits of Magellan between the Atlantic-Gulf seaboard of the United States and Australasia.

To—	From New York.						From New Orleans.						Remarks.
	Distance saved.	Days saved for vessels of—					Distance saved.	Days saved for vessels of—					
		9 knots.	10 knots.	12 knots.	14 knots.	16 knots.		9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	
	Miles.						*Miles.*						
Adelaide	1,746	7.5	6.7	5.6	4.6	4.0	3,258	14.6	13.1	10.8	9.2	8.0	Difference between routes via Panama, Tahiti, Sydney, and Melbourne, and via St. Vincent and Cape of Good Hope.
Melbourne	2,770	12.3	11.0	9.1	7.7	6.7	4,282	19.3	17.3	14.3	12.2	10.7	Difference between routes via Panama, Tahiti, and Sydney, and via St. Vincent, Cape of Good Hope, and Adelaide.
Sydney	3,932	17.7	15.8	13.1	11.2	9.7	5,444	24.6	22.2	18.4	15.7	13.7	Difference between routes via Panama and Tahiti and via St. Vincent, Cape of Good Hope, Adelaide, and Melbourne.
Wellington	2,493	11.0	9.9	8.1	6.9	6.0	3,488	15.6	14.0	11.6	9.9	8.6	Difference between routes via Panama, and Tahiti and via Straits of Magellan.

The Panama Canal will shorten the distance from New York to Adelaide 1,746 miles, and the steaming time of 9 and 10 knot freight vessels 7.5 and 6.7 days, respectively. The reduction in the case of Melbourne is 2,770 miles—12.3 and 11 days—and for Sydney 3,932 miles—17.7 and 15.8 days. It is thus evident that freight vessels of 9 and 10 knots speed with per diem expenses of 10 cents to 12 cents per ton net register, can reduce the expenses of voyages from New York to Melbourne from \$1.10 to \$1.46 per ton; and the expenses of voyages from New York to Sydney from \$1.58 to \$2.12 per ton. Even in the case of 12-knot vessels, which are fast for a strictly freight service, the Panama Canal would effect a saving of \$0.91 to \$1.08 per net vessel ton from New York to Melbourne and of \$1.31 to \$1.57 to Sydney. The traffic from our Atlantic seaboard to Melbourne and Sydney will bear a relatively stiff Panama Canal toll.

The reduction in distance from New York to Adelaide, due to the canal, is but 1,746 miles, and the saving in time for freight steamers ranges from 7.5 days for 9-knot vessels to 6.7 days for those of 10 knots and to 5.6 days for those of 12 knots. The money equivalents of these reductions in time are from \$0.56 to \$0.90. If Adelaide were the terminal port of the route out from New York, or if Adelaide were a port whose trade was carried in vessels that did not regularly call at other places in Australia, its traffic with New York would bear only relatively low Panama tolls, were it not for the lower fuel costs by way of Panama. A 10½-knot freight steamer of 38 tons per day average coal consumption while at sea would save about \$3,500 by taking the Panama route instead of the one around the Cape of Good Hope on a round trip voyage between New York and Adelaide. This would nearly pay the tolls one way.

Steamers outbound from the United States or Europe to Australia regularly proceed to Sydney, calling at Adelaide and Melbourne en route. Sydney is the most important port of Australia, and, being but 60 miles from the Newcastle coal fields, it is an economical coaling station. It is the tolls which the vessels engaged in traffic of Sydney can afford to pay for using the Panama Canal, that are the real measure of the tolls that the traffic of Adelaide and Melbourne can bear. The fuel expenses by way of the Panama route between New York and Sydney are much less than by way of the Cape of Good Hope. For the above-mentioned 10½-knot freight steamer the fuel costs for a round trip voyage between New York and Sydney would be about \$6,230 less via Panama than via the Cape of Good Hope.

Most of the commerce between the Atlantic seaboard of the United States and Australia is handled by line steamers that are now run from New York to Australia by way of the Cape of Good Hope and back by the same route. After the Panama Canal is opened these lines will be operated through the canal, and for the economies thus effected, relatively high tolls may be charged without diversion of much traffic to the route around South Africa.

Some cargoes are now taken out to Australia in chartered vessels, sail and steam. Sailing vessels, whose use after the opening of the canal will be infrequent, will naturally go out from the eastern coast of the United States around Africa, and, if cargo can be gotten in Australia, they will return around Cape Horn. Chartered steamers that are able to secure full cargoes for the return trip from Australia to the United States will undoubtedly take the Panama route.

It can hardly be predicted what route will be taken from Australia to the Atlantic coast of the United States by chartered steamers that can not secure full cargoes in Australia. Vessels leaving Australia in ballast will be apt to seek sugar or other cargo in the East Indies, but they may cross the Pacific to take cargo from the west coast of South America or even of North America to Atlantic ports of the United States or Europe. Chartered steamers that can secure in Australia a partial cargo for the United States and a partial cargo for Europe will take the Panama route; and it may happen that a vessel receiving only a partial cargo for Europe may take the Panama route and finish her loading at some American port. Whether such a vessel takes the Panama, the Cape of Good Hope, or the Suez route will depend upon the prospect of securing traffic on the way. Such vessels as proceed from Australia to New Zealand to secure or to complete cargoes either for the eastern United States or for Europe will select the Panama route if the tolls are reasonable.

All but a small share of the commerce between the Atlantic-Gulf seaboard of the United States and New Zealand may be expected to use the Panama Canal. The time saved via Panama over the route through the Straits of Magellan will be 11 days for 9-knot steamers, and 9.9 days for 10-knot ships. A 10-knot ship could afford to pay about $1, and a 9-knot ship $1.10, per ton net register to effect this saving in time. The fuel expenses via Panama will be as much less than via Magellan as to give the canal route a decided advantage. Chartered steamers outbound from Europe via the Suez or Cape route may, from time to time, approach New Zealand from Australia, and it is quite certain that steamers en route via the Panama Canal between the Atlantic seaboard of the United States and Australia will call on the outbound and inbound voyages at one or more New Zealand ports. As far as Europe is concerned, New Zealand may be considered either as an outpost on the Suez or Cape routes beyond Australia, or as a way station on the route via Panama to Australia. This observation, however, applies rather to the traffic of line vessels than to that of chartered ships, and is only partly true even of line steamers, for the reason that New Zealand exports are relatively large in volume and include bulky commodities readily shipped in full cargoes. Thus New Zealand is not to be considered primarily as a traffic dependency of Australia (although to some extent it is such); but rather as a commercially autonomous section to and from which traffic routes lead. This fact is one that should be considered in discussing the use of the Panama Canal by the vessels employed in the commerce of Europe with New Zealand.

In the foregoing discussion of the Panama tolls that the traffic between the eastern seaboard of the United States and Australia and New Zealand can afford to pay, the traffic to and from New York—the typical North Atlantic port—has alone been considered. The assistance which New Orleans and other Gulf ports will derive from the canal in the trade with Australasia will be much greater than the aid that will be secured by the Atlantic ports. New Orleans will be brought by the new route from 3,258 to 5,444 miles nearer the principal ports of Australia and New Zealand; and the tolls equivalent to such savings in distance would much exceed those that may wisely be charged at Panama.

IV. Effect of Tolls upon Traffic via the Panama Canal Between Europe and Australia and New Zealand.

The continent of Australia lies just outside of the traffic zone of the Panama Canal, as regards the trade of Europe. The line passing through points equally distant from Liverpool via the Panama and Suez routes runs just east of Australia—150 miles from Sydney. New Zealand, however, is located well within the Panama Canal's sphere of influence. (See Plate 2 at end of volume.) The following table (Table IV) states the distances from Liverpool to the principal ports of Australia and to Wellington, New Zealand, via the Suez and Panama routes. The table also gives the number of days to be saved by steamers in taking the Suez route to Australia and the Panama route to New Zealand.

TABLE IV.—DISTANCES FROM LIVERPOOL TO AUSTRALIA AND NEW ZEALAND VIA THE PANAMA CANAL AND VIA THE SUEZ CANAL, AND DISTANCES AND DAYS SAVED BY THE SHORTER ROUTE.

To—	Via—	Distance.	Distance saved via shorter route.	Days saved via shorter route for vessels of— 9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	Remarks.
		Miles.	*Miles.*						
Adelaide	Panama	13,478							Via Panama, Tahiti, Sydney and Melbourne.
	Suez	11,142	2,336	10.8	9.7	8.1	6.9	6.1	Via Aden, Colombo and King George Sound.
Melbourne	Panama	12,966							Via Panama, Tahiti, and Sydney.
	Suez	11,654	1,312	6.1	5.4	4.6	3.9	3.4	Via Aden, Colombo, King George Sound, and Adelaide.
Sydney	Panama	12,385							Via Panama and Tahiti.
	Suez	12,235	150	0.69	0.62	0.52	0.44	0.39	Via Aden, Colombo, King George Sound, Adelaide, and Melbourne.
Wellington	Suez	12,989							Via Aden, Colombo, King George Sound, and Melbourne.
	Panama	11,425	1,564	6.7	6.0	4.9	4.2	3.5	Via Panama and Tahiti.

For the commerce of Australia, the Panama Canal will compete mainly with the route around the Cape of Good Hope rather than with the Suez Canal. The distance from the English Channel to Australian ports (which are located on the south and southeastern sides of the continent) being only 1,000 miles less via Suez than via the Cape, freight vessels practically always take the Cape route, while only steamers carrying passengers, mail, and express use the Suez Canal. Inasmuch as there will hardly be a service of passenger steamers maintained between Europe and Australia via Panama with calls at American ports, the only European-Australian tonnage which the American canal can expect to secure is of cargo ships which for the most part are now operated via Cape Town. Nor is it to be expected that much of the strictly freight traffic between Europe and Australia will use the Suez Canal until its tolls are reduced below their present amount of 6.75 francs ($1.30) per ton net register, Suez measurement. The rate is to be 6.25 francs beginning January 1, 1913, but that will not cause much diversion of traffic to the canal route.

The fact that Sydney is the ultimate destination of nearly all vessels that go out to Australia from Europe is of first importance in connection with the possible use of the Panama Canal by a portion of the trade of Australia with Europe. A cargo vessel departing from Sydney for a port on or beyond the English Channel will ordinarily take the Cape of Good Hope route; although it is about 850 miles longer than the route via Panama. The time required to make the run from Sydney to the English Channel would be practically the same by way of Panama as by way of Suez, and if either canal were selected in preference to the Cape of Good Hope route the choice would probably be determined by the tolls payable and the cost of coal via the two alternative canal routes. The fuel expenses will be somewhat less via Panama. A 10½-knot freight steamer of 38 tons per day average coal consumption while at sea, making a round-trip voyage between Liverpool and Sydney can save somewhat more than a thousand dollars in coal costs by taking the Panama route instead of going by way of the Cape of Good Hope. The tolls payable at Panama would be about seven times that amount, and it is thus evident that traffic considerations rather than economy of fuel expenses will determine the choice between the Panama and Cape of Good Hope routes for vessels making a voyage between Europe and Sydney.

It is the vessels leaving Australia for Europe partly loaded or in ballast that will contribute most of the tonnage of shipping using the Panama Canal en route between Australia and Europe. Some of these vessels will seek cargo at Melbourne, Adelaide, or elsewhere along the south coast of Australia and proceed to Europe by the Cape of Good Hope. Other vessels will run to the East Indies and secure Java sugar or some other cargo and pass on through the Suez Canal; while some ships will continue the present practice of crossing the Pacific with cargoes of coal, or in ballast, or partly laden, to the west coast of the United States or of Chile, where bulk cargoes, varying with the seasons, can usually be obtained. The opening of the Panama Canal will strengthen the reasons vessels will have, when clearing light from Australia, to seek cargoes on the west coast of North and South America. The canal will enlarge the exports from the Pacific coast of America to Europe and will provide a shorter and more profitable route for the enhanced volume of trade.

Thus, while it is to be expected that most of Europe's commerce with Australia will continue to follow the Cape of Good Hope and Suez routes, it is also quite certain that as long as the Suez tolls are not less than those at Panama some considerable share of Australia's exports and of the shipping outbound from Australia to

Europe will pass through the Panama Canal. In the figures of tonnage of traffic that will use the Panama Canal, 10 per cent of the tonnage of the shipping entering Europe from Australia has been included.

The position of New Zealand is such that the use of the Panama Canal by its commerce with Europe may be largely influenced by the tolls charged. With the opening of the Panama Canal the trade of Europe with New Zealand may move by four possible routes. The shortest course between Liverpool and Wellington will be by way of Panama—11,425 miles in length; the next shortest route will be one through the Straits of Magellan—11,975 miles long. The distance via Suez, Colombo, and Melbourne is 12,989 and via the Cape of Good Hope about 14,000 miles. The competition of routes will be keen, but nearly all of New Zealand's exports to Europe will naturally move either by way of Panama or the Straits of Magellan. New Zealand's exports consist for the most part either of commodities handled in full-vessel cargoes or of perishable articles that require refrigeration, and are certain to choose the shorter and cooler route. The refrigerated meats and fruits will be carried by line steamers, fitted with passenger accommodations and operated back and forth by a direct route between Europe and New Zealand. The better coaling facilities and cheaper coal along the Panama route, as compared with that through the Straits of Magellan, and the possibility of engaging in the passenger traffic at intermediate ports make it probable that regular line vessels operated between Europe and New Zealand will use the Panama Canal, although the tolls to be paid are greater than the saving effected by the reduction in distance and time.

Vessels seeking cargoes for Europe may be expected to approach New Zealand in considerable numbers from Australia, after having made a charter voyage to that continent. If such vessels secure full cargoes in New Zealand for Europe they will take either the Magellan or Panama route, with chances in favor of the latter. The fuel expenses of a 10-knot steamer of 30 tons per day average coal consumption while at sea, making a round-trip voyage between Liverpool and Wellington, will be about $8,470 less by way of Panama than via the Straits of Magellan, the saving in coal bills being nearly enough to pay canal tolls both ways. The large difference in favor of Panama is due to the high cost of coal at the stations along the east coast of South America.

Storms will be less dangerous by way of the Panama route between Europe and New Zealand, and the insurance rates will be lower than via the Straits of Magellan. It is probable that many chartered vessels from New Zealand to Europe will go by way of the Straits of Magellan to avoid the payment of Panama Canal tolls. It is, however, to be expected that a large share of the chartered vessels in both directions between Europe and New Zealand will choose the Panama route to save fuel expenses. Line vessels will unquestionably prefer to take the Panama route. Tolls will not divert them to the Straits of Magellan. In discussing the tonnage of available Panama Canal traffic it was estimated that 50 per cent of the tonnage of vessel movements between Europe and New Zealand would be by way of Panama.

V. Relation of Canal Tolls to the Traffic via the Panama Canal Between the Atlantic–Gulf Seaboard of the United States and Japan, China, and the Phillipines—The Countries Between Yokohama and Singapore.

The eastern seaboards of Asia and North America are on opposite sides of the northern Hemisphere. The line of 80° west longitude, which runs close to the Panama Canal, skirts the east coast of Florida and passes between Savannah and Charleston. The corresponding longitude on the opposite side of the earth, that of 100° east of Greenwich, runs through the Malay Peninsula, somewhat west of Singapore. New England and southern China are opposite; while the Phillipine Islands and central and northern China are 180° from Nova Scotia and Newfoundland.

These facts would indicate that the Pacific seaboard of Asia is nearer to the Atlantic coast of the United States via the Suez Canal than via Panama; but the Suez route, though shorter in degrees of longitude, is longer in distance, because the route by way of Suez and Singapore to the Orient lies in tropical and equatorial latitudes where the degrees are of maximum length, while the course from the Atlantic shore of the United States to Pacific Asia, via Panama, follows closely the great circle route from the Isthmus to Japan and thus crosses the broad Pacific in northern latitudes where the degrees are relatively short. Thus, Hongkong which is 16° and 16′ of longitude farther west of New York than it is east thereof is practically the same distance from New York via the Panama and Suez routes. Manila is also about equally distant from New York via the alternative canal routes. From New Orleans and the Gulf ports, because of their nearness to the American Isthmus, all oriental countries north and east of Singapore are less distant via the Panama route. Table V states which route is shorter in distance and time from New York and from New Orleans to Yokohama, Shanghai, Hongkong, Manila, and Singapore.

TABLE V.—DISTANCES AND DAYS SAVED BY THE PANAMA OR THE SUEZ CANAL BETWEEN THE ATLANTIC-GULF SEABOARD OF THE UNITED STATES AND JAPAN, CHINA, THE PHILIPPINES, AND SINGAPORE.

To—	Via—	From New York.						From New Orleans.						Remarks.
		Distance saved.	Days saved for vessels of—					Distance saved.	Days saved for vessels of—					
			9 knots.	10 knots.	12 knots.	14 knots.	16 knots.		9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	
		Miles.						*Miles.*						
Yokohama	Panama	3,768	16.9	15.2	12.6	10.7	9.3	5,705	25.9	23.3	19.3	16.5	14.4	Via San Francisco.
	Suez	......	......	......	......	......	......	......	......	......	......	......	......	Via Colombo, Singapore, Hongkong and Shanghai.
Shanghai	Panama	1,876	8.1	7.3	6.0	5.1	4.4	3,813	17.1	15.4	12.7	10.8	9.4	Via San Francisco and Yokohama.
	Suez	......	......	......	......	......	......	......	......	......	......	......	......	Via Colombo, Singapore, and Hongkong.
Hongkong	Panama	......	......	......	......	......	......	1,919	8.4	7.5	6.2	5.2	4.5	Via San Francisco, Yokohama, and Shanghai.
	Suez	18	......	......	......	......	......	......	......	......	......	......	......	Via Colombo and Singapore.
Manila	Panama	41	......	......	......	......	......	1,978	8.6	7.7	6.4	5.4	4.7	Via San Francisco and Yokohama.
	Suez	......	......	......	......	......	......	......	......	......	......	......	......	Via Colombo and Singapore.
Singapore	Panama	......	......	......	......	......	......	......	......	......	......	......	......	Via San Francisco and Yokohama.
	Suez	2,484	11.0	9.8	8.4	6.9	5.9	547	2.0	1.7	1.4	1.1	.9	Via Colombo.

The competition of routes for the traffic between the Atlantic seaboard of the United States and the Orient will be solely between the Suez and the Panama canals. A small tonnage of sailing vessels will round the Cape of Good Hope, but as sailing vessels will navigate neither canal and as their use is steadily declining, they need not be considered in this discussion. Practically all of the traffic between the Atlantic-Gulf seaboard of the United States and the Pacific ports of Asia will be handled by steamers following either the Suez or Panama route. Which of these two routes a vessel will take, when outbound from an eastern port of the United States to an Asiatic port from Singapore to Yokohama, or when inward bound from eastern Asia to an Atlantic or Gulf port of the United States, will be determined by one or more of several factors—relative distances via alternative routes, necessity for and prospect of securing cargo en route, the coaling facilities and the cost of fuel on the way, and the tolls payable at Panama and Suez.

Most of the traffic between the Atlantic-Gulf seaboard of the United States and the region from Singapore to Yokohama will be carried by steamship lines and not by individual chartered vessels. Vessels operated in a line service follow more fixed routes than chartered or "tramp" ships do; the ocean line must make regular calls en route, and it must give a schedule service at many fixed points between its home and terminal port. Thus, relative distances via alternative routes between the ports of departure and destination can be but one, and that often not the strongest, factor determining the choice of ocean highways. In a word, the factors which affect the route taken by both chartered and line vessels are complicated.

This will be particularly true of the shipping that will handle the commerce of the countries from Singapore to Yokohama with the Atlantic seaboards of the United States and Europe. As was stated in the Isthmian Canal Commission report of 1901:

> From New York and the North Atlantic ports of the United States the distance to the Philippines and Hongkong by the American canal route will not be much less than by Suez; consequently the trade of our eastern seaboard with those and other places so nearly antipodal will be divided between the easterly and westerly routes. The shipper will have the advantage of the competition of the carriers using the different canals. The coast between Shanghai and possibly Yokohama on the east and Singapore and possibly India on the west will be traveled in both directions by vessels bound for American ports. The overlapping of trade routes in the East and the tendency of vessels to follow the routes where the greatest volume of traffic can be secured may possibly bring some of the East Indian trade across the Pacific and through the American canal.

The actual routes which line and charter steamers will find most profitable to follow in handling the commerce of the eastern United States with the Pacific side of Asia can not be definitely forecasted in advance of the opening of the Panama Canal. The following statement by one of the managers of a company which acts as agents for steamship companies doing a large business between New York and the Orient suggests how some vessel lines may be operated:

As regards the business that would move from New York by the Panama Canal which now moves through Suez, in our opinion the first consideration would be the rate of canal dues; secondly, the coaling facilities and the price of bunker coals en route; and given a satisfactory solution of these two very important points the question of distance alone would govern, and we should probably operate our far eastern trade in two services, directing the boats for the Straits Settlements, Manila, and southern China via the Suez Canal as heretofore, and the Japan and Shanghai boats by way of the Panama Canal.

This prophesy would indicate that the commerce between New York and the Orient will so divide between the Suez and Panama routes as to locate the boundary of the Suez and Panama traffic zones between Hongkong and Shanghai and thus to associate the Philippine trade more closely with the Suez than with the Panama route; but from what has already been said it is evident that no such sharp line of division can be drawn between the sections of the Orient that will be commercially tributary to the Suez route and the sections that will lie within the Panama Canal's sphere of influence. There will doubtless be much overlapping in the Orient of eastbound and westbound routes taken not only by chartered but also by line vessels.

If the tolls at Panama are not higher than at Suez the American route will have some advantage in competing for the traffic of the Orient. Lower tolls at Panama, however, would not draw away from the Suez Canal a large share of the shipping that would, with equal tolls at each canal, take the Suez route. Traffic opportunities via the opposing routes and the relative costs of coal and other necessities en route will have more influence than canal tolls in determining the division of traffic between the two canals. On the 1st of January of 1913 the Suez tolls on loaded vessels will become 6.25 francs ($1.206) per net ton, Suez measurement, and on vessels in ballast 3.75 francs ($0.723) per net ton. The Suez charges have been reduced from time to time during recent years, and, in view of the continued high profits of the Suez Co., it is probable that further reductions in the tolls will be made in the future. The Suez tolls, of 6.25 francs per net ton, amounting to about 65 cents per ton upon cargo which consists for the most part of commodities of high value, do not impose a heavy burden upon commerce, and the Suez charges will doubtless be kept as low as those imposed at Panama.

It should be borne in mind, also, that the Suez Canal has a firm hold upon most of the traffic that uses it—the traffic between Europe and India, the East Indies, and the Far East. The commerce through the Suez Canal to and from the Atlantic ports of the United States is of small volume compared with the European commerce that uses the Suez route. Such being the case, the United States can not hope, by means of low tolls at Panama, to divert a large tonnage from the Suez to the American route. It will, however, be desirable for the United States to keep the tolls at Panama at least as low as they are at Suez and to provide vessels at Panama with coal and other necessaries at economical prices in order thereby to insure bringing to the Panama Canal the major share of the commerce between the Atlantic seaboard of the United States and the Pacific ports of Asia from Singapore to Yokohama; but the increase in revenue that might be secured at Panama by charging low tolls to draw competitive traffic away from the Suez Canal would be much less than the loss in receipts resulting from the reduction of Panama tolls upon the large volume of shipping—that moving between the Atlantic and west coast of the Americas—by which the Panama Canal is certain to be used. Indeed, the Suez Canal and the Panama Canal each has such a well-defined traffic zone, that neither can hope to secure larger revenues by fixing its tolls with a view to obtaining competitive traffic; but while the Suez Canal can secure none of the traffic of the west coast of the Americas, it is possible for the Panama Canal to obtain some of the commerce between North Atlantic countries and those of the Pacific side of Asia. Thus, in so far as can be done without unduly reducing the revenues derivable from the traffic using the Panama Canal, the competition of the Panama route with the Suez Canal should be aided. The surest and most economical way to assist the Panama route in drawing traffic from Suez is for the Government of the United States to provide coal and other supplies as cheaply as possible at Colon and Panama.

VI. Relation of Canal Tolls to the Traffic via the Panama Canal Between Europe and the Countries East of Singapore.

The distance from Europe to the east coast of Asia is shorter via Suez than by way of Panama. The city of Yokohama is 694 miles—the equivalent of two and one-half days' sailing for a vessel of moderate speed—nearer Liverpool by the Suez than by the Panama route. Plate 2 at the end of this volume locates points equally distant from Liverpool via Panama and Suez. The advantage which the Suez Canal has, in distance and sailing time, over the Panama Canal for the commerce between northwestern Europe and Pacific Asia is illustrated by Table VI, which gives the saving effected by the Suez Canal from Liverpool to the chief commercial centers of the Orient.

Table VI.—Distances and days saved via the Suez Canal, as compared with the Panama route, between Liverpool and Singapore, Manila, Hongkong, Shanghai, and Yokohama.

To—	Distance shorter via Suez than via Panama (nautical miles).	Days saved for vessels of—					Remarks.
		9 knots.	10 knots.	12 knots.	14 knots.	16 knots.	
Singapore	6,946	31.6	28.4	23.6	20.2	17.5	Panama route via San Francisco and Yokohama. Suez route via Colombo.
Manila	4,421	19.9	17.9	14.8	12.6	11	Panama route via San Francisco and Yokohama. Suez route via Colombo and Singapore.
Hongkong	4,172	18.8	16.8	13.9	11.9	10.3	Panama route via San Francisco and Yokohama. Suez route via Colombo and Singapore.
Shanghai	2,776	12.3	11	9.1	7.8	6.8	Panama route via San Francisco and Yokohama. Suez route via Colombo, Singapore, and Hongkong.
Yokohama	694	2.7	2.4	1.9	1.5	1.3	Panama route via San Francisco. Suez route via Colombo, Singapore, Hongkong, and Shanghai.

What has been said in the preceding pages regarding the factors other than distance that will affect the choice of routes taken by line and charter vessels between the eastern seaboard of the United States and eastern Asia is applicable to a discussion of the possible use of the Panama Canal by a portion of the commerce between Europe and the Orient. There were reasons given for thinking that some vessels outbound from Europe will be dispatched by way of the United States and the Panama Canal, and for believing that at least a small percentage of the vessels home-bound to Europe from Japan and other countries of the Orient will cross the Pacific to North or South America and proceed thence via the Isthmian Canal to Europe. At the present time an appreciable tonnage of shipping makes the voyage from the Far East by way of America, and with the opening of the Panama Canal the volume of traffic to and fro between the English Channel and the Orient moving via America may be expected to increase.

The chief factor in producing this result will be the attractive force of the large volume of commerce (*a*) from the eastern seaboard of the United States to the Orient; (*b*) from the Orient to both the Pacific and Atlantic seaboards of the United States; and (*c*) from both the western and eastern seaboards of the United States to Europe. Just as vessels following the Suez route between Europe and the ultimate ports of the Orient may exchange cargo en route at Asiatic ports, so may ships taking the Panama route between Europe and Asia engage en route in the foreign trade of the United States with Asia and with Europe; and, while both the shorter distances via the Suez route and Europe's intimate commercial relations with Asia will cause most of the European-Asiatic trade to follow the Suez route, a minor share of the commerce will move by way of Panama.

Fuel expenses for voyages between Europe and China will be less via Suez than via Panama, but for voyages from British and other North European ports to Japan the coal costs will be somewhat less via Panama. Freight vessels leaving Yokohama with full cargoes for Europe will be influenced by the slightly lower fuel expenses to select the Panama route; if, as is probable, the tolls at Panama are no higher than at Suez.

It is possible that such vessels as are now obliged to cross the Atlantic from Europe to the United States with light cargoes or in ballast, and which are consequently eager to obtain freight at low rates, may bring goods, destined for the Orient, to New York for transshipment to lines running from New York to Japan, China, and the Philippines. At the present time a part of the commerce between the eastern United States and the Orient is sent to Europe and there transshipped, but the opening of the Panama Canal may reverse this current of trade. A manager of a firm doing a large business as agent and carrier in the commerce between the eastern United States and the Orient says:

> We are of the opinion that instead of the trans-Atlantic lines soliciting American freight for transshipment via Europe they may be soliciting European freight for transshipment at New York for such of those New York services [to the Orient] as find it advantageous to use the Panama Canal. This may add somewhat to the traffic [between the United States and the Orient and Australasia], but it is hard to tell what such a movement might eventually amount to.

The possibility that the Panama Canal may be used by at least a minor share of the shipping moving between Europe and the Pacific ports of Asia, and the apparent prospect that New York may become a transfer point for a portion of the trade of Europe with the Far East, make it desirable that the tolls should be no higher at Panama than at Suez. It is uncertain what share of the traffic between Europe and the Orient can be secured by the Panama Canal in competition with the Suez route. In any event the Panama Canal will obtain only a small percentage of the total, but it will be well not to handicap the Panama route by tolls higher than those at Suez.

CHAPTER XII.

PANAMA TOLLS I.

PRINCIPLES AND CONSIDERATIONS THAT SHOULD CONTROL IN FIXING RATES.

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PANAMA TOLLS I.

PRINCIPLES AND CONSIDERATIONS THAT SHOULD CONTROL IN FIXING TOLLS.

The Panama Canal has been constructed and undoubtedly will be operated primarily to promote the commerce and industry of the United States and the world. In deciding upon the policy to be adhered to in the administration of the canal the commercial usefulness of the waterway should be given first consideration. Tolls may wisely be imposed to secure revenue, but the transit dues must not prevent the canal from fulfilling its primary function. The tolls should not only be within what the traffic will bear, but should be low enough to permit commerce to derive substantial benefits from the canal.

The Canal to be Commercially Self-Supporting.

The canal should, however, be required to yield such revenues as can be secured without unduly limiting its usefulness. The United States has made a heavy investment, and will have large current operating and maintenance expenses to meet year by year. Business prudence and political wisdom demand that the canal shall be commercially self-supporting, provided revenues large enough to enable the canal to carry itself can be secured without unwisely restricting traffic. This principle was advocated by the President in his message of December 21, 1911, in which he stated:

> I believe that the cost of such a Government work as the Panama Canal ought to be imposed gradually but certainly upon the trade which it creates and makes possible. So far as we can. consistent with the development of the world's trade through the canal and the benefit which it was intended to secure to the east and west coastwise trade, we ought to labor to secure from the canal tolls a sufficient amount ultimately to meet the debt which we have assumed and to pay the interest.

The canal will cost the United States Government $375,000,000, much of which has been, or will be, secured by borrowing funds. The interest and principal of this debt must be paid either from funds secured by general taxes or from the revenues derived from canal tolls. It seems wise and prudent that the United States should adhere to sound business principles in the operation of the canal and in levying tolls. Public expenditures are increasing rapidly. Funds are required in increasing amount for the promotion of the public health, for irrigation and reclamation, and for maintaining the military power and naval prestige of the United States. Large expenditures upon rivers and harbors are urgently needed. Taxes must inevitably increase. The demands upon the United States are certain to be much greater in the future than they have been in the past, and it does not seem wise for the Federal Government to construct and maintain at the expense of the general budget such a costly public work as the Panama Canal. Those who derive immediate benefit from the use of the Panama Canal may properly return to the Government a portion of the profit secured from using the canal, provided this policy can be followed out without burdening commerce.

In reaching this conclusion the fact has not been overlooked that the people of the United States will have in the Panama Canal a great military and naval asset. The naval advantages derived from the Panama Canal will be of such value that many men regard the waterway primarily as a military asset, as a work that must have been, and would have been, executed regardless of its commercial usefulness. This is an exaggerated view of the military, as compared with the commercial, value of the canal, the chief purpose of which is to shorten the routes of ocean commerce. However, the Navy will be very definitely benefited. The mobility of the fleets will be increased, and they will be able to defend our now widely separated seaboards more economically and more effectively. It is often said that the canal will double the efficiency of the Navy. This may be an overstatement of the facts, but is probably approximately correct.

The strong fortifications that will be maintained at the Atlantic and Pacific termini of the canal will enhance its value to our Navy. The Canal Zone will be a strong naval base from which our fleets may go forth to strike a blow, and to which they may return, confident of being protected while coal and other supplies are being secured and while the vessels of the fleet are being given necessary repairs. It would be difficult to overestimate the importance to the United States of having strong fortifications and a secure, well-equipped naval base at the sole gateway between the Atlantic and Pacific.

The canal, however, will add to our military expenses as well as to our fighting strength. To maintain strong fortifications at the Atlantic and Pacific termini of the canal, manned by at least 6,000 troops, to keep 1,200 marines stationed on the Isthmus, to support naval coaling depots at Cristobal and Balboa, and dry docks and repair shops for the Navy at Balboa, and to provide and operate the transports and colliers which the Army and Navy will need to have to maintain the military establishments on the Isthmus will require an annual outlay quite equal to the cost of operating the canal and paying interest on the investment. The necessary addition to our military and naval expenses (which are already heavy in comparison with the expenditures for civil affairs) consequent upon the utilization of the canal as a military asset will be so large as to emphasize the advisability of adopting the policy of making the canal self-supporting as a commercial highway.

The policy of having the annual operation, maintenance, and interest charges borne partly by the military and naval budgets and partly by the revenues derived from tolls has some advocates. Those who hold this view contend that, inasmuch as the canal is a benefit to the Navy and to the Army as well as to commerce, a part of the canal expenses should be charged against the appropriations made for the support of the Army and Navy. Two objections may be made to this policy.

1. The canal, as has just been stated, will bring about a large increase in the annual Army and Navy expenses.

2. The Navy is maintained and the canal is fortified not only to enhance our military power but also to protect American commerce on the high seas and to facilitate the extension of our foreign trade.

Commerce will derive large indirect benefits from the addition which the canal will make to our military strength and naval efficiency. The policy of charging tolls upon shipping large enough to produce a revenue equal to the operating, maintenance, and interest expenses will inflict no injustice upon those who use the canal. It will be borne in mind, of course, that the Panama Canal, at least during the early years of its operation, will be used more largely by foreign ships than by American vessels and that the commerce passing through the waterway will, for some years to come, be more largely foreign than American.

Revenue and Rate of Tolls That Will Make the Canal Commercially Self-supporting.

The annual revenue ultimately required to make the canal commercially self-supporting will be about \$19,250,000. It is estimated that the operating and maintenance expenses will amount to \$3,500,000 yearly and that \$500,000 will be required for sanitation and for the government of the zone. The interest on \$375,000,000 at 3 per cent per annum will amount to \$11,250,000, and the treaty with Panama guarantees an annuity, beginning in 1913, of \$250,000 to the Republic of Panama. The sum of these four items is \$15,500,000. If to this there be added 1 per cent per annum on \$375,000,000 to accumulate a fund to amortize the investment the total annual expenses will be \$19,250,000.

In deciding what tolls shall be charged for the use of the canal, the fundamental question is whether a system of charges can be devised and levied that will ultimately yield about \$19,250,000 per annum without unduly burdening American trade and without seriously limiting the ability of the canal to compete for traffic against the routes via the Straits of Magellan, the Cape of Good Hope, and the Suez Canal.

The investigation of the traffic available for the use of the canal led to the conclusion that about 10,500,000 tons net register of shipping will pass through the canal during the early years of its operation. The rate at which the Suez Canal tonnage and the commerce of the world is increasing indicates that an increase of at least 60 per cent in the traffic of the Panama Canal may be expected during the decade 1915–1925. It is thus probable that there will be 17,000,000 tons of shipping using the canal during 1925. An increase of 60 per cent during the second decade of the canal's operation would bring the traffic up to 27,000,000 net register tons at the end of 20 years. These estimates are believed to be conservative. If the traffic of the Panama Canal shall be equal to these estimates, it will be possible to secure from moderate tolls enough revenues to enable the canal to be commercially self-supporting. If tolls of \$1.20 per net vessel ton, or charges equal to those which the Suez Canal will impose on and after January 1, 1913, are levied for the first 10 years on all shipping using the Panama Canal, the annual receipts at the end of the first decade will more than cover the estimated operation, maintenance, zone sanitation and government, Panama annuity, and interest charges. It will be possible within 10 years after the opening of the canal to begin the accumulation of an amortization fund. If a toll of only $1 per net ton is maintained during the second decade of the canal's operation, the annual receipts will be large enough to meet operating, maintenance, zone sanitation and government, interest, and Panama annuity expenses, to set aside a liberal amount for the amortization of the investment, and to furnish several million dollars per annum for the betterment of the canal, which by that time will probably be necessary.

A toll of $1.20 per net vessel ton would, in the case of the ordinary cargo steamer, impose a charge of 44 to 80 cents per ton upon the freight carried. This is due to the fact that freight vessels can carry from 1½ to 2¾ tons of cargo for each net register ton—the ratio of freight tonnage to vessel tonnage depending upon the type of ship and the character of the goods carried. A toll of $1.20 per net ton would add about 2 to 4 cents per hundredweight to the freight rate.

After the Panama Canal is opened, it is probable that some low-grade bulk freight may be carried as full-vessel cargoes between our two seaboards at rates as low as $5 per weight ton. The charges on high-class measurement freight will probably be from $12 to $15 per ton. If these are the rates charged, a toll of $1.20 per net ton on vessels passing the Panama Canal would add about 10 or 12 per cent to the rate of freight charged on low-grade bulk commodities and about 4 or 5 per cent to the rate of freight on high-class goods shipped as measurement cargo. Tolls of this amount, whether borne by the shipper or the carrier, would not materially restrict the use of the canal nor would such charges be a serious burden upon traffic. Of course, any toll is a burden that must be borne either by the carrier, the shipper, or the producer; but, if the toll charged neither limits canal traffic nor hinders the healthy and profitable extension of trade, the burden is one which the Government may properly impose in order to secure the revenues required to meet canal expenses. Taxes, as well as tolls, are a burden; and it is probable that the canal revenues can be secured with minimum public burden by taking, as canal revenues, a portion of the profits derived by those that directly use the canal.

The Different Interpretations Given the Hay-Pauncefote Treaty.

There has been much discussion of the policy of exempting American ships from the payment of Panama Canal tolls. Those who favor this policy believe it to be permitted by the Hay-Pauncefote treaty, Article III, section 1, of which stipulates that—

> The canal shall be free and open to the vessels of commerce and of war of all nations observing these rules, on terms of entire equality, to that there shall be no discrimination against any such nation, or its citizens or subjects, in respect of the conditions or charges of traffic, or otherwise. Such conditions and charges of traffic shall be just and equitable.

Some advocates of free tolls for American vessels are of the opinion that the coastwise shipping of the United States can be exempted from Panama tolls without discriminating against foreign shipping, because vessels under foreign flags are not allowed to engage in the coastwise trade of the United States. Being excluded from our coastwise trade, such vessels, it is contended, are not discriminated against by favors granted to our own ships. Other advocates of free tolls for American shipping so interpret the Hay-Pauncefote treaty as to exempt from the restrictions of Article III, section 1, all American ships—those engaged in foreign commerce as well as those employed in our coastwise trade. Those who give the treaty this interpretation hold that Article III of the convention formulates the rules which the United States adopted for the use of the canal by all other nations than the United States, i. e., that the United States agreed to maintain the canal as a highway to be used by all foreign nations under terms of entire equality as long as such nations observe the rules laid down by the United States.

Among those who interpret the Hay-Pauncefote treaty as requiring the payment of the same Panama tolls by all vessels, both American and foreign, are advocates of the policy of relieving the American coastwise shipping of the burden of canal charges by the repayment from the United States Treasury to the owners of American vessels using the canal the amounts collected as tolls. The result of this policy would be the same as the exemption of American coastwise shipping from the payment of tolls. Repayment of the exact tolls collected would give the same assistance to American vessels as would be rendered by the exemption of American ships from the payment of tolls.

It does not come within the province of this report to interpret the scope and meaning of the Hay-Pauncefote treaty. Whatever the Hay-Pauncefote treaty may be held to mean, the policy of the United States as to the exemption of American ships from the payment of Panama tolls should not be decided with reference to the rights of the United States under the treaty. The fundamental questions to be considered are (1) whether the exemption of American shipping from the payment of tolls is required to enable the canal effectively to promote the development of American commerce and shipping, and (2) what effect the nonpayment of the tolls by American ships will have on the canal revenues.

The general principle has been enunciated, from time to time, in this report that the rate or rates of toll adopted for the Panama Canal should be such as not unduly to burden American trade; but that the charges should be high enough to secure from the canal revenues that will, within a few years after the opening of the canal, be sufficient to meet the annual operating, maintenance, sanitation, government, annuity, and interest charges, provided revenues of this amount can be secured without limiting the usefulness of the canal in the promotion of American shipping and the development of the commerce of the United States and of the world. The exemption of American shipping from the payment of tolls will reduce the revenues obtained from the canal. Is this sacrifice of revenue necessary and justifiable? The question of special significance is, Will this contribution by the Government be effective in building up the American marine?

Arguments for and Against Free Tolls For American Ships.

The arguments that have been advanced in favor of the exemption or repayment of Panama tolls on American shipping may be summarized as follows:

1. It is contended that, unless American ships are aided by the exemption or repayment of Panama Canal tolls, not enough vessels will be constructed and put into operation to handle the traffic seeking shipment between our two seaboards. It is asserted that the coast-to-coast shipping business will not be profitable enough to attract capital and that Government aid will be needed.

2. It is argued that the higher cost of constructing and operating American vessels will enable the foreign vessels (which will be mainly British) to carry commodities between British Columbia and the Atlantic seaboard of the United States, and between eastern Canada and the west coast of the United States, at lower rates than can profitably be charged by American vessels engaged in the traffic between the two seaboards of the United States. The lower rates thus enjoyed by Canadian shippers, producers, and merchants will, it is said, give them a decided advantage over their competitors in the United States, to the detriment of American shipping and of the domestic industry and commerce of the United States.

3. A third argument advanced is that, if tolls are charged on the coast-to-coast traffic by way of the canal, the railroads will be able to maintain their rates higher, by the amount of the canal tolls, than their charges would otherwise be; and that, inasmuch as the traffic handled east bound and west bound by the railroads will be larger than the tonnage shipped by water between our two coasts, the addition to the rail rates due to canal tolls on coast-to-coast business will require the public to pay the railroads much more than the Government will receive from the canal tolls on coastwise shipping. It is asserted that the canal tolls will enable the railroads to add to the freight tax paid by the shippers.

4. The fourth contention is that an insufficient supply of American ships for the coast-to-coast trade of the United States and the lower rates enjoyed by foreign shippers will create an irresistible demand on the part of the commercial interests of the United States for the admission of foreign-built ships to the American coastwise trade. This argument is advanced not only by the owners and builders of American ships but also by others who feel that the admission of foreign-built ships to American registry will bring about the closing of the principal seaboard shipyards, and thus make the United States dependent upon foreign yards for the construction of vessels for the American Navy.

The arguments in favor of charging all vessels, American and foreign, the same canal tolls and in opposition to the policy of omitting or remitting tolls upon American coastwise shipping may be summarized as follows:

1. It is not necessary to relieve coastwise shipping of canal tolls as long as foreign built-ships are not allowed to engage in the domestic commerce of the United States. American shipowners have a monopoly of the coastwise trade; the canal will greatly increase the demand for coastwise transportation, and the rates that may be charged by water carriers between our two seaboards will be high enough to make their business profitable. Coastwise shipping will be increased in tonnage in proportion to the enlarged demand for transportation facilities, unless, as is feared by some persons, the steamship lines owned or affiliated with the transcontinental railroads may engage in destructive warfare against vessel lines not connected with the railroads.

If it should be found to be the policy of the railroad-controlled steamship lines—assuming that such lines are permitted to use the canal—to attempt to drive the lines independent of railroad affiliation off the canal route, the independent steamship companies can be protected against unfair competition by Federal supervision and regulation of the services and rates of coastwise carriers. For reasons that are presented below, it is not probable that it will be a wise policy on the part of the railroads to engage in destructive warfare against independent coastwise steamship lines; but, in either event, it will doubtless be wiser for the Government to regulate, rather than to limit, the use of the canal.

2. To the argument that Canadian shippers and producers will have an advantage over their competitors in the United States, because the rates will be lower by foreign vessels than by American ships, two answers are made:

(*a*) The American producer is protected by the tariff. The principal articles shipped from Washington and Oregon in competition with the producers in British Columbia will be wheat, lumber, and fish. The present tariff upon wheat is 25 cents per bushel and upon flour 25 per cent ad valorem. Upon lumber the tariff rates range from 50 cents to $2.75 per thousand feet, and on fish the duties are ¾ cent per pound for most varieties, with a duty of 1 cent per pound upon salmon, mackerel. and halibut.

(*b*) The rates charged by steamship lines between ports on the Atlantic and ports in British Columbia will probably be the same as the rates of the steamship lines operating between the Atlantic and Pacific seaboards of the United States. The coastwise steamship lines operating through the canal to and from Canadian and British Columbian ports will be in competition with the lines operating between the two seaboards of the United States, and it is not to be expected that the lines serving Canadian and American ports will act independently of each other. In all probability the rates of the several lines, American and foreign, will be fixed in the "conferences" of the interested lines, and it is not to be expected that the rates to and from British Columbian ports will be lower than the rates between the less distant places on the two seaboards of the United States.

Shippers in British Columbia and Canada will be able to charter vessels at lower rates than the shippers in the United States will have to pay, for the reason that American producers and merchants will, unless our navigation laws are changed, be able to secure the services only of American vessels, which, as compared with those under foreign flags, are more expensive to build and to operate. However, as has been explained in earlier parts of this report, a relatively small share of the tonnage between the two seaboards of North America will be shipped as full vessel cargoes. All but a comparatively few of the largest shippers will employ the services of line steamers.

The producers and exporters of lumber from the Northwestern States of the United States are desirous of being relieved from the payment of canal tolls in order that they may thereby more readily compete with their Canadian rivals. Lumber is well adapted to shipment as full cargoes in chartered vessels, and the exemption of coastwise shipping from the payment of canal tolls would somewhat increase the profits of the northwestern lumbermen. In this connection, however. it should be borne in mind, as has just been stated, that the lumber sent to the eastern ports of the United States has no tariff duties to pay, while the British Columbian shipper to our Atlantic seaboard can enter our markets only by the payment of relatively high duties.

Whether there be tolls on American ships at Panama or not, it is unlikely that much Pacific coast lumber can be sold in the Atlantic markets of the United States in competition with southern lumber. The lumber from the southern mills is shipped north either by cheap all-water routes or by inexpensive rail-and-water routes from Mobile, Jacksonville, Savannah, Charleston, Georgetown, N. C., Norfolk, Va., and numerous other Gulf and south Atlantic ports. The large exports of lumber from Washington and Oregon are shipped mainly to foreign countries, and can be transported in foreign vessels at the same charter rates as are paid by British Columbian exporters.

3. The third argument in favor of relieving American coastwise shipping from Panama tolls—that the tolls charged will be added to railroad rates—assumes an improbable adjustment of rail and water rates. Those who contend that the traffic carried by rail between the eastern and western parts of the United States will be charged rates increased by the rate of canal tolls assume that the rail charges must be and will be controlled by the coast-to-coast water rates and that the schedules of railroad rates will be fixed at such differentials above the water rates as the railroads can charge and secure traffic in competition with the rival water lines. In order to bring about this adjustment of rail and water rates there must be, first, active, rate-controlling competition among the water lines, and, second, it must be the policy of the railroads to fix rates so as to compete actively with the carriers by water for practically all traffic moving between the two seaboards. Will those conditions exist?

Up to the present time it has been the practice of steamship lines, when operating between common termini, to adjust services and rates by "conference." There is more competition among steamship lines than among railroad companies; but the informal organizations or conferences of steamship companies are able to regulate competition and to prevent rates from being forced by competition to the level below which they could not be forced without making the business unprofitable. When several steamship lines operate over established routes and serve the same sections, they are able by agreements and understandings with each other so to limit competition as to make their services and rates at least partially monopolistic. Unless prevented by effective Government regulation, steamship companies will, like railroad companies, steadily increase the monopolistic character of their service.

If this analysis of the relation of steamship companies with each other be correct, it follows that the rates charged by steamship lines between the two seaboards of the United States will be, or will tend to be, not the lowest rates at which traffic can be profitably handled, but rates as high as the interested steamship lines think the rates can be put without limiting the growth of traffic or without losing tonnage to the railroad lines. Steamship companies, like railroad companies, will tend to charge what the traffic will bear; and steamship traffic will bear such rates as shippers will pay to have their goods transported by water instead of by rail. If this be true, the tendency will be for carriers by water to adjust their charges with reference to the schedules of railroad rates. In so far as this practice of rate making prevails, it will be impossible for the carriers by water to add the canal tolls to their rates. Whether there be canal tolls or not, rates by water carriers will be such as the traffic will bear; the upper limit of what traffic by water will bear will be the lower limit to which rates are brought by the railroads; and the tolls will be paid by the owners of the steamship lines instead of by the shippers in additional water rates.

In the case of chartered vessels, however, the shipper, and not the owner, of the vessels must bear the burden of the canal tolls. Charter rates will necessarily be increased by the amount of the canal tolls; and, in so far as railroads compete with the chartered vessel for lumber and similar traffic, the canal tolls will be of advantage to railroads. This advantage, however, will be more theoretical than real. It is not probable that the railroads can, in any event, compete with the carrier by water for bulk cargoes of lumber, coal, and similar products. The railroads will be obliged to allow that traffic to move by water. They will not run the risk of depressing their general schedule of commodity and class rates for the purpose of preventing chartered vessels from securing traffic that can be handled between the two seaboards of the United States for $5 per ton.

The probable adjustment of rates, by the coastwise water lines and by the railroads, upon traffic between the two seaboards of the United States was considered at length in Chapter IV, and the general conclusion reached was that "it will be the policy of the railroads to allow a portion of the traffic that might be held to the rails to be shipped coastwise through the canal and to maintain rates upon the traffic which can readily be prevented from taking the canal route. It is probable that the railroads will adopt the general policy of surrendering without serious struggle the minor portion of their traffic in order to maintain profitable charges upon the major share of their tonnage."

The foregoing argument concerning the effect of canal tolls upon rail and water rates, and concerning the adjustment of the charges of coastwise and all-rail carriers handling traffic between the two seaboards of the United States may be summarized as follows:

Producers and consumers would not secure the major share of the benefits resulting from the remission of tolls upon coastwise shipping using the Panama Canal. On the traffic handled by steamship lines between the two seaboards, rates will be but slightly affected by canal tolls. The coastwise traffic between our Atlantic and Pacific ports will consist mainly of general commodities and package freight handled by the established steamship lines. The rates charged by the steamship lines, being regulated by agreements among competing companies and being fixed with reference to what the traffic will bear, will presumably be as high as traffic conditions warrant regardless of tolls. The several lines will have uniform and relatively stable schedules of charges and the rates of the steamship lines will ordinarily be adjusted with reference to the stable schedule of commodity and class rates prevailing upon the transcontinental railroads and their rail connections. If canal tolls are charged, the operating expenses of the steamship companies will be increased by the amount of the tolls and their net profits will be lessened by the same amount.

Charter traffic between the two seaboards of the United States will be limited to a few commodities handled as bulk cargoes by or for the exceptionally large shipper. Chartered vessels will not compete with the regular steamship lines to such an extent nor in such a manner as generally to regulate the rates charged by the steam ship lines on the greater portion of their traffic.

4. The contention that, unless coastwise shipping is relieved of Panama tolls, there will be an insufficient supply of American ships and that this condition will bring about the admission of foreign-built ships to our domestic trade need not be given great weight. If the canal brings about a large demand for coastwise transportation facilities it will be profitable for American capital to invest in ships to provide those facilities. If there should prove to be a permanent scarcity of American ships to handle the coast-to-coast traffic, it is probable that the Congress can and will devise methods of aiding American shipping without closing American shipyards to the detriment of our navy.

5. It is earnestly argued by those who favor relieving American shipping of Panama tolls that the policy should be adopted in order to give further aid to the American merchant marine. When subjected to analysis this argument loses force. Our shipping employed in the foreign trade needs assistance, but our coastwise marine has a monopoly of the coastwise trade and does not need further aid. In 1911 there were 3,537,750 tons of American ships enrolled for the domestic trade on the Atlantic-Gulf and Pacific seaboards. The increase during the preceding decade had been 38 per cent. There is thus a relatively large and healthily increasing tonnage of coastwise shipping; and the opening of the Panama Canal will undoubtedly bring about a large addition to the coastwise fleet. Our coastwise marine is now given sufficient aid and protection by our navigation laws.

American shipping engaged in the foreign trade has declined steadily for several decades; and careful consideration may well be given to measures that promise effective aid in building up our shipping registered for the foreign trade; but the exemption of that shipping from the payment of Panama Canal tolls is inadvisable.

The policy is not advisable because the aid given would be of little effect. The amount of money paid by the Government to our shipping engaged in the foreign trade would be slight and the subsidy thus granted would be so widely and thinly distributed as to accomplish little, if any, results. In order to make a ship subsidy effective, the companies aided must thereby be put in a position to compete successfully with foreign steamship companies. The Government must concentrate its aid and so strengthen the strong lines that are given Government support as to put them in a position to hold their own, and to grow stronger, in competition with their foreign rivals.

The adoption of the policy of paying back to American shipowners the Panama tolls collected from them, might be a disadvantage instead of an aid to our shipping. The repayment to shipowners of the Panama tolls collected from them would invite similar action by other nations to overcome the effect of our action. It would be a form of subsidy suggesting retaliatory action by foreign governments.

The same tolls should be collected from all ships, American or foreign, in order that the Government may secure from the canal traffic such revenue as can be collected without limiting the commercial usefulness of the waterway. This argument ought to be given weight in deciding upon the policy to be followed in charging Panama tolls. The United States Government should conserve its revenues carefully. The fiscal policy of the Government should square with business principles. Our coastwise shipping does not need further aid, and to exempt our marine in the foreign trade from canal tolls would be to grant a subsidy that would reduce the Government revenues without effectively aiding our merchant marine.

Panama Tolls Should be Within What the Traffic Will Bear.

In fixing Panama Canal tolls some consideration should be given to the established principles of rate making. It will not be advisable for the United States Government in fixing canal tolls to adhere strictly to the principles that control rail and water carriers in the making of freight rates; but the rate or rates of toll levied at Panama may well be a compromise between charges based upon traffic and revenue principles and charges fixed solely with reference to the promotion of political or national aims. The tolls charged for the use of the canal should not be all the traffic will bear; indeed, they ought to be less than ships can afford to pay in return for the services rendered by the canal. While the primary purposes of the Panama Canal are to promote commerce and to strengthen the military and naval efficiency of the United States, it should be the policy of the United States Government so to manage the canal as both to develop traffic and to increase the canal revenues.

The preceding chapter considered with some detail the effects which tolls may have upon traffic through the canal; and the facts there presented show clearly that all of the commerce between the Atlantic-Gulf seaboard of the United States and the entire west coast of America, including Hawaii, will bear heavier Panama tolls than it will be wise to charge. The canal route, because of the saving in distance and fuel expenses, has a monopoly of this traffic, and tolls will have to be much above $1.20 per net vessel ton—the Suez Canal rate—to divert any tonnage from Panama. Even the shipping engaged in the trade of central Chile with our Atlantic seaboard will unquestionably use the canal route, because of the high price of coal via the Straits of Magellan.

The Panama Canal is likewise certain to be used by practically all of the trade between Europe and Pacific America, including Hawaii. Between Europe and all places north ot Valparaiso the canal route will be taken, although the tolls exceed the 1913 Suez rate of $1.20 per net ton; and, although ordinary freight vessels en route between Europe and Valparaiso will effect a distance saving via Panama equivalent to only 60 or 70 cents per net ton, the fuel expenses and the space necessarily devoted to coal bunkers via Panama will be enough less than via Magellan to cause the Panama route to be preferred, though the tolls are made double the saving that will result from the shortening of time and distance. Moreover, as has been explained, the Panama route, even though more expensive than the one via Magellan, will be preferred, because it will enable vessels to engage in trade at the west coast South American ports intermediate between Panama and Valparaiso. It will be well to study carefully the effect which Panama tolls may have upon the routes taken by vessels running between Europe and central Chile, but it is not believed that ships will be diverted to the Straits of Magellan by tolls at Panama of $1.20 per net vessel ton.

Shipping engaged in the trade between the eastern part of the United States and Australia could readily afford to pay Panama tolls equal to those that will be charged at Suez—$1.20 per net ton beginning with January 1, 1913—even though the fuel expenses were the same via Panama as by way of the Cape of Good Hope.

Vessels making voyages between the eastern part of the United States and New Zealand will have the choice of the Panama and Magellan routes. The saving resulting from the shortening of time and distance via Panama will be somewhat less than $1.20 per net ton for freight vessels, but the fuel expenses via the Isthmian route will be so much less than those by way of the Straits of Magellan as to leave no doubt as to the preferability of the Isthmian route.

Australia is nearer Europe by way of Suez than via Panama, and most of the Continent is less distant from Europe via the Cape of Good Hope than by way of the American isthmus. However, the city of Sydney, which is the ultimate destination of most vessels outbound from Europe to Australia, is but 150 miles farther from Liverpool via Panama and Tahiti than via Suez, Colombo, and Australian ports of call. As compared with the route from Australia to Europe via Durban (to secure coal) and the Cape of Good Hope, the sailing distance via Panama is about 1,000 miles shorter, and the fuel expenses will be somewhat less via the American route.

These facts indicate that the course taken by vessels between Sydney, Australia, and the ports of northern Europe will be determined mainly by the relative advantages of the alternative routes as regards traffic opportunities at intermediate ports. At the present time many vessels sail from Australia in ballast or with part cargoes for the west coast of North and South America to secure freight for transportation to Europe via the Straits of Magellan. The opening of the Panama Canal may be expected to increase the tendency of vessels to cross the Pacific from Australasian ports to secure cargoes in America for Europe. The route taken by vessels outbound and inbound between Europe and Australia will unquestionably be influenced by the rate of tolls charged at Panama. If the Panama transit dues are the same as those at Suez, both canal routes will compete with the Cape of Good Hope under equal conditions. The Australian-European tonnage that can be secured for the Panama route will not constitute a large enough share of the total traffic of the Panama Canal to warrant a general reduction in Panama tolls for the purpose of increasing the use of the American canal by the commerce of Australia with Europe.

The Panama Canal must compete with the Suez route for the commerce between the Atlantic-Gulf seaboard of the United States and the Orient east of Singapore. Manila and Hongkong are about equally distant from New York by the Suez and Panama routes. The territory north and east of those two cities is within the Panama Canal's traffic zone, while that south and west is tributary to the Suez route. It is not to be expected, however, that all of the commerce between the eastern seaboard of the United States and points south and west of Hongkong and Manila will take the Suez route and that all of the ships plying between our Atlantic ports and the territory north and east of Hongkong and Manila will use the Panama Canal. There will be some traffic from places north and east of Hongkong and Manila that will be taken to New York and the Atlantic-Gulf seaboard of the United States by way of Suez, and it is equally certain that some vessels will start from points west of Hongkong and Manila and proceed by way of Panama to the eastern ports of the United States. There will be an overlapping of routes between Singapore and Yokohama.

The fuel expenses for round-trip voyages between the Atlantic-Gulf seaboard of the United States and the Orient east of Singapore will be so much less by Panama than by Suez as to make it certain that the Panama route will be taken by practically all the trade between the eastern part of the United States and Japan, China, and the Philippines. Tolls at Panama equal to those at Suez will not divert from the American route any considerable amount of the commerce between the United States and the Pacific seaboard of Asia.

Europe will trade with the Orient east of Singapore mainly by way of the Suez Canal. The line connecting points equally distant from Liverpool via Panama and Suez runs 347 miles east of Yokohama. (The line connecting points equally distant from Liverpool via the Panama and Suez routes is located in plate 2 at the end of this volume.) Traffic opportunities at intermediate ports will decide whether vessels take the Suez or Panama route between Europe and Japan, China, or the Philippines. For voyages between northern Europe and China, fuel expenses will be less via Suez; while to and from Japan coal costs will be slightly lower via Panama.

With tolls at Panama not exceeding those at Suez, the Panama Canal can secure a small share of Europe's traffic with the Far East. The tonnage to be competed for is heavy. In 1910 the European entrances and clearances of vessels engaged in the oriental trade amounted to nearly 12,000,000 tons net register. If it should be possible for the canal to secure 20 per cent, or even 10 per cent, of this tonnage the traffic of the American waterway and its revenues would be appreciably increased. However, in estimating the tonnage of available Panama traffic it has not been assumed that the American route would secure any of the East Indian and Chinese commerce with Europe. Indeed, the only European-oriental trade credited to the Panama route was 5 per cent of the shipping engaged in the trade between Europe and Japan.

Summary of the Considerations that Should Control in Fixing Panama Tolls.

1. In managing the Panama Canal and in fixing tolls, the usefulness of the waterway to commerce and industry should be given first consideration. The policy as regards tolls and revenue should not be allowed to limit the traffic usefulness of the waterway.

2. The Panama Canal should be made commercially self-supporting. Tolls based upon the value of the service rendered by the canal are justifiable. Those who use the waterway may justly be required to make some compensation for the benefits received. Tolls, not unduly restricting the commercial usefulness of the waterway, may be levied that will yield revenue enough to meet operation, maintenance, sanitation, government, annuity, and interest charges.

3. The same rate of toll should be charged upon American as upon foreign vessels, because—

(*a*) The omission or repayment of tolls on American shipping would be of assistance mainly to our coastwise shipping which does not need aid and would be of but little help to American vessels engaged in the foreign trade.

(*b*) Such subsidies as are given the American merchant marine should be paid to vessels employed in our foreign trade; but the remission or repayment to vessel owners of Panama tolls on American ships in the foreign trade would be an ineffective subsidy that might invite retaliatory measures by foreign governments.

(*c*) The exemption of coastwise shipping from Panama tolls would inure mainly to the benefit of the coastwise carriers and only partially to the benefit of shippers and consumers. Neither the rates of the steamship lines nor the charges of the rail carriers will be appreciably higher if tolls are charged on coastwise shipping than they will be if such shipping is relieved from the payment of tolls.

4. The United States should adhere to business principles in the management of the Panama Canal. The Government needs to guard its revenues carefully. Present demands on the general budget are heavy and are

certain to be larger. Taxes must necessarily increase. Those who directly benefit from using the canal, rather than the general taxpayers, ought to pay the expenses of operating and carrying the Panama Canal commercially.

5. The tolls at Panama should be such as to enable the canal (*a*) to divert from the Straits of Magellan all the traffic of the Pacific coast of South America, (*b*) to prevent the use of the Cape of Good Hope route by the commerce between the Atlantic-Gulf coast of the United States and Australia, (*c*) to divert from the Suez Canal the trade between the eastern seaboard of the United States and the Orient east of Singapore, and (*d*) to compete with the Suez Canal for a portion of Europe's commerce with the Far East.

CHAPTER XIII.

PANAMA TOLLS II.

RATES OF TOLL—GROSS AND NET REVENUE.

CHAPTER XIII.

PANAMA TOLLS II—RATES OF TOLL—GROSS AND NET REVENUE.

BASES OF TOLLS.

For reasons that have been briefly stated in Chapter IX of this report and which are discussed in detail in the volume upon the Measurement of Vessels, it is recommended that the tolls levied upon merchant vessels for the use of the Panama Canal be based upon net vessel tonnage so determined as to express the ship's earning capacity, and that the tolls upon war vessels be based upon displacement tonnage. It is recommended that the same basis for the levy of tolls—net tonnage or actual earning capacity—be adopted for both freight and passenger vessels, that spaces occupied by passengers and freight pay the same rate of tolls, and that no tolls be levied on passengers. Reasons for these recommendations may be briefly considered.

REASONS WHY PASSENGER TOLLS SHOULD NOT BE LEVIED.

Tolls on passengers are unjustifiable, because the collection of such charges, in addition to tolls upon the earning capacity of a vessel, or its actual net tonnage—the entire space available for freight and passengers—imposes an unjustifiable double tax upon the portion of the ship devoted to passenger accommodations. The space occupied by passengers ought not, for the following reasons, to be taxed more heavily than the portion of the ship in which freight is carried:

(*a*) In vessels fitted to carry both freight and passengers the revenue derived from the passenger accommodations is more variable and less certain than the earnings secured from the ship's freight capacity. Vessels devoted entirely, or in large part, to the transportation of passengers may at times be highly profitable, but are less reliable revenue producers, year by year, than are ships that carry cargo only. Vessels that transport passengers must be run upon schedule time. They can not remain in port, as freight vessels usually can, until all or a large share of the accommodations have been disposed of. Passenger travel, furthermore, is more seasonal and otherwise more variable than freight shipments are; and it is more difficult to shift passenger vessels from one route to another than it is to change freight carriers, as the volume of freight fluctuates, from ports of light traffic to those to and from which freight movements are temporarily heavy.

(*b*) The double taxation of the space occupied by the passenger cabins, resulting from levying tolls both upon passengers and upon net vessel tonnage, is objectionable, because steamship companies may thereby be induced to give passengers, especially those in the third cabin, less space per person than would otherwise be provided. Even in the second and third cabins the effect of passenger tolls may be the restriction of spaces devoted to social halls and recreation rooms. It is said that the passenger tolls charged by the Suez Canal Co. have thus unfavorably influenced the arrangements of the passenger accommodations on vessels operated through that waterway.

The substitution of passenger tolls for tolls upon the capacity, or net tonnage, of the space occupied by passenger accommodations would not be justifiable, because the per capita levy, unless made exceptionally large, would tax passenger accommodations too lightly as compared with the spaces occupied by freight. The most scientific and most equitable basis of tolls, both upon freight and upon passenger spaces, is the net tonnage of vessels, so calculated as accurately to express earning capacity.

THE RATES OF TOLL RECOMMENDED.

The following rates of toll upon merchant ships and war vessels are recommended:

On merchant vessels, carrying passengers or cargo, \$1.20 per net vessel ton, or each 100 cubic feet, of actual earning capacity.

On vessels in ballast, without passengers or cargo, 40 per cent less than the rate of toll upon vessels with passengers or cargo.

Upon all naval vessels other than transports, colliers, hospital ships, and supply ships, 50 cents per displacement ton.

Upon Army and Navy transports, colliers, hospital ships and supply ships, $1.20 per net ton, the vessels to be measured by the same rules as are employed in determining the net tonnage of merchant vessels.

REASONS FOR RECOMMENDING TOLLS OF $1.20 PER NET TON UPON LOADED MERCHANT VESSELS.

Panama tolls should be so adjusted as to fulfill three conditions: The rate of toll should be low enough to enable the canal to compete actively with alternative and rival routes; the rate should not be so high as unduly to burden or seriously to restrict the usefulness of the canal; and the rate should be high enough to yield revenues that will make the canal commercially self-supporting.

A toll of $1.20 per net ton on loaded merchant vessels and a reduction of 40 per cent from the standard rate in the case of vessels in ballast will place the Panama Canal and its rival, the Suez Canal, upon an equal competitive footing. The Suez rates, beginning January 1, 1913, are to be 6.25 francs ($1.206) for loaded vessels and 3.75 francs ($0.724) for ships in ballast.

The Panama Canal must compete with the Suez route for the commerce of the eastern seaboard of the United States and of the Atlantic-North Sea ports of Europe with the Orient east of Singapore. For voyages between the eastern ports of the United States and the Orient, fuel expenses via Panama will be less than by way of Suez; and, with equal tolls at each canal, the Panama route will readily secure the traffic.

It is not to be expected that much of the commerce of Europe with the Pacific seaboard of Asia can be diverted to Panama from its present route via Suez. Distances are less via Suez; and, with the exception of voyages from north Europe to Japan and return, the fuel expenses are lower by way of Suez. With equal tolls at Panama and Suez, some vessels will take the Panama route between Japan and Europe in order to discharge and secure cargo at American ports. To attract from the Suez to the American route any considerable, additional share of the European-Oriental tonnage, the rates of toll at Panama would have to be made so low as to reduce unjustifiably the revenues of the canal. Neither traffic considerations nor probable financial results warrant the charging of lower tolls at Panama than at Suez, for the purpose of increasing the use of the American canal by the commerce of Europe with the Orient.

A Panama toll of $1.20 per net ton will not unduly burden the commerce served by the canal. The costs of transportation between the two seaboards of the United States will be reduced several times the amount of the toll; and, for the commerce of the eastern seaboard of the United States with western South America and with Australia, the economies effected by the Panama Canal will largely exceed the toll suggested. Likewise the saving in time and fuel expenses via Panama, as compared with the Magellan route, between our eastern seaboard and New Zealand will be such as to insure the profitable use of the Panama Canal.

Nor will a toll of $1.20 per net ton seriously restrict the use of the canal by European countries. For the commerce of Europe with Chile and with New Zealand, the saving resulting from the shortening of the time of voyage via Panama, as compared with the Straits of Magellan, would not warrant the payment of tolls of $1.20 per net vessel ton for using the Panama Canal; but the fuel expenses via Panama will be so much less than via Magellan as to make the canal route preferable, even with tolls of $1.20 per net ton. Moreover, the profitable trade route between Europe and Chile is via Panama and the ports intermediate between the Isthmus and Valparaiso. Panama is the natural entrance and exit for the west coast South American trade.

The normal growth of the traffic of the Panama Canal will not be interfered with by a toll of $1.20 per net ton. The tonnage of shipping using the Suez Canal has increased rapidly, the growth of traffic having been about 70 per cent during the past 10 years, although the tolls at the opening of the decade were $1.74 per net ton, and, in 1911, $1.30—a higher rate than is recommended for Panama. It is suggested that the tolls at Panama start with the relatively low rate to which the Suez charges will have been brought in 1913, at the end of 43 years of traffic development.

FORTY PER CENT DEDUCTION IN TOLLS ON SHIPS IN BALLAST.

From the 1st of January, 1913, the Suez Canal tolls will be 6.25 francs ($1.206) per ton net on loaded merchant vessels, and 3.75 francs ($0.72) per net ton on vessels in ballast. A rebate of 2.50 francs per net ton in the rate of toll when vessels are in ballast will be a deduction of 40 per cent from the rate payable by loaded vessels.

This is a much larger percentage deduction than has formerly been made. When the Suez Canal was opened the rate of tolls on loaded merchant vessels was 10 francs, and upon vessels in ballast 2.50 francs (25 per cent) less than the regular rate. In 1874 the Suez tolls were increased to 13 francs per net ton upon loaded vessels, and the rate remained above 10 francs until 1884. During this period, however, the reduction made for vessels n ballast remained 2.50 francs. In 1893, when the regular rate of tolls on loaded vessels became 9 francs, the reduction made for vessels in ballast amounted to about 28 per cent. In 1912 the toll upon loaded vessels became 6.75 francs per net ton, the reduction for ships in ballast amounting to 37 per cent. If vessels in ballast using the Panama Canal are charged tolls 40 per cent less than are levied upon loaded vessels, the percentage of reduction will be greater than the Suez Canal Co. granted prior to 1913.

The policy of the Suez Canal Co. has been to make an absolute, instead of a percentage, deduction from the standard rate of tolls in favor of vessels in ballast. A percentage reduction is more logical, and is fairer to the two classes of vessels. When once an equitable relationship between the dues payable by loaded vessels and by vessels in ballast has been established, a reduction in the standard rate of toll payable by loaded ships automatically lowers, by a just amount, the charges payable by vessels without passengers or cargo.

TOLLS OF 50 CENTS PER DISPLACEMENT TON UPON WAR VESSELS.

Naval vessels—battleships, armored and unarmored cruisers, torpedo boats, and torpedo-boat destroyers—are not constructed for the transportation of freight and passengers. They are fighting machines, not commercial carriers; they have no "earning capacity," and can have no real net tonnage. The size of such vessels is always indicated by their displacement. It is, accordingly, recommended that the tolls upon warships be levied upon displacement tonnage, and that the rate of toll be 50 cents per ton.

Auxiliary vessels required by the army and navy—colliers, transports, supply ships, and hospital ships—may readily be measured to determine their net tonnage; and it is recommended that such vessels be charged the same tolls as are levied upon merchant vessels—$1.20 per net ton.

The Suez Canal Co. applies its measurement rules to warships as well as to merchant vessels; and the tolls upon warships are based upon an artificial net tonnage thus determined, the rate of tolls being the same as upon merchant shipping. That the calculation of a net tonnage for war vessels is difficult and the results arbitrary is indicated by the experience of the United States naval constructors in applying the Suez measurement rules to American naval vessels. The Bureau of Construction and Repair in the Navy Department found, in applying the Suez rules to our warships, that numerous questions arose which the naval constructors could not answer without securing rulings from the Suez Canal authorities. Lists of questions were twice submitted to the Suez Canal Co.; and, after great labor, the Bureau of Construction and Repair prepared a book of instructions to be followed in calculating the net tonnage of American warships according to the Suez rules. The book thus prepared by the bureau is printed as an appendix to the volume upon The Measurement of Vessels.

A toll upon warships of 50 cents per displacement ton is somewhat more than the equivalent of a charge of $1.20 per net ton calculated in accordance with the measurement rules of the Suez Canal Co. The net tonnage of the American battleships and armored cruisers measured by the Bureau of Construction and Repair in accordance with the Suez rules was found to average 35 per cent of the displacement tonnage, for unarmored cruisers the net tonnage, Suez measurement, was 36 per cent of the displacement, and for torpedo boats 55 per cent. A toll of $1.20 per net ton would thus have been equal to a charge of 42 cents per displacement ton in the case of battleships and armored cruisers, to 43 cents per displacement ton for unarmored cruisers, and 66 cents per displacement ton for torpedo boats. The application of British measurement rules to battleships gives a ratio of net tonnage to displacement higher than the Suez rules produce. In the volume on "Warships," by Edward L. Atwood, member of the Royal Corps of Naval Constructors (England), the net tonnage of battleships is stated to be 39 per cent of their displacement tonnage.

A toll of 50 cents per displacement ton imposes a somewhat higher charge upon warships than is recommended for merchant vessels. The ratio of net tonnage to load displacement of merchant ships varies widely with the type of vessel, but averages about 1 to 3. A toll upon merchant vessels of $1.20 per net ton is equal to about 40 cents per ton of displacement.

The Panama tolls on warships ought, for several reasons, to be somewhat higher than upon merchant vessels:

1. Comparatively few naval vessels will use the canal, and they will be of large average size and of relatively deep draft. The battleships and cruisers will be among the largest ships using the canal.

2. The risks incurred by the canal authorities in passing warships through the locks will be greater than those incident to the lockage of merchant ships. Special care will also need to be taken to avoid delaying warships in

transit. Any detention of a fleet of war vessels might be made the basis of heavy damage claims against the United States.

3. While the policy of charging merchant shipping canal tolls equal to the value of the service rendered by the canal would not be defensible, the policy of charging war vessels tolls in accordance with the value of the service would be theoretically justifiable. Such charges upon warships are not recommended; but it is believed that the tolls levied upon such vessels should be large enough to cover the expenses and risks incurred by the United States in performing the service of passing naval fleets through the canal. The tolls upon merchant vessels should be fixed low enough to enable the Panama Canal effectively to promote the commerce of the United States and of the world; but the United States Government is not called upon to make the Panama Canal tolls upon warships low for the purpose of lightening the naval burdens of foreign countries. In sending their warships through the Panama Canal foreign nations should pay tolls high enough to cover costs and risks incurred by the canal authorities in performing the service rendered.

ESTIMATED GROSS AND NET REVENUE.

The gross revenues of the Panama Canal will depend upon three factors—the rate of tolls, the total volume and rate of growth of traffic, and the share of traffic subjected to, or exempted from, tolls.

If the rate of increase in available canal tonnage that has prevailed since 1899, 60 per cent per decade, shall continue up to 1915, the tonnage of vessels using the canal during the first two years of its operation will amount to about 10,500,000 tons per annum. If the conservative assumption be made that this rate of increase will continue during the first decade of the canal's operation, the shipping using the Panama Canal in 1925 will amount to 17,000,000 tons net register. This estimate takes no account of the influence of the canal in accelerating the growth of traffic. The tonnage of the Suez Canal has increased about 70 per cent during the past decade, and it seems safe to assume that the traffic of the Panama Canal will reach 17,000,000 net tons by 1925.

The shipping using the Panama Canal may be subdivided into three classes: That engaged in the coastwise commerce between the two seaboards of the United States, American shipping employed in carrying the foreign commerce of the United States, and foreign shipping carrying the commerce of the United States and foreign countries. The following table states the probable volume of each of these three classes of shipping during the first two years of the operation of the canal, during 1920, and during 1925:

TABLE I.—CLASSIFICATION OF ESTIMATED NET TONNAGE OF SHIPPING USING THE PANAMA CANAL IN 1915, 1920, AND 1925.

	Average per annum during 1915 and 1916.	1920	1925
Coast-to-coast American shipping	1,000,000	1,414,000	2,000,000
American shipping carrying foreign commerce of the United States	720,000	910,000	1,150,000
Foreign shipping carrying commerce of the United States and foreign countries	8,780,000	11,020,000	13,850,000
Total	10,500,000	13,344,000	17,000,000

The figures given in the above table for the tonnage of coast-to-coast American shipping that may be expected to use the Panama Canal during the first year or two of its operation are obtained by estimating that the tonnage of traffic that was available in 1910 will have increased to 1,000,000 net tons by 1915. During 1911 and 1912, the rate of increase has been more rapid than this; but, in order to be on the safe side, this has been the rate of increase assumed. It is believed, however, that the canal will greatly increase the traffic carried by water between the two seaboards of the United States. In constructing the above table, it was estimated that the intercoastal shipping through the canal would double during the decade ending with 1925. At that rate of increase, the coast-to-coast American shipping through the canal will amount to 1,414,000 tons in 1920.

In deciding upon the tonnage of American shipping that will be employed in carrying the foreign commerce of the United States through the canal, it was necessary to depend mainly upon conjecture. In 1909–10 the total shipping, American and foreign, employed in carrying that part of the foreign trade of the United States that would have used a Panama canal had it been in existence, amounted to 2,856,900 net tons. An increase in this tonnage, at the rate of 60 per cent per decade, raises the figures to 3,600,000 net tons in 1915. It was assumed, in constructing the table, that, shortly after the opening of the Panama Canal, one-fifth of the foreign commerce of the United States carried through the canal would be transported in vessels flying the American flag. It is possible that this estimate overstates the tonnage of American shipping that will be used in our foreign commerce through the canal.

At the present time about 9 per cent of the value of the entire foreign commerce of the United States is carried in American bottoms. Twenty-three per cent of the total tonnage of entrances and clearances at our ports of vessels employed in the transportation of our foreign commerce consists of ships under the American flag; but, at the present time, most American ships engaged in handling the foreign commerce of the United States are employed in our trade with Canada, the West Indies, Mexico, and Carribean countries. Only a small tonnage of American ships is employed in the long-distance foreign trade of the United States. This situation should be, and doubtless will be, changed to some extent by the opening of the Panama Canal. Some of the lines operating to the Carribean will be extended through the canal to engage in the trade with the west coast of Mexico, Central America, and South America.

It is, however, not probable that the American marine in the foreign trade can make very much headway until our navigation laws are so changed as to permit foreign-built ships to be purchased for registry under the American flag for use in the foreign trade. If, before the canal is opened, the navigation laws of the United States are so changed as to permit Americans to secure, for use in our foreign trade, ships as cheaply as their competitors can obtain them, it is probable that fully one-fifth of the shipping employed in carrying the foreign commerce of the United States through the canal will, within a few years after the opening of the waterway, be under the American flag.[1]

It is probable that the foreign trade of the United States using the Panama Canal will increase at least 60 per cent during the first decade. If it be assumed that 20 per cent of the foreign commerce of the United States through the canal will be carried in American ships, there will be 720,000 tons of American shipping in 1915 or 1916, 910,000 tons in 1920, and 1,150,000 tons in 1925, employed in carrying that part of the foreign trade of the United States which makes use of the Panama Canal. It is recognized, however, that not even this small percentage of the total shipping employed in handling our foreign commerce by way of the canal will consist of American vessels, unless our navigation laws are so changed as to reduce the handicap which the owners of American vessels now have in competing with the owners of vessels under foreign flags.[1]

In constructing the above table, it was estimated that the total traffic of the Panama Canal would increase at the rate of 60 per cent per decade and would rise from an average of 10,500,000 tons per annum, during the first year or two of the canal's operation, to 17,000,000 tons in 1925. If the tonnage of shipping employed in the intercoastal trade of the United States and the tonnage of vessels under the American flag employed in carrying the foreign commerce of the United States through the canal are correctly estimated, the tonnage of foreign shipping engaged in transporting the commerce of the United States and foreign countries through the canal will rise from an average of 8,780,000 net tons per annum, during 1915 and 1916, to 11,020,000 tons in 1920, and to 13,850,000 tons in 1925. Should the estimate of American shipping in the foreign trade prove to be too large, it will not affect the estimate of the total shipping using the canal; for, in that case, a larger volume of trade will be handled in foreign vessels.

The gross revenue that may be secured from the Panama Canal, with tolls at $1.20 per net ton upon all merchant vessels, and the estimated share of the total receipts that would be secured from American coastwise shipping, from American vessels engaged in carrying the foreign commerce of the United States, and from foreign shipping are stated in the following table:

TABLE II.—CLASSIFICATION OF ESTIMATED REVENUE OF THE PANAMA CANAL AT A TOLL OF $1.20 PER NET TON

	Average per annum during 1915 and 1916.	1920	1925
Coast-to-coast American shipping	$1,200,000	$1,696,800	$2,400,000
American shipping carrying foreign commerce of the United States	864,000	1,092,000	1,380,000
Foreign shipping carrying commerce of the United States and foreign countries	10,536,000	13,224,000	16,620,000
Total	12,600,000	16,012,800	20,400,000

[1] A few days after the completion of this report, Congress so amended the navigation laws as to admit foreign built ships, owned by citizens of the United States, to American registry for use in foreign trade. This law was a part of the Panama Canal act of Aug. 24, 1912.

The foregoing table does not take account of the fact that some of the vessels using the Panama Canal will be without cargo or passengers and will pay less than the standard rate of toll. In the investigation of the tonnage of available canal traffic it was found that 96 per cent of the total shipping that would use the canal consisted of vessels with cargo and 4 per cent of ships in ballast. This ratio of loaded to ballasted vessels is practically the same as prevails in the traffic of the Suez Canal. If the tolls on 4 per cent of the total traffic of the Panama Canal are 40 per cent less than the standard rate of $1.20 per net ton, the revenue, as stated in the preceding table, should be reduced by 1.6 per cent. This reduction, however, has not been made, partly for the reason that the table does not, and could not, take account of the revenue that may be received from tolls upon war ships.

The preceding tables, in which the tonnage of canal traffic and the receipts from that traffic are specified, make the tonnage of canal traffic and the revenue obtainable therefrom less than they would be if the figures for net tonnage were determined by the application of the Suez rules to the measurement of vessels engaged in the commerce that will use the canal. As is explained in the volume upon "The Measurement of Vessels," the rules followed in the United States, Great Britain, Germany, and other countries in measuring vessels yield a lower net tonnage than do the Suez rules. If measurement rules approximating those in force at the Suez Canal are adopted for the measurement of vessels using the Panama Canal, the tonnage and revenues of the American canal will be somewhat higher.

Table II contains an estimate of the amount of Panama tolls obtainable from American and foreign shipping unless American shipping is exempted from paying tolls. The amount of tolls payable by American ships would, according to the table, rise from somewhat over $2,000,000 per annum during the first two years of the operation of the canal to about $3,780,000 during 1925, provided, as is improbable, that the rate of tolls remained $1.20 per net ton throughout the 10-year period. Should the tolls start and remain at $1.20 per net ton, foreign shipping will be required to pay about $10,500,000 in tolls per annum during the first two years of the operation of the canal, and about $16,200,000 during 1925. A reduction in the rate of tolls before 1925 will cause a proportionate, or nearly equivalent, decrease in the revenue obtained, both from American and from foreign ships. The exemption of American ships from the payment of tolls, or the repayment of tolls to the owners of American vessels, will mean a sacrifice of one-sixth of the canal revenues during the early years of the operation of the canal and of nearly one-fifth of the revenues at the end of a decade.

It has been estimated by the Isthmian Canal Commission that the annual expenses for the operation and maintenance of the Panama Canal during the early years of its operation will amount to $3,500,000, and that $500,000 per annum will cover the annual outlay for sanitation and civil administration, provided the Canal Zone is made a Government reservation and the population is limited to the canal operatives and their families. It is thus anticipated that the annual expenses for the operation and maintenance of the canal and the sanitation and government of the zone will amount to $4,000,000. The canal will cost $375,000,000. This sum includes the $40,000,000 paid the French Canal Co. and the $10,000,000 given the Republic of Panama for the canal concession. The cost of the construction work, which is now within one year of practical completion, has been kept within the estimates, and unless unforeseen contingencies occur the canal when finished will have required an outlay of $375,000,000 on the part of the United States Government. The interest on this sum at 3 per cent per annum will amount to $11,250,000. The canal concession treaty between Panama and the United States requires the United States, beginning in 1913, to pay $250,000 annually to Panama. Thus the total annual expenses for the operation and maintenance of the canal, the government and sanitation of the zone, for the annuity to Panama, and for the interest on the investment will be $15,500,000.

If all vessels, American and foreign, using the canal are required to pay tolls at the rate of $1.20 per net ton, the revenues per annum during the first two or three years of the canal's operation will average between twelve and thirteen million dollars. By the end of the first decade the revenues will probably have risen to $20,000,000. If only foreign ships are required to pay tolls, the receipts during the first few years will be between ten and eleven million dollars per annum and will rise to sixteen or seventeen million dollars by the end of the first 10 years. It is not probable, however, that the rate of $1.20 per net ton will be maintained throughout the decade. That is the rate that will be charged by the Suez Canal Co. in 1913;. and it is more than probable that the Suez Canal Co. will reduce its tolls below that rate within a few years after 1913. It will probably be unwise for the United States to maintain higher tolls at Panama than are charged at Suez.

It will hardly be possible to secure from foreign shipping enough revenues during the first decade of the Panama Canal's operation to meet all operation, depreciation, interest, annuity, zone government, and sanitation charges. On the other hand, if Panama tolls are charged both upon American and upon foreign ships at the rate of tolls that may be expected to prevail at Suez, it will apparently be possible to secure revenues from the Panama Canal that will make it commercially self-supporting during the first decade.

With the growth of traffic through the Panama Canal during the second and succeeding decades of its operation it will be possible, with tolls, at that time, of not exceeding \$1 per net ton, for the United States Government to secure revenues that will permit of the ultimate amortization of the investment in the canal. It will be possible and advisable for the United States, beginning with 1925, to invest 1 per cent per annum of the \$375,000,000 investment in a sinking fund. If this is done, the annual net revenues must amount to \$19,250,000, or the sum of \$3,500,000 for operation and maintenance, \$500,000 for government and sanitation of the zone, \$11,250,000 for interest, \$250,000 for the Panama annuity, and \$3,750,000 for the sinking fund.

During the second and succeeding decades, moreover, it will unquestionably be necessary to devote relatively large sums per annum to the betterment of the canal to keep the waterway abreast of traffic needs. Will this be possible? An increase of 60 per cent during the first decade, as has been stated, will bring the canal traffic to 17,000,000 net tons in 1925. Should this rate of increase continue, as it undoubtedly will, during the second decade, the traffic in 1935 will amount to 27,000,000 net tons; and with tolls at that time of \$1 per net ton, revenues of \$27,000,000 per annum may readily be obtained. Receipts of this amount would enable the Government to meet all expenses, including operation, maintenance, betterments, zone sanitation and government, the Panama annuity, and the sinking fund.

The figures here given of the probable traffic and possible revenue of the Panama Canal in 1925 and 1935 are estimates based upon a careful study of the rate of increase of the commerce of the United States and foreign countries and of the development of the traffic of the Suez Canal. While it is never safe nor scientific to prophesy, the actual history of commerce during the past 20 years clearly indicates that the estimates regarding the Panama Canal traffic and revenues are conservative. If they shall prove to be so, it will be possible for the United States, without unduly burdening commerce or restricting the usefulness of the canal, to secure enough revenues during the first 20 years to make the canal commercially self-supporting. To follow this policy will be to apply business principles to the management of the Panama Canal, and to prevent its being a continuing burden upon the General Treasury and upon the taxpayers of the United States.

APPENDICES.

EXPLANATORY NOTE.

The preceding Report upon Panama Traffic and Tolls was authorized by the President "for the purpose", as stated in the instructions issued by the Secretary of War, "of bringing up to as late a date as practicable the data contained in the Report of the Isthmian Canal Commission for 1899–1901 relative to the industrial and commercial value of the Isthmian Canal." The entire 1901 Report of the Isthmian Canal Commission, of which the report on the industrial and commercial value of the canal was a part, was reprinted, with plates, in 1904; and, for that edition, the report on the value of the canal was slightly revised. In 1911, a separate print, with an analytical table of contents, but without accompanying folded plates, was made of the report on the value of the canal. The issue of 1911 is here reproduced, without change, as Appendix I. It has not been deemed necessary to reproduce the thirteen plates that were a part of the 1904 edition of the report; but the first and last plates of the series have been revised and republished as the first two of the twelve folded plates accompanying this report on Panama Canal Traffic and Tolls.

APPENDIX I.

REPORT ON THE INDUSTRIAL AND COMMERCIAL VALUE OF THE ISTHMIAN CANAL.

By EMORY R. JOHNSON, Ph. D.

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REPORT ON THE INDUSTRIAL AND COMMERCIAL VALUE OF THE ISTHMIAN CANAL.

By Emory R. Johnson, Ph. D.,

Member of the Isthmian Canal Commission June 9, 1899, to March 10, 1904, and Professor of Transportation and Commerce, University of Pennsylvania.

PREFACE.

The information upon which this report is based was secured mainly during 1900 and the latter half of 1899. The report was written during 1900 and the early part of 1901. The Isthmian Canal Commission's detailed report, of which this is an appendix, was submitted to the President in November, 1901, and promptly forwarded by him to Congress. The republication of this report, after nearly three years, makes certain parts of the discussion less up to date than is to be desired. However, I have had an opportunity to reedit the report before it was sent to the Public Printer. Several changes in details have been made and several footnotes have been added to make such explanations as were rendered necessary by the events of the past three years.

These alterations have not changed the original character of the report. The main purpose of the investigation was to analyze the relations of the proposed Isthmian canal to American industries and commerce, and to present to the Commission the geographical and commercial facts to be considered in deciding whether to recommend the adoption of the Nicaragua or the Panama route. Those who now read the report should bear its purpose in mind. Had the study been made three years later, the same methods would have been followed and the same conclusions reached.

June, 1904.

Chapter I.

SCOPE AND METHOD OF THE INVESTIGATION.

This study of the isthmian canal from the standpoint of its use, or its industrial and commercial value, has been made for the accomplishment of two purposes. One object was the presentation of an analytical discussion of the more important relations of the proposed waterway to the commerce of foreign nations and to the industries, transportation interests, and domestic and foreign trade of the United States. The other purpose was to compare the commercial advantages of the Nicaragua route with those of one across Panama, all other routes having been eliminated from consideration.

There are two sides to an investigation of the value of an isthmian canal, one industrial and the other commercial. A careful study of the leading industries of the different sections of the United States is requisite to an analysis of the effects which the canal will accomplish or to a fruitful discussion of the commerce that will use the waterway. Commerce is but the auxiliary of industry; and a complete discussion of the economic value of an isthmian canal first requires an examination of the leading industries of the United States and other important countries, and then a consideration of the volume of business which those industries would bring to the canal.

While this report does not discuss the entire field as thus defined, it covers those parts of the subject that are of direct importance to the American people. The relation of the canal to the industries and domestic and foreign commerce of the United States has been studied with care and is presented with considerable detail, nearly half of this discussion being devoted to the subject. A separate chapter is given to each of the four sections of the United States—the southern, eastern, central, and western—for the purpose of considering the manner in which the proposed canal will affect their industries and commercial progress, and these chapters are followed by more detailed studies of the coal and iron and steel industries and the shipbuilding and maritime interests, with special reference to the effects which the new interoceanic route will have upon each. The facts bearing upon the use of the canal by sailing vessels are analyzed and the influence which the new waterway will have upon the future place of the sailing vessel as an ocean carrier is considered. The effect of the canal upon the traffic of American railways is also made the subject of a special chapter.

The foreign countries whose resources and trade have been examined are those of the Pacific, and they were chosen for investigation partly because it was believed that in general the effect of the interoceanic canal upon them would be greater than upon other foreign countries; that their commercial relations and economic conditions would be most benefited. The present and prospective importance to the United States commercially, and politically also, of the Pacific nations was another reason for studying carefully the relation of the canal to the progress of those countries. The industries and trade of the countries of western South America and the manner in which the isthmian canal will affect their progress and our commercial relations with them have been examined with special care, because of the importance of this extensive section to the world's commerce. The information concerning this region is comparatively meager and the significance of the section for the traffic of an interoceanic canal and the commercial progress of the United States is frequently underestimated. The industries and trade of Japan, China, Australia, the Philippines, Hawaii, western Mexico, and Central America, and the effects of the isthmian canal upon them are also discussed.

The latter part of this discussion relates to the traffic that will use the waterway. The effects which the isthmian canal will have upon the length of the ocean routes connecting the United States and Europe with the various countries of the Pacific are shown by eight tables, the distances in which were calculated by the United States Hydrographic Office.

The investigations made to ascertain the present and prospective available tonnage of canal traffic are described in Chapters XVIII to XXI, inclusive. Three statistical studies are discussed in the report, and after describing and presenting the results of the three investigations the tonnage figures obtained by the three different methods of inquiry are compared.

After having determined the amount of canal traffic available in 1899, and having ascertained the rate of increase in that traffic during the previous decade, estimates are made concerning the probable tonnage that will be available for the canal in 1909 and 1914. The growth in the traffic passing the Suez is analyzed and an estimate is made regarding the increase in the tonnage of the isthmian canal during the first decade of its use.

In the discussion of available canal tonnage the effect of tolls upon the use of the waterway by the traffic between the different sections has been considered. The detailed analysis of the relation of tolls to the volume of traffic using the canal was, however, reserved for a special chapter in which the question is treated at some length.

Printed material, books, pamphlets, and official statistical reports published by the United States and foreign countries have been examined, and an extensive correspondence has been carried on with men engaged in different lines of business so as to secure data concerning industrial and commercial facts in descriptive rather than statistical form. Special and different inquiries were addressed to manufacturers, importers, and exporters, the owners, operators, and builders of ships, and the higher officials of a number of the larger railway companies. The information received from individual sources is frequently referred to, but for obvious reasons the personal or corporate name of the correspondent is not given. The information regarding the industries and trade of foreign countries was in part supplied by special reports prepared for the commission by consuls and ministers of the United States in accordance with instructions sent them by the State Department.

In order to supplement the information obtained from the sources just enumerated, visits were made to twenty-nine large commercial and industrial cities. The places visited included the larger seaports from Portland, Me., to Galveston, Tex., and the interior industrial cities of Pittsburg, Cleveland, Cincinnati, Detroit, Indianapolis, Milwaukee, Chicago, St. Louis, Memphis, Louisville, Chattanooga, Birmingham, and Atlanta. In each of these cities the commercial organizations, manufacturers, and others interested in the development of their industries assisted by giving information. Special reports were prepared for the commission by the commercial organizations in these and other cities.

From the nature of the subject investigated, some of the conclusions regarding the industrial effects of the canal must be based on premises concerning which differences of opinion may exist. Moreover, the presentation of the industrial data and a discussion of them can not be made as brief and concise as a mathematical demonstration. These limitations apply in less degree to the statistical material used in measuring the volume of traffic available for the use of the canal. The conclusions to which this inquiry has led are here given without claiming that they are absolutely correct in every particular, but they are, at least, as close approximations to the truth as could be attained by careful and impartial research.

Much time and labor have been given to the preparation of maps locating the resources and industries of the foreign Pacific countries discussed in Chapters XI to XVI of the report. Chapter XVII, on distances, is accompanied by commercial maps showing the location and length of the ocean routes by present lines of trade and by those that would pass through a Nicaragua canal and a Panama canal.

The information used in the preparation of the maps accompanying the report was derived from numerous sources. American and foreign government publications have been consulted, and geographical literature and maps, both published and unpublished, have been examined. The United States consular reports, and particularly certain special reports prepared for the Canal Commission by the consular representatives of the United States in the various foreign countries, were a valuable aid, especially in the preparation of the maps of Australia, China, South America, and Japan. In a number of cases the text of these special reports was accompanied by maps prepared in accordance with suggestions made by the Commission. The publications of the Bureau of the American Republics have been used to some extent in preparing all of the American maps. With the exception of two countries, this is also true of Bianconi's commercial charts. The Commission has secured many facts by an extensive correspondence; and in the following specific references to the authorities for the information contained in the maps no attempt is made to give all the sources drawn upon.

The map of Chile contains much information furnished by the representatives of the Chilean Government, and among the other sources of the data used special mention should be made of the work of the United States Weather Bureau and of the book on South America by F. G. Carpenter. The chart of northwestern South America contains many data contributed by the Bolivian Government. The Geographic Society of Lima sent, in manuscript, a carefully prepared agricultural map of Peru. Some facts were taken from Carpenter's "South America" and from "Between the Andes and the Ocean," by W. E. Curtis. The reports of the Intercontinental Railroad surveys were of value in the preparation of this map and also of that of Central America.

The map of Mexico is based in part upon the economic map recently published by the Bureau of the American Republics. This information has been largely supplemented and verified by extensive correspondence with Americans engaged in business in Mexico. The following authorities, in addition to those more generally referred to above, were consulted: French and Belgian consular reports, and "Geographical Notes on Mexico," by M. Romero.

The map of New Zealand was constructed almost entirely from information derived from the yearbook and the other excellent reports published by the government of that colony.

For the Australian map the information came chiefly from the maps accompanying the special consular reports and from the detailed industrial descriptions contained in the official publications of the various States.

The map of China draws largely upon the economic maps published by Beresford in "The Breakup of China," and Chisholm's "The Resources and Means of Communication of China." The data used were, in almost every case, verified by the excellent economic map prepared for this commission at the United States legation in Peking or by reference to some of the following works on China: Reports of Imperial Maritime Customs; "A Journey in Western Szechuen," by Bishop; "China in Transformation," by Colquhoun; "China in Decay," by Krauss; "Through Yangtse Gorges," by Little; "The Earth and Its Inhabitants," by Reclus.

For the data used in the map of Japan large use was made of the facts in Ransom's "Japan in Transition," which were verified and supplemented by reference to a special United States consular report and to Japanese Government reports, public and special.

The author desires to express his appreciation of the valuable assistance of his collaborator, Mr. J. Russell Smith, in the preparation of this report and the accompanying maps. Mr. Smith was clerk to the Committee on the Value of the Canal from September, 1899, to August, 1901.

Chapter II.

THE ISTHMIAN CANAL AND THE INDUSTRIES AND TRADE OF THE SOUTHERN STATES

The products of the South find their present foreign market mainly in Europe, but they are desired in greater or less degree by nearly all countries, those of the Pacific Ocean as well as those of the Atlantic. Because of the geographical position of the South its exports can not readily reach the markets of the Pacific. The position of the South as regards Pacific trade is very similar to that of the west coast of the United States as regards its commerce with Atlantic countries.

As compared with the States adjacent to the North Atlantic, those of the Gulf are considerably nearer the eastern terminus of an isthmian canal. In the following table the distances of Greytown and Colon from New York are compared with their distances from the most important Gulf ports:

From—	To Greytown.	Less than distance from New York to Greytown.	To Colon.	Less than distance from New York to Colon.
Boston	2,220	a 160	2,165	a 184
New York	2,060		1,981	
Philadelphia	2,000	60	1,960	21
Norfolk	1,849	211	1,779	202
Savannah	1,646	414	1,586	395
Tampa	1,117	943	1,215	766
Pensacola	1,223	837	1,344	637
Mobile	1,250	810	1,371	610
New Orleans	1,257	803	1,380	601
Sabine City	1,344	716	1,465	516
Galveston	1,360	700	1,481	500

a More.

It will be seen that of the Gulf ports included in the table Tampa is nearest to Greytown and Colon and that the ports to the west of Tampa are successively farther from the two isthmian ports, Tampa being approximately 250 miles closer than Galveston is to the Caribbean termini of the two canal routes. This would give Tampa some advantage over the other Gulf ports in the canal trade were not the benefits derivable from the shorter ocean route in part, if not quite, overcome by the longer railway haul to that city, as compared with Pensacola and other Gulf ports, from many of the sources of the heaviest volumes of traffic originating in the Southern States.

The proximity to the canal of the Gulf States and cities, as compared with the North Atlantic section of the country, will help the South in developing a direct trade through the canal and in drawing a larger amount of the export and import trade of the Mississippi Valley to the Gulf ports, but the more northerly ports, especially New York, will possess the advantage of having more facilities for shipping at all times to different parts of the world. However, as the commerce of the South with Pacific countries develops, because of the opportunities afforded by the isthmian canal for dispatching freight more promptly to different ports of the world, the Southern gateways will enjoy in increasing measure the benefit of their relative nearness to the canal.

THE CANAL AND THE COTTON INDUSTRIES.

The raising of cotton has been the dominant industry of the South for nearly a hundred years, and, although the development of other resources is giving that section of the country an increasingly diversified economic life, cotton and the manufactures based upon it now hold and will probably retain the first rank. The rapid multiplication of cotton mills and the extensive manufacture of cotton-seed products have latterly strengthened very greatly the industrial position of the cotton crop.

The chief Pacific market for our raw cotton is Japan, which took 312,269 bales, valued at $12,712,619, during the year ending June 30, 1900, the gain over the previous years having been large. The sales for 1898 and 1899 averaged about 200,000 bales a year. The consumption of raw cotton in the mills of Japan has increased with extraordinary rapidity. In 1887 the Japanese imports of raw cotton were only 28,400 bales, by 1895 the amount had increased to 380,000 bales, and in 1898 the imports were 660,000 bales. In 1895, 57.3 per cent of these cotton imports into Japan were obtained in China. British India supplied 32.5 per cent, the United States 8.4 per cent, and other countries 1.8 per cent. Three years later the imports from China dropped to 11.1 per cent. Those from British India rose to 56.3 per cent, while the purchases in the United States comprised 30.8 per cent, the amount obtained from other countries remaining at 1.8 per cent It is fair to conclude from these percentages that the United States is certain to find a large and growing market for raw cotton in Japan.

The cotton cloth shipped from the United States finds it way to numerous Pacific countries. China, the largest buyer, took $8,783,134 worth in 1900, her purchases for the two previous years having averaged $7,500,000 annually. Among the other buyers of cotton manufactures are the British East Indies, which took $524,419 worth in 1900, and Australia, whose purchases amounted to $622,228. Besides this, the Hawaiian Islands took $572,541 worth. The demand of these and other Pacific countries is increasing, and our sales to them are growing, even under the present adverse conditions to be overcome in reaching their markets.

About 300,000 bales of the cotton exports to Japan for the fiscal year 1900 were shipped during the first eight months of the season. The distribution of these 300,000 bales among the three shipping routes gave the Atlantic ports, New York and Savannah, 44,000 bales; the Gulf ports, New Orleans, Galveston, and Pensacola, 87,000, and the Pacific coast ports, which were reached by rail, 169,000 bales. Nearly three-fifths of the cotton exported to Japan that year took the overland route, involving a railway haul of 2,000 miles to the seaboard.

The cost of transporting such a bulky commodity as cotton from the southern section of the United States to North Pacific countries by rail to our west coast, and thence by steamer, or from our Atlantic or Gulf seaboard through the Suez Canal (sometimes direct, and sometimes via England or Germany), are so high as greatly to restrict the trade. This fact is clearly shown in letters received from firms that are exporting cotton from Texas, New Orleans, Charleston, and elsewhere. The difficulties under which cotton is exported to oriental markets by the existing routes can be illustrated by quoting a few sentences from a communication received from a representative New Orleans firm:

> Two direct steamers went last year (in 1898) from this port to Japanese and one to Chinese ports (Shanghai) around the Cape, and more steamers went from Galveston, but these steamers are too long on the way. First of all, they have to stop in port here a long time to collect all the lots which are bound for Japan; then they travel two or three months, whereas payment is made by Japanese and Chinese buyers against ninety days draft, thereby causing loss of interest. To avoid this loss Japan bought last year (1898) a lot of cotton in Texas, the nearest State for shipment via San Francisco, but the Southern Pacific and other roads, owing to the inclement weather, etc., could not handle the big quantity, and cotton that should have gone out in January was in San Francisco by June. The rate to Yokohama and Kobe (Hiogo) is 80 cents per hundred pounds gross, to Shanghai 90 cents per hundred pounds gross; insurance 2 per cent, equal to one-eighth cent per pound. We believe China and Japan will consume over 2,000,000 American cotton (bales) a year within the next five years.[a] A good deal of cotton to China yet comes from Hamburg, Germany, and London, England. Any shorter and safer route would materially increase consumption and net more to the producer here, as big freight and high insurance stand in the way of trade.

The cotton manufacturing industry of the South, as well as the exporters of raw cotton, will be served by the canal. With 5,000,000 spindles already in operation, and the erection of new mills constantly going on, the growth in the cotton manufacturing business of the South will in the future be limited only by the extent of the market that can profitably be reached. The secretary of the New Orleans Cotton Exchange, a recognized authority on the cotton industry, makes the following statement in regard to the growth of the business of cotton manufacturing in the United States:

> The American mills, North and South, took, in the year 1890, 2,346,000 bales, and of this the census of that year tells us 2,259,000 bales were consumed. In 1899 American mills consumed 3,589,000, or 1,330,000 bales more. Our mills now turn out more goods than necessary for this country alone, and it is essential to their prosperity that export facilities be had that will enable them to compete successfully with other countries in the great markets of the world, especially those of the Far East. To the Southern States particularly, which have increased their consumption from 547,000 bales in 1890 to 1,400,000 in 1899, and give promise of still greater progress in the near future, an outlet through an isthmian canal is of the first importance.

In a special report received by the Commission from a committee of business men in Charleston, S. C., the opinion is expressed that "within a period of five years South and North Carolina will spin more cotton than they grow." The report also states that "the cloth they manufacture is almost entirely of the coarser grades, such as is used in South America and the Orient. The

[a] The supply of cotton has not been equal to the demand since 1901, and the consequent high price has restricted the export of the American product to the Orient.

average growth of the two States is 1,450,000 bales. They spun into cloth last year (1899) 970,000 bales."

Although, as the foregoing quotation states, the chief market in the Orient is for the coarser grades of cottons, there seems to be a growing demand for the finer qualities. Several manufacturers report an increasing sale of the finer qualities of cloth, and these statements would indicate that the eastern market is in the future to be one where a variety of cotton manufactures can be sold.

At present the cotton goods exported from this country to the East go out largely by way of New York and through the Suez Canal, although a portion of the trade is done by way of transcontinental railways.

THE CANAL AND THE IRON AND STEEL INDUSTRIES OF THE SOUTH.

The most notable phase of the recent industrial progress of the South has been the growth of the iron industry, whose chief center is in the district about Birmingham, in the north central part of Alabama. Two members of the Commission visited this section, and Chattanooga, where a large variety of iron and steel wares are manufactured, and were strongly impressed by the extent and range of the present activities, and by the possibility of future development.

A special report prepared for the Commission by a committee appointed by the Birmingham Commercial Club contains the following statement:

We have the three essential materials for iron making—coal, ore, and limestone within exceptional proximity, within rifle range of the furnaces; and in consequence of these geological conditions and the low cost of individual materials, iron can be produced in this district cheaper than at any other point in the known world.

The use that is being made of these resources of coal and iron is concisely stated in this report:

Less than twenty-five years ago the first coal mine was opened. In 1878 fires were lighted in its first furnace. There are now in this district about 125 coal mines, with a capacity of about 20,000 tons output per day; about 5,000 coke ovens, with a capacity of about 4,500 tons per day; two steel mills, with a capacity of about 1,160 tons per day; one wire, rod, and nail mill, with a capacity of 500 tons per day.

In addition to these there are about 200 more small manufacturing concerns, all established within the last twenty-five years.

The Southern States, including the Virginias, at the present time produce nearly one-fifth of all the iron ore mined in the United States, and the Alabama and Tennessee mines yield nearly one-seventh of the total. The pig-iron manufacture in Alabama in the year ending June 30, 1900, equaled about 1,200,000 tons.

The iron industries of the Birmingham district are devoted most largely to the manufacture of pig iron. This pig iron is in part manufactured into cast-iron pipe, wire, and nails, and the other simpler iron and steel products.

The iron of the Alabama district is mostly shipped outside of the State. During the last ten years about 20 per cent of the iron has been used in local establishments; about 5 per cent was taken by Southern States other than Alabama, 1 per cent went to the Pacific coast and to Mexico, 19 per cent was exported to foreign countries other than Mexico, and 55 per cent of the entire output was marketed north of the Ohio and Potomac rivers.

For the last three years about one-fifth of the iron produced in the Birmingham district has been exported. This export of iron began as late as 1896, and during the years 1897 and 1898 was larger than it has since been.[a] These foreign sales of iron from the southern furnaces have been facilitated by the cheap rates obtainable on iron, which makes desirable freight for a part of the cargo of steamers that load with cotton.

In the Southern States, outside of the Birmingham district, notably in Chattanooga, machinery, engines, implements, and a variety of iron and steel articles are being manufactured both for the domestic and foreign trade. Twenty-one Chattanooga firms are already shipping to or beyond the Pacific coast of the United States, and most of these are engaged in some form of iron and steel manufacture. The disadvantageous conditions under which they are conducting this trade at the present time are illustrated by a letter received from the head of one of the large establishments of that city engaged in the manufacture of steel plows. He says:

We have made several shipments to Australia and some to China this year (1900). Some of these we had to ship by rail to San Francisco and pay a freight of $1.50 per hundredweight (to San Francisco), when we could have reached New Orleans and put them on a vessel for 24 cents.

In the foregoing discussion of the iron manufactures of the South, and the effect which the opening of a canal would have upon them, the statements made are intended to be illustrative

[a] Since 1900 the high price of iron in the United States has temporarily checked the export of both crude and manufactured iron, but when prices decline the Southern States will again find the exportation of iron and steel as well as the manufactures of them highly desirable.

rather than comprehensive. Alabama and Tennessee contain the largest iron-producing and manufacturing regions in the Southern States, but Virginia and West Virginia have come to be important centers for those industries. Their industrial and commercial interests, however, are more closely associated with the North Atlantic than with the South Atlantic and the Gulf, and they have consequently not been considered in this discussion.

THE CANAL AND THE EXPORTATION OF SOUTHERN LUMBER AND FOREST PRODUCTS.

In a special study of the lumber trade of the United States made by the United States Bureau of Statistics and published in the Monthly Summary of Commerce and Finance, November, 1900, the importance and general location of the timber resources of the Southern States are described in the following concise manner:

> The timbered region of the South Atlantic and the Gulf slope is, commercially, the most important district in the United States. A circle whose center is Chicago and whose circumference begins with Norfolk, Va., and sweeps southwestward to the lower left-hand corner of Arkansas passes through the heart of the southern pine region from beginning to end. The hard-wood region of the South lies inside of the great pine belt and south of the Ohio River, embracing the mountainous section of every Southern State east of the Mississippi, together with the whole of West Virginia, Kentucky, and Tennessee. The Piedmont and mountain sections and the river valleys of the slopes of the Southern Alleghenies are the home of the best remaining hard woods east of the Mississippi, if not the best in the entire country.

The standing supply of timber in the Southern States is estimated to be about 700,000,000,000 feet B. M., about 30 per cent of the present total amount within the United States.

The exports of forest products from the United States have reached large proportions and are increasing. Our total foreign sales in the year ending June 30, 1900, of wood and manufactures of wood, not including other forest products, were $50,598,416, and were double the amount sold ten years ago. This increase has been due to several causes, prominent among which are the restrictions which European nations are placing upon the cutting of their timber. Most of the lumber shipped abroad is cut on the Pacific coast and in the Southern States. The latter furnish more than half of the lumber exported from the United States, and somewhat more than seven-tenths of the lumber sent abroad from the South goes to Europe. One-fourth of the southern exports are now marketed in the West Indies, Mexico, Central America, and eastern South America.

Although the lumber exports from the United States are large, they are estimated to be not more than 8 per cent of the total amount manufactured in the country. The lumber coasting trade of the Atlantic States is much in excess of the foreign shipments from that region, but the opposite is true of the Gulf cities. The chief lumber-shipping ports on the Gulf are Pensacola, Mobile, Pearl River, Mississippi, and New Orleans, but there are now others doing a large business, the trade being well distributed. The stave trade, one of the important branches of the lumber business, is centered at New Orleans, which handles more than half of all the staves exported from the country.

The large and rapidly growing exportation of lumber from the Southern States, not only to Mexico and the West Indies, but also to Brazil, Uruguay, and Argentina, indicates that large shipments would be made to the west coast of South and Central America if an isthmian canal were in existence. Those sections are obliged to import a large part of their lumber, and by way of a canal they will be nearer the Gulf cities of the United States than the mouth of the Rio de la Plata now is. There is a demand on the west coast of all three Americas for hard wood, and from Southern California south soft woods are needed.

The hard-wood lumber is now being shipped from the Southern States to the Atlantic South American States and to the Pacific coast of the United States. The cost of transportation by all water from Memphis through a canal to Pacific markets would be so low as to make possible the development of a more important trade. The industrial progress of the west coast of all the three Americas will greatly enlarge the demand for lumber. This larger business will be shared, both by the regions of present supply, and by other and new ones now debarred from trade because of their inaccessibility to the markets.

Naval stores—turpentine, resin, tar, etc.—constitute an important class of forest products. These commodities have always been produced in the South, because that is the home of the long-leaf pine, from which they are obtained. Besides supplying the large home demand for naval stores, the Southern States exported about $12,500,000 worth in the year ending June 30, 1900. The previous year the exports were valued at about $10,000,000, and in the year before that at about $9,000,000. The chief foreign markets are in Great Britain, Germany, and other European countries, but there is a growing demand for the commodities in all Pacific countries.

Although the United States uses a vast amount of paper its annual exports of that commodity now amount to about $6,250,000 in value, the paper being made mainly from wood pulp, which is also extensively used for pails and other utensils. The manufacture of pulp and paper are industries naturally associated with the use of the forests for lumbering purposes. To some extent pulp is a by-product of the lumber industry, because much of the material used in its manufacture would otherwise be wasted in cutting off the forests. At the present time the pulp mills are mostly located in the northeastern part of the United States, partly because the poplar and spruce timber that has thus far been used mainly in pulp manufacture exits most abundantly in that section. As far as the supply of available timber is a determining factor, the pulp manufacturing industry can be developed in the South as well as in the North. Pulp is now manufactured from hemlock as well as spruce, and such timbers as basswood, cucumber, buckeye, maple, birch, and beech are successfully used in connection with poplar. Cottonwood is well adapted to paper making and is largely used for that purpose, being nearly as good as poplar.

Australia is a very large buyer of American paper and woodenware, being the third heaviest purchaser, and ranking second among our foreign markets for printing paper, of which she takes 35 per cent of all our exports. In the Australian, South American, and other Pacific markets, our trade in paper, woodenware, and other products made from wood could be increased by facilities for cheaper shipments.

THE CANAL AND THE FERTILIZER INDUSTRIES OF THE SOUTHERN STATES.

The South already uses large amounts of fertilizers on its cotton and tobacco plantations, its grain fields, and its truck farms, and the future demands will be larger than the present. Much of the soil of the South, while it possesses excellent physical characteristics, is not strong in those chemical properties required by the various plants that are grown. Unless carefully cultivated and kept up by fertilizing, the soil is soon exhausted; but when care is taken in tilling the ground and restoring to it the chemical constituents that are taken by the varions crops, the farms are highly and continuously productive. Such being the case, the South must inevitably require a constantly increasing amount of fertilizers as the population becomes more dense and the change from extensive to intensive methods of agriculture becomes necessary.

The South has great stores of phosphate rock, the most important mineral constituent of commercial fertilizers. The supply of this mineral is the source of a large foreign trade and the basis of important fertilizer manufacturing industries. The exports of crude phosphate amounted to 776,220 tons, valued at $6,376,367, in the year ending June 30, 1900. The States in which most of the rock is mined are Florida, South Carolina, and Tennessee. The amounts obtained from each State and the amount of increase in the production is shown by the following table. One noticeable fact is the recent prominence which Tennessee has acquired in the phosphate production. The figures are from the latest published report of the United States Geological Survey:

Production of phosphate rock, 1894 and 1899, and value where mined.

State.	1894.		1899.	
	Tons.	Value.	Tons.	Value.
Florida	527,653	$1,666,813	726,420	$2,804,061
South Carolina	450,108	1,745,576	[a]357,090	1,078,099
Tennessee	19,188	67,158	430,192	1,192,916
Pennsylvania			2,000	9,000
Total	996,949	3,479,547	1,515,702	5,084,076

[a] Including 440 tons from North Carolina.

The opening of an isthmian canal will affect the fertilizer industries of the Southern States in two ways: (1) In the manufacture of commercial fertilizers nitrate of soda is used, and this at present has to come from Chile around Cape Horn or through the Straits of Magellan. (2) There would be a large market for the manufactured product in California, Hawaii, and other Pacific countries if the costs of reaching those markets were lower. Cheaper transportation will enable the manufacturers of fertilizers in South Carolina, Virginia, and probably in Tennessee to supply the growing demand of the Australian and California agriculturists. With the growth of population and the increasing value of land in those countries, present methods of agriculture are becoming unprofitable, and a change must be made. Farming is carried on in Japan in a very intensive manner, and large quantities of fertilizers are required. In the Hawaiian Islands there is already a considerable demand for the article, and portions of western South America will in time import large quantities of the commodity.

Although Florida is the State from which the largest quantity of crude phosphate rock is obtained, the region about Charleston, S. C., is where the largest amounts of commercial fertilizers are manufactured. A special report prepared for the Commission by the Cotton Exchange and Chamber of Commerce of Charleston contains the following information in regard to the phosphate industry of that vicinity and the benefit which would be conferred by the opening of a canal across the Isthmus:

Inquiries have come for the manufactured fertilizers from the Sandwich Islands, and efforts are now being made to sell the manufactured fertilizers there and in Japan. In connection with this commodity, it may be stated that Charleston manufactures more commercial fertilizers than any place in the world, the output of the factories here being 400,000 tons per annum. With cheap rates of freight that the isthmian canal would give large quantities of this fertilizer would undoubtedly move to different countries bordering on the Pacific Ocean. The only commodity moving from Charleston to any of the countries touching the Pacific Ocean is phosphate rock, to the Sandwich Islands and Japan. About 5,000 tons, approximately three steamer loads, of this commodity go from here annually to these countries. The value of this commodity here is $4 per ton; the steamer freight has averaged about $7.50 per ton to Japan. The high freight rate is a barrier to a large movement of this commodity to the islands named.

The chemical company which controls a larger fertilizer manufacturing business than any other concern in Virginia and North Carolina stated in letters received from them in May and July, 1900, that they had imported about 10,000 tons of nitrate of soda during the preceding twelve months. They also say that they could use a great deal more if the cost of the nitrate were reduced. In regard to the effect which the present rates of freight have upon their west coast business, they state as follows:

There is now a demand for goods we produce, viz, superphosphates, on the west coast of this country. Our recent efforts to secure freights on large bulk cargoes which would make such business possible from Atlantic coast ports have proved unavailing. Overland freights on our products from this coast to the Pacific coast are entirely prohibitory.

THE CANAL AND COMMERCE OF THE GULF PORTS.

Several forces are now operating to increase the future commercial importance of the Gulf ports, and in order to appreciate the probable scope of the influence of the proposed canal upon the commerce, handled through the Gulf gateways, a brief analysis of those forces is essential.

The Gulf ports have capacity for handling a large commerce. Large wharves and piers have been, and are being erected by the railway companies, which, together with other corporations, are making large investments for the purpose of increasing the trade of these ports. The Plant System at Port Tampa, the Louisville and Nashville at Pensacola, the Illinois Central and Southern Pacific at New Orleans, the Southern Pacific and the Atchison, Topeka and Santa Fe at Galveston, these and other roads are expending large sums for the development of terminal facilities. The Mobile and Ohio, the Louisville and Nashville, and other companies are developing the port of Mobile.

The Gulf ports have the commercial advantage of being nearer than the Atlantic seaboard is to the larger portion of the Central West, the upper part of the great Mississippi Valley. These cities are convenient gateways for a greater or less share of the import and export traffic of the entire Mississippi Valley. The relative distances by rail from representative Mississippi Valley points to New York and to New Orleans are shown by the following table:

From—	To New York.	To New Orleans.	Saving to New Orleans.	From—	To New York.	To New Orleans.	Saving to New Orleans.
	Miles.	*Miles.*	*Miles.*		*Miles.*	*Miles.*	*Miles.*
Chicago, Ill	912	912	0	Peoria, Ill	1,006	860	146
Duluth, Minn	1,390	1,337	53	Cairo, Ill	1,089	554	535
Minneapolis, Minn	1,332	1,297	35	Evansville, Ind	989	708	281
St. Paul, Minn	1,321	1,279	42	Louisville, Ky	867	746	121
Sioux City, Iowa	1,422	1,258	164	Nashville, Tenn	939	557	382
Omaha, Nebr	1,402	1,070	332	Denver, Colo	1,932	1,336	596
Dubuque, Iowa	1,079	968	111	Kansas City, Mo	1,335	878	457
St. Louis, Mo	1,058	695	363				

All points south and west of Lake Superior, northern Michigan, Lake Michigan, and a line drawn from Chicago through Indianapolis, Frankfort, Ky., and on to Charleston are nearer New Orleans and to several other Gulf ports than to New York. While distance is not the only factor in determining the direction in which traffic will move, it is one of the factors, and the proximity of the industrial centers of the Central States to the Gulf cities will greatly assist those ports in securing a large share of the South American and Pacific trade. The Gulf ports have the advantage of being able to bring the railway car and the steamer side by side at terminals where freight can be very economically handled, and this is a factor that will materially assist their commercial progress.

The following tables show to what extent the ports of the Atlantic and of the Gulf, respectively, have increased the tonnage of the vessels entering and clearing in foreign trade during the past ten years. The first table compares all the ports of the Atlantic with all the ports of the

Gulf. The second table compares the increase made in the tonnage of entrances and clearances by each of seven of the North Atlantic ports with the growth accomplished by each of the five leading Gulf ports:

Tonnage of vessels entered and cleared at Atlantic and Gulf ports, years ended June 30, 1890, 1895, and 1900.

Ports.	1890.	1895.	Gain in five years.	1900.	Gain in ten years.	Gain in ten years.
						Per cent.
Atlantic	22,649,610	24,186,387	1,536,777	32,777,196	10,127,586	44.72
Gulf	4,035,256	4,679,247	643,991	8,414,432	4,380,176	108.55

Tonnage of vessels entered and cleared at the seven leading North Atlantic ports and at the five leading Gulf ports, years ended June 30, 1890, 1895, and 1900.

Port.	1890.	1895.	Gain in five years.	1900.	Gain in ten years.	Gain in ten years.
North Atlantic ports:						*Per cent.*
Portland	260,796	250,312	0	716,001	455,205	174.54
Boston	2,613,335	3,115,478	502,143	4,145,187	1,531,852	58.62
New York	12,283,740	13,188,085	904,345	16,020,290	3,736,550	30.42
Philadelphia	2,530,094	2,711,434	181,340	3,736,615	1,206,521	47.69
Baltimore	1,969,501	1,608,257	0	3,452,654	1 483,153	75.31
Newport News	266,138	440,046	173,908	1,095,727	829,889	311.71
Norfolk	183,533	208,992	25,459	592,887	409,354	223.04
Total	20,107,137	21,522,604	1,415,467	29,759,361	9,652,224	48.00
Gulf ports:						
Port Tampa	9,080	174,466	165,376	208,595	199,515	2,197.30
Pensacola	815,778	703,380	(a)	1,115,382	299,604	36.73
Mobile	254,012	532,399	278,386	1,054,471	800,459	315.13
New Orleans	2,035,072	1,997,769	(a)	3,395,442	1,360,370	66.85
Galveston	343,575	767,629	424,054	1,538,300	1,194,725	347.73
Total	3,457,517	4,175,643	718,126	7,312,190	3,854,673	111.49

a Decrease.

In order to show the gains above referred to, in the grain export traffic of the Gulf cities, a table, taken from evidence prepared for the Interstate Commerce Commission in 1899, is submitted.

Percentage of the total wheat, corn, and flour exports handled at the Atlantic, Gulf, and Pacific ports, respectively, during the years 1880, 1885, 1890, 1895, and 1899.

	Wheat.	Corn.	Flour.		Wheat.	Corn.	Flour.
Atlantic ports:	*Per cent.*	*Per cent.*	*Per cent.*	Pacific ports:	*Per cent.*	*Per cent.*	*Per cent.*
1880	78.3	83.7	83.7	1880	13.9	0.1	10.8
1885	56.1	79.7	77.8	1885	37.9	0.1	14.4
1890	40.9	75.3	79.1	1890	50.5	0.1	13.1
1895	53	78.6	80	1895	38.3	0.5	10.4
1899 a	48.8	76.2	79.4	1899 a	17.3	....	11.4
Gulf ports:				Miscellaneous ports:			
1880	2.5	3.2	0.9	1880	5.3	8	4.6
1885	1.9	12.8	0.2	1885	4.1	7.4	7.6
1890	4.5	14.7	0.4	1890	4.1	9.9	7.4
1895	2.5	9.8	1.7	1895	6.2	11.1	7.9
1899 a	29.4	15.1	3.9	1899 a	4.5	8.7	5.3

a Four months, January 1 to April 30, inclusive.

The Gulf ports are making substantial commercial progress. Their trade is growing with the industrial progress of the South, and they are handling an increasing volume of business originating in the central section of the United States. This latter source of the commerce of the Gulf cities is usually spoken of as due to a diversion of traffic away from the Atlantic ports. This statement, however, does not exactly describe what has occurred. During the past score of years there has been an enormous expansion of the industrial activities of the Central West, and at the same time the railway systems leading to the Gulf have increased in number and efficiency. The result has been that both the Atlantic and Gulf lines have handled an ever-increasing volume of business. The business of the Gulf cities shows a greater percentage increase, but the absolute growth in the traffic to and from the Atlantic has been much larger than the increase in the business handled through the Gulf gateways.

Many commodities are now moved a third of the distance across the continent to the Eastern seaports of the United States for shipment to the Orient. At the present time, with the exception of some occasional full cargoes, mainly of cotton, the trade between the southern sections of the United States and the Orient is carried on either by way of the Pacific ports or through the Atlantic gateways. New York City handles by far the larger share of the oriental and west coast South American commerce of the southern and central sections of the United States. If an isthmian canal were in existence, the South American and trans-Pacific trade of the Southern States would be largely handled by the Gulf ports, and the Central States would have the advantage of a new route, which they would doubtless adopt from time to time in accordance with the conditions of competition prevailing among rail and ocean carriers.

The effect of the canal upon the traffic of the Gulf cities will consist less of diverting existing traffic to new routes than of bringing about trade not now in existence. It will lead to a larger commerce between the southern section of the United States and the west coast of South America. This trade will consist largely of the importation of nitrate of soda, for use in the manufacture of fertilizers and explosives, and of the exportation of lumber, coal, manufactures of iron, steel, wood, and cotton goods. The southern section of the United States has practically no direct trade at the present time with the west coast of South America.

The opening of the canal would lead to a direct trade between the Gulf ports and the Orient—a trade consisting of the exchange of cotton, cotton goods, lumber, and manufactures of iron and steel, for the tea, silk, mattings, curios, and other manufactures characteristic of the Orient.

An important effect of the canal upon the trade of the southern section will result from giving that region a more direct and economical connection by water with the Pacific States. The coal, steel, cotton goods, cotton-seed products, and fertilizers of the Southern States will find a growing market west of the Rocky Mountains, whence the South will secure wool, wines, fruits, and barley.

In their efforts to increase their trade, the Gulf cities now suffer because their exports are so much greater than their imports. But few goods are brought into the country by way of the Gulf cities. One effect of the opening of the canal will be to remove this handicap partially, although not entirely. The Gulf cities will be ports from which a larger portion of our imports from tropical and oriental countries will be distributed. The present one-way trade of the South, with its consequent relatively high costs for transportation, will, to a considerable extent, give way to a reciprocal and more economically transported commerce.

Chapter III.

THE CANAL AND THE INDUSTRIES AND TRADE OF THE NORTHEASTERN SECTION OF THE UNITED STATES.

The northeastern section of the United States does more manufacturing and has more foreign trade than any other part of the country; and, although the central, southern, and western divisions of the United States are rapidly expanding and diversifying their industries, there is no probability that the States and seaports of the Northeast will cease to rank first in manufacture and foreign commerce. Inasmuch as the chief commercial reason prompting the United States to construct an isthmian canal is to connect our two seaboards and to promote the foreign trade of the country, the effects of the proposed waterway upon the industrial and commercial activities of the section of the country having the densest population, the most highly diversified industries, and the largest trade with other nations constitute an inquiry meriting careful consideration.

GEOGRAPHICAL LIMITS OF THE NORTHEASTERN SECTION.

The geographical limits of the northeastern section are clearly defined on the south by the mouth of the James River and by the railway systems from the West having their termini at Norfolk and Newport News. South of those cities and the territory served by the Chesapeake and Ohio and the Norfolk and Western railways the industrial and commercial affiliations are mainly with the South Atlantic and Gulf States. The western margin of the northeastern section of the United States can not be so easily and distinctly marked, because the industries of the East shade off into those of the Central West by close gradations. The latitude being the same, the two regions are not much differentiated by diversities of climate, and their common stores of coal and iron give them the basis for several identical industries. The industrial and commercial similarities of the East and Central West, however, have very marked limitations. East of Pittsburg the economic activities are dominantly manufacturing and commercial, while westward from that city agriculture grows increasingly important, and before the State of Ohio is passed it becomes characteristic of most parts of the region.

The region about Pittsburg—that is, the western part of Pennsylvania and eastern Ohio—lies on the borderland between the Northeast and the Central West, with both of which it has close business relations. The iron ore used in this region comes mainly from the west; its coal supply is local. Its markets are both east and west, although the larger volume of trade is with the American States and foreign countries adjacent to the Atlantic. Its business connections are such as to prevent its being with strict propriety included with either the Central West or the East; but, if placed with either, it will best be grouped with the northeastern section, which, for the purpose of this discussion, will be held to include eastern Ohio, West Virginia, and that part of the United States east of that region and north of the mouth of the James River.

INDUSTRIAL CHARACTERISTICS.

The northeastern section of the United States has become much like western Europe industrially and commercially. It has a large foreign trade in manufactured products, made in part from materials obtained domestically and to some extent from raw and partially manufactured materials imported from other countries. The southern, central, and far western sections of the United States are drawn upon alike by Europe and the eastern part of the United States for the raw materials of industry; indeed, those sections of our country contain the granaries, mines, and forests that supply a large share of the needs of the manufacturing nations grouped about the North Atlantic.

Both Europe and the northeastern section of the United States are obliged to secure a part of their supply of the crude materials required by their manufactures from the tropical and south-temperate latitudes of the Atlantic, Pacific, and Indian oceans. The nitrate of soda from Chile, the lumber and grain from the Pacific slope of the United States, the Australian wool, meats, and hides; the teas, silks, and mattings from the Orient; the sugar and spices, rice, jute, hemp, vegetable oils, and gums from the British and Dutch East Indies and Oceania are examples of the large class of imports derived by the North Atlantic nations from the lands of the Pacific and Indian oceans. These raw materials and oriental wares are for the most part paid for by European and American manufactures, which are finding a large and growing market in the countries of the western part of the American continent and in the islands and continental countries of the South Pacific and Far East.

The Suez Canal has given Europe convenient access to the raw materials and markets of the Indies and the Orient, but her ships are still obliged to make the long detour around Cape Horn in order to reach the western ports of the Americas. The eastern half of the United States is less favorably situated than Europe is for trading with Pacific countries. The distances to Australasia, Malaysia, China, and Japan are shorter from Europe than from our Atlantic coast. For the trade with the west coast of South and North America, also, the advantages are with Europe, partly because sailing vessels, which have been used extensively in this commerce, can make the trip from Europe more quickly than from the United States, and also because of the cheaper freight rates from Europe to Pacific America than from the eastern United States to that section, the lower freight charges being secured by the European shippers on account of the large tonnage of vessels sailing from Europe in ballast or partly loaded.

In studying the relation of the canal to the southern and western sections of the United States, the most typical industrial resources and activities have been separately considered and the changes that the proposed waterway will produce are pointed out in Chapters II and V, and that plan of investigation could readily be followed for the Southern and Western States, because of the relatively small number of large industries typical of each of the sections. In the Northeastern States, however, where manufacturing has reached a high degree of development, the number of large industries is much greater than in the South and West, and, in order to avoid making the discussion prolix, it is necessary to group the varied economic activities in a small number of large classes.

Most of the economic activities of the Northeastern States are directly or indirectly associated with four groups of industries, a study of which with reference to the effects of the isthmian canal will present the more important, though by no means all, of the relations of the waterway to the future industrial and commercial progress of that section of the United States. These four groups are (1) the mining, transportation, and exportation of coal; (2) the manufacture of iron and steel and of the machines and tools made of steel; (3) the shipbuilding and maritime interests; (4) the various classes of textile manufactures. If, in addition to considering these four groups of industries, an analysis be made of the effects which an isthmian canal would have upon (5) the commerce or the import and export business of the North Atlantic seaports, the chief relations of the proposed waterway to the economic interests of the Northeastern States can be presented. In this chapter only the textile industries and the commerce of the North Atlantic cities will be discussed. The effect of an isthmian canal upon the coal-mining industry of the country, and the relation of our coal trade to the commercial use of that waterway, are subjects of such importance that a special chapter, No. VI, has been given to their discussion. The relation of the canal to the iron and steel industries of the United States is discussed in Chapter VII. The effects which the isthmian canal will have upon American shipbuilding and maritime interests are considered in Chapters VIII and IX, Chapter VIII dealing with the subject directly and exclusively and Chapter IX indirectly, in connection with an analysis of the factors affecting the use of the canal route by sailing vessels.

THE CANAL AND THE TEXTILE INDUSTRIES OF THE NORTHEASTERN STATES.

The importance which the textile industries of the United States are assuming is shown by comparing the number of machines used in the industries in 1900 with those employed in 1890. The following table is taken from the July, 1900, issue of the Textile World:

Comparison of textile machinery in 1900 with 1890.

	1900.	1890.	Per cent of increase.
Cotton spindles	21,057,983	14,188,103	48.4
Cotton looms	490,398	324,866	50.9
Woolen sets of cards	7,806	7,245	7.9
Worsted combs	1,510	855	76.6
Woolen and worsted looms	80,759	67,817	19.0
Knitting machines	75,721	36,462	107.6
Silk spinning and twisting spindles	1,426,245	718,360	98.5
Silk looms	48,246	20,822	131.7

The silk industry in the United States is confined almost entirely to the New England and Middle Atlantic States, only two Southern States having yet established the industry, and much the same statement may be made regarding the woolen industries, although the mills are somewhat more widely distributed. There are now in the United States nearly half as many cotton spindles as there are in the United Kingdom, the country that is far ahead of all others in the textile industries, and the number of our mills is rapidly increasing. The cotton manufacturing industry is increasing in both the northeastern section of the country and in the Southern States, the growth being more rapid in the latter region. In 1900, according to the Textile World, the Southern States were operating 5,845,429 spindles and the northern mills 15,242,554. Ten years earlier the South possessed only 1,828,972 and the Northern States had 12,722,341. During the decade the number of spindles in the South increased 4,016,457, or 219.6 per cent. The gain in the number of spindles in the Northern States was 2,520,213, or 19.8 per cent. Massachusetts is far ahead of all other States in the number of spindles, it having 8,012,331 in the year 1900. Rhode Island ranked second, with 2,090,138; South Carolina came third, with 1,794,657; North Carolina fourth, with 1,499,540, and then came New Hampshire, Georgia, and Kentucky.

We are now supplying ourselves with nearly all of the various grades of cotton used in this country, with the exception of certain foreign-made articles of a higher grade, the demand for which is kept up by custom, and have developed a foreign trade which has amounted to about $24,000,000 annually for the past two years. Our silk and woolen mills are still unable to meet the home demand, and we are obliged to import large quantities both of manufactured goods and raw materials. We have no silk exports, and the sales of woolen goods amount to only $1,250,000 a year. Three-fourths of the raw silk comes from Pacific countries, and we are obliged to purchase wool in China, Oceania, the west coast of South America, and the west coast of Mexico and the United States.

The exports of cotton manufacture from the United States are sent mainly to the countries of the Pacific Ocean. China takes about half of our exported cotton cloth, and the sales to Australia, the Hawaiian Islands, other parts of Oceania, and numerous Pacific countries are slowly increasing. One significant fact concerning our foreign trade in cotton goods is the small market which we now have in South America. The cotton goods purchased by those countries now amounts to between $70,000,000 and $80,000,000 a year. Barely 6 per cent of those goods come from the United States. It seems probable that the United States will be able in the future to supply a large share of the demand of these countries for cotton goods. The opening of the canal will give our mills ready access to the west coast of the continent, and make much more favorable the conditions of competition for the trade of the western third of South America, a region from which we are practically debarred.

In the manufacture of the higher grades of woolen goods it is necessary to import considerable quantities of Australian wool. At the present time most, although not all, of this wool comes to North Atlantic ports of the United States by way of London, which is the great wool market of the world. The advantage of importing wool from London is that the American buyer is able to select his purchases from a large and varied stock. The disadvantage is that the American exporter has to pay freight charges for a route that is somewhat roundabout as compared with the future route via an isthmian canal, and has to bear the expenses incurred in handling, storing, and selling the wool in London. With the growth of our wool manufacturing industries we shall be obliged to import increasing quantities of Australian, South American, Chinese, and South African wools, and it is reasonable to expect that New York or Boston will become the wool market of this country. Should this change take place, it will be brought about largely by the effect which the canal will have upon ocean routes.

The textile industries of the United States have developed later and more slowly than many other manufacturing activities, because they have their natural home in thickly populated countries, where an abundant supply of skilled and inexpensive labor is available. The populous States of our country now possess the requisites of textile manufacture, and the cotton, woolen, carpet, silk, and weaving industries generally are expanding rapidly. Foreign markets will in the future be needed for the products of our spindles and looms, as well as for the output of our furnaces, foundries, and other manufacturing establishments.

THE CANAL AND THE COMMERCE OF THE NORTH ATLANTIC PORTS.

Our European commerce at present includes a part of both the import and export trade of the United States with Pacific countries. The outbound rates from Great Britain, Germany, and Belgium being very low, because the heavier volume of their commerce is inbound, and the facilities for shipping directly from the eastern part of the United States to the west shore of the American continents and to other sections of the Pacific being limited, our trade with those regions is frequently sent to Europe and the goods there transshipped. This roundabout route is still used, although the reduction in the rates on our transcontinental railways, the establishment of the American-Hawaiian Steamship Company's line between New York and San Francisco, the increased facilities and connections for handling freight via the Panama Railroad, and the placing of more vessels on the route between New York and Australia have made the American exporters and importers less dependent than they formerly were on securing transportation by way of some European ports of transshipment.

After the American canal route has become available it is probable that little, if any, of our South American and Pacific foreign commerce will be handled by way of Europe. Possibly some shipments to the east coast of South America, south of Cape St. Roque, will be sent to Europe and taken thence by the lightly laden outbound vessels. This will depend upon the rapidity with which we develop our facilities, during the next ten or fifteen years, for shipping directly from the United States to that region. Probably none of the trade between our eastern seaboards and the west coast of North, Central, and South America will take the indirect route after the Isthmus can be traversed by ocean vessels.

The reciprocal nature of the trade that will be carried on through the canal, between the eastern half of the United States and the western part of South America, is discussed in Chapter XI. That chapter, and the others dealing with the relation of the proposed canal to the trade and industries of the countries of the Pacific, should be read both with reference to our own trade and with regard to the effect which the canal will have on the foreign countries discussed.

The trade of the United States with Japan and continental Asia, the Indies, and Oceania is now carried in part through the Pacific ports of the United States and British Columbia by means of the railways and steamship lines having termini there; but the larger share of the business is shipped by way of the Atlantic seaboard. Several firms run steamers via the Suez Canal between New York and eastern ports, and three regular lines of steamers and sailing vessels connect New York with Australia by way of the Good Hope route. There is also a large amount of traffic between our eastern seaboard and oriental countries in tramp steamers chartered for limited periods. The steamers going out from New York to the Indies, China, or Japan pass through the Suez Canal and usually return by the same route. Chartered steamers going out from New York to an oriental port frequently cross the Pacific to Chile to obtain nitrate cargoes for Europe. Steamers returning to our eastern seaboard from Australia more frequently come via Suez and call at Europe, while the sailing vessels cross the Pacific Ocean to secure a west-coast cargo for New York or some other Atlantic port. There is an important round-the-world movement of vessels at the present time, the extent of which will probably be increased by the American canal.

After the isthmian canal is completed, the shipments between our Atlantic or Gulf ports and Japan, the Philippine Islands, Australia, and the continent of Asia north of Hongkong will usually make use of the American canal route, although some ships will doubtless go and come by the Suez route, for the purpose of doing business at intermediate ports. A large part of the world's commerce will be done by tramp steamers whose charters will take them in whatever direction and along whatever route the movement of tonnage is strongest. The outbound traffic of the United States to most sections is heavier than the inbound; the opposite is true of European commerce. The tramp steamer will, whenever possible, move with, rather than counter to, the flow of traffic.

One certain effect of the isthmian canal upon the Atlantic ports of the United States will be to cause the major portion of their commerce, to and from places east of Singapore, to use the American canal instead of the present easterly routes. Between Singapore and Shanghai, and in the region of the Philippines and the Dutch East Indies, there will be a region whose trade with our Atlantic and Gulf seaboard will be divided between the American and Suez Canal routes. It is believed, however, for reasons stated in Chapters XIX and XX, that the conditions of competition will be more favorable for the American than for the Suez route.

Our exports to Australia and New Zealand will consist mainly of general manufactures, and to some extent of heavy iron and steel products. The major portion of the general manufactures will be sent out from the North Atlantic ports; the iron and steel products will probably be shipped very largely from the Southern States. Most of the wool, hides, gums, etc., imported from Australia and New Zealand will enter by the North Atlantic cities, which are the most convenient gateways to the section of the country where manufacturing is most fully developed.

After the canal has come into use probably but a small part of the trade carried on between the Southern States and Pacific markets will be handled through North Atlantic ports; soon after the opening of the isthmian waterway, facilities for importing and exporting directly through Southern ports may be expected to develop.

The general effect of the canal upon the commerce handled by the North Atlantic ports will be to enlarge its volume and variety. The Pacific countries, both American and transoceanic, will be markets for increasing amounts of American manufactures and the source of growing quantities of the raw materials required by the industries in the northeastern part of the United

States. The subsequent chapters dealing with the industries and trade of foreign Pacific countries indicate in detail the character of the commerce that will be promoted by the construction of the canal. The establishment of a new highway for a large share of the world's commerce will necessarily change the present routes of some trade. It will cause the ports of our North Atlantic seaboard to cease to handle some of the traffic now passing their gateways, and will likewise bring to them some commerce now tributary to other cities. The chief effect of the canal upon the commerce of the ports of the Northeastern States will come from the industrial changes that will follow upon the opening of the interoceanic waterway. The commerce of that section must progress pari passu with its industrial advance, and the manufacturing development of the Northeastern States during the coming decades promises to be large and many-sided.

Reports prepared with especial care were received by the Commission from the commercial organizations in Boston and Philadelphia. A brief statement of some of the facts presented in those reports will indicate some of the relations which will exist between the isthmian canal and the trade of the North Atlantic ports.

Appended to the report from Philadelphia, which was prepared under the joint auspices of the Board of Trade and the Maritime Exchange, were two tabular statements, one of which gave the quantity and value of the principal items of commerce between Philadelphia and Pacific markets. The other table compared the distances for sailing vessels and full-power steamers by way of existing routes to the Pacific markets with the distances by way of a Panama canal route and by way of a waterway across Nicaragua. Concerning the saving in freight rates that an isthmian canal would accomplish for the commerce of Philadelphia the report states:

> The canal would provide a shorter water route than any now followed between Philadelphia and certain important ports of the Pacific, notably those of the west coast of North and South America and the Hawaiian Islands; * * * it would appear that its existence should constitute a factor of significance in regulating freight rates, at least with those ports.

The report does not attempt to state in precise terms the saving in freight rates that would be accomplished by the canal, because of the complexity of the factors entering into the fixing of rates, and because of the difficulty of predicting what readjustments may take place in ocean transportation as the result of the opening of a new highway for such a large part of the world's commerce, but it illustrates the saving which the new route would effect in cost of ocean transportation by presenting an estimate based upon the daily costs of operating a modern freight steamer of 6,000 tons cargo capacity. The calculation led to the conclusion that a saving of about 75 cents per cargo ton would be accomplished by using the canal route instead of existing water routes between Philadelphia and San Francisco, Vancouver, or Acapulco. In this calculation a toll of $1 per net register vessel ton was assumed. The report closed with the following statements regarding the relation of the canal to Philadelphia:

> The prospect of the inevitable increase of our country's transoceanic commerce in the near future enhances the importance of an isthmian canal as contributing to the facilities of ocean transportation, but we would, however, point out that whether the canal exists or not, supply and demand must, in the last resolution, determine the volume of our port's trade.
>
> The canal project, while opening a new route, would in reality open up no markets that are not already accessible, but it would seem that the canal would be a favorable factor by shortening the routes to some important points, and thus assist our merchants to enter into more effective competition with nations of Europe which are now enabled to underbid us in the Far East, by reason of the more economical and expeditious transportation which their merchants enjoy by way of the Suez Canal route.

In the statement that the volume of Philadelphia's trade must, in the last analysis, be determined by supply and demand, the underlying thought evidently is that the opening of a new ocean route must be considered as only one of the factors determining the volume of any community's foreign trade. Supply and demand, however, it must be remembered, is but a general statement of the manner in which production and consumption are kept in equilibrium. There is no absolute law or principle explaining the final adjustment of production and consumption embodied in the general term "supply and demand." The intensity of demand and the volume of supply are both subject to modification by any factor capable of altering costs or prices, or both. The effect of the isthmian canal will be to lower the cost of producing many things at Philadelphia and elsewhere, and to reduce the prices at which those products can be sold to the consumers in Pacific markets. Stated concretely, the manifold manufacturing industries of Philadelphia will be able, after the canal is in existence, to produce more cheaply and will be able to put their commodities on Pacific markets at lower freight costs. The persons who buy these articles in those markets will be able to secure commodities more cheaply, and the amount they consume will correspondingly expand.

The city of Boston has developed a large commerce with Europe, but has a comparatively small direct maritime trade with Pacific countries. A small share of its Pacific business, import and export, is carried by the transcontinental railways, but a much larger part is handled through

New York or via Liverpool. The report of the special committee of the Boston Chamber of Commerce states:

> We have from Boston practically no water-borne commerce with the west coast of Central and South America, the west coast of the United States and Canada, Japan and China, Australia and Oceania. * * * While we send to the Orient a considerable quantity of our manufactured wares, and receive from Asia and Australasia a large quantity of merchandise there produced, the trade is not systematized. Transportation is carried through a variety of channels, but only a small portion of it comes to or goes from Boston directly.

Boston's tea imports, according to the report, come by three routes—by way of the transcontinental railroads, or through New York, or via London. The Australian wool comes chiefly by sailing vessels direct from Melbourne, but a part is received by way of the London market. The chinaware from Japan and China "comes chiefly across the Pacific and by rail via Vancouver and San Francisco."

The readier access to the raw materials and markets of the Pacific countries afforded by the isthmian canal will promote the manufacturing and commercial progress of New England and of the territory tributary to Boston. This will give Boston a larger trade and increase the incentives for the operation of tramp and line vessels between Boston and Pacific ports of the United States and foreign countries. A large increase in American shipping during the coming fifteen years seems to be indicated by the trend of our economic development; and this, together with the larger trade tributary to Boston, will naturally tend to cause Boston to depend less upon other ports. What is true of Boston in this regard will obtain with other Atlantic cities; and the general effect of the canal upon the commerce of the North Atlantic cities will be to increase its total volume and promote its distribution among the several ports.

The manner in which the isthmian canal will affect the industries and commerce of the northeastern section of the United States is illustrated, in a concrete way, by a letter received from a firm located in New York, engaged in the manufacture of pumping engines and hydraulic machinery for the home and foreign trade. The firm has a large trade with several important Pacific countries.

> We have a large trade on the western coast of the United States, and this would undoubtedly be increased if we had a short water route, so that we might ship machinery at a reasonable freight rate. This is probably of more importance in the case of first-class freight, as the risk of railroad transportation to intricate machinery is greater than water transportation, and therefore the freight rates are unusually high, as we are obliged to pay from $1.25 to $4 per 100 pounds. You can readily see the advantage of a canal to the fruit and other agricultural industries in California if they are able to purchase machinery for irrigation at a lower price than they are now obliged to pay for it.
>
> Our business in the Sandwich Islands has been very large in the past few years—at the rate of over one-half million dollars per year. This could undoubtedly be increased, and at the same time the sugar and other industries there fostered if we were not handicapped by the long railroad haul across the country.
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> Our business in Japan and China has not been large, owing to the fact that we are obliged to ship by all-water route in order to keep the prices down to meet European competition. Such a large proportion of our machinery is sold on contract where time is so much an object that we are badly handicapped, and that which is sent out for stock requires the tying up of considerable capital and loss of interest, owing to the long time the material is on the water in transit.
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> Our trade on the western coast of South America is growing, but very slowly. We believe that a canal would be of great benefit to the western coast of South America in building up their industries, by enabling people to purchase machinery, etc., to so much better advantage, and that this country would receive the benefit of this, as a good line of steamers, from here direct down to the western coast, would undoubtedly tend to throw most of the business to this market.

As the manufacturing activities of the northeastern section of the United States multiply, the volume of imported raw materials brought in by way of an isthmian canal will increase, and the stream of manufactured articles flowing out through the canal to the market of our west coast and of foreign Pacific countries will grow steadily larger with every lowering of the costs of production and transportation. The proposed waterway will readjust the routes of shipment and open avenues for a larger and more varied commerce.

Chapter IV.

THE CANAL AND THE CENTRAL WEST.

The term Central West is generally applied to the five States north of the Ohio River and the seven trans-Mississippi States of Minnesota, Iowa, Missouri, Kansas, Nebraska, and the two Dakotas. These twelve States have a combined area of 753,550 square miles, and in 1900 had a total population of 26,335,243—that is to say, they comprise one-fourth of the area and nearly one-third of the population of the United States, exclusive of Alaska and our insular possessions.

The eastern, southern, and western sections of the United States are situated adjacent to or comparatively near the seaboard, and the imports and exports received or dispatched by them through an isthmian canal will need to be hauled a relatively short distance by rail. The Central West, on the contrary, is situated from 500 to 1,500 miles from the ocean, and the trade which it may have by way of a canal will, on an average, be moved nearly 1,000 miles by railroad. Will the canal affect the industries and Pacific trade of this interior section of the United States?

INDUSTRIAL RESOURCES OF THE CENTRAL WEST.

Taking this region as a whole, its most important industrial resources are those connected with agriculture. The States in the western part of this section of our country are entirely agricultural, but Ohio and Indiana are extensively engaged in manufacturing, and Michigan, Wisconsin, and Illinois have numerous cities in which large manufacturing activities are carried on. In most of these States there are abundant supplies of the raw materials of industry. Ohio and Illinois have large fields of coal in which 30,000,000 tons of bituminous coal are annually mined; and Indiana, Iowa, Missouri, and Kansas have deposits from which 10,000,000 tons are taken yearly. The natural-gas wells of Ohio and Indiana are a valuable source of fuel for parts of those States. In the northern section of the Central West there are large forests of excellent white pine, while in the central and southern portions of the region a good quantity of hard-wood timber is available. Throughout all these States foods are cheap, and in the more thickly populated sections there is a large supply of intelligent labor.

In northern Michigan, Wisconsin, and Minnesota over seven-tenths of all the iron ore mined in the United States is obtained, the rich deposits of those States being made available by the cheap transportation on the Great Lakes to the coal fields of Pennsylvania, Ohio, and Illinois. The low costs of pig iron and steel in Ohio, Indiana, Illinois, and other States of the Central West unite with the abundant stores of cheap fuel and good lumber to establish a sure foundation for diversified manufacturing activities. This foundation is being rapidly built upon, and several of the States of this part of our country are manufacturing on a large scale both for the extensive and expanding home markets and for our trade with foreign countries in all parts of the earth.

Ohio is the leading State of the Central western group in the variety and amount of its manufactures. Cleveland and Cincinnati, the largest cities of the State, are typical industrial centers, and in order to illustrate the relation of the proposed isthmian canal to the State of Ohio, as a whole, a special discussion is given below to the industries and foreign trade of those cities, and the manner in which they will be affected by the new water route to and from the Pacific. Indianapolis is the metropolis and most important industrial center of Indiana, and the same is true of Chicago as regards Illinois, and St. Louis with reference to Missouri.

By studying the relation of the canal to these cities and a few others of minor rank, as is done in the following pages, it is believed that the effects of the interoceanic waterway upon the Central West generally can be adequately portrayed.

In the tier of four States situated farthest west, in the section being considered in this chapter, the export business consists almost entirely of grain and provisions, but from all the other eight Commonwealths there are sent out to foreign markets, in addition to those articles, large quantities of agricultural machinery, wooden ware, vehicles, tools and implements of all kinds, stoves, engines, and other iron and steel products in great variety, boots and shoes, and many other articles enumerated in detail in the reports received from commercial organizations, the volume and variety of the export trade increasing from west to east, from the Missouri River to the State of Ohio.

There is also an important volume of imports from Pacific foreign countries and the west coast of the United States required in the Central West. These imports consist in part of wool, nitrate of soda, canned fruits, vegetables and salmon, Japanese and Chinese goods in large variety, and hemp, jute, gums, and waxes. Those from foreign Pacific countries come in part by way of our Pacific ports, but most largely through New York.

PRESENT ROUTES OF SHIPMENT FROM CENTRAL WEST.

The exports from the Central West to foreign Pacific countries are now sent by various routes, most of which can be indicated by referring to the shipments from Chicago, the largest and most centrally located city of the region. The manufactures of that city, particularly mining and other heavy machinery, are sent to many parts of the world. Heavy freight destined for Mexico is frequently sent directly by rail, but shipments are often made via New York, and sometimes by way of San Francisco. Assignments for the east coast of Central America may go either by New Orleans or New York. Most of those for the west coast of Central America and all those for western South America go via New York and thence either by the Isthmus of Panama or around South America. Until four years ago most shipments of machinery from Chicago to Australasia, Malaysia, and the Orient are reported to have been sent to some European port and there transshipped, but latterly vessels direct from New York have handled the business. The shipments to Hawaii go via San Francisco or some other Pacific port, as also do those that must reach trans-Pacific countries with a minimum of delay, but when time permits heavy freight is sent through New York. Further information regarding the routes by which commodities from the Central West are shipped to Pacific markets is given below, where a communication received from the chamber of commerce of Cleveland is referred to.

THE CANAL AND THE INDUSTRIES OF CLEVELAND.

The State of Ohio is situated in that indeterminate border land lying between the northeastern section of the United States, where manufacturing and commerce are the dominant activities, and the Central West, where agriculture still heads the list of industries. The State consequently now ranks well up in the list of manufacturing Commonwealths, and its future development must inevitably increase the magnitude and variety of its industries. Something concerning the effects which the isthmian canal will have on the economic progress of Ohio may be found in the subsequent chapters devoted to "The canal and the iron and steel industries." By referring with some detail in this connection to the interest of Cleveland and Cincinnati in the canal, the relation of the new water route to the foreign trade, not only of those cities, but also of Ohio and much of the eastern part of the Central West, will be indicated.

Cleveland, which is now the metropolis of Ohio, has become, by virtue of its location on Lake Erie, and at a point where the coal from Pennsylvania and Ohio and the iron ore from Lake Superior can be readily and economically brought together, a great center for the manufacture of iron and steel products and the home of a large variety of activities. It has the advantages of cheap fuel and low transportation cost to domestic markets.

The Chamber of Commerce of Cleveland was requested to address a circular letter to the merchants and manufacturers of the city, asking them to state what commodities they were sending or receiving from various Pacific countries, by what routes these shipments to and from Cleveland were made, and to indicate how they would be affected by the proposed canal. Letters were sent by the chamber of commerce to 153 establishments and replies were received from 58, of which 38 manifested a direct interest in the canal and 9 others favored the opening of the waterway because it would inevitably benefit their business. Thirty of the 38 having a direct interest in the opening of the canal were manufacturers and 8 were importers and wholesalers. Of the 30 manufacturers who replied that they were shipping to Pacific countries, 6 thought their business was such that the canal would not be of much help to them, and 1 person thought the canal would give his rivals in New England a greater advantage than they now possess.

The foregoing analysis of the replies indicates, first of all, the well-known fact that the manufacturers of Cleveland—and the same is true of the Central West and most of the United States at the present time—are producing mainly for the home market. It is also evident, from the letters, that several Cleveland firms doing a foreign business have not yet developed a trade with Pacific countries. Some report that they are debarred from this trade by the present cost of transportation. A few Cleveland firms, whose goods reach Pacific markets, are unable to report the amount of trade in those markets, because their goods are sold to New York or London exporters. Other firms having no foreign Pacific trade report that they are doing business in our west coast States, and they especially complain of the present high costs of transportation by rail.

The variety of commodities shipped from Cleveland to the various countries of the Pacific Ocean is surprisingly large. In the report submitted by the Cleveland Chamber of Commerce the articles sent to each section of the Pacific are enumerated, the routes by which the commodities are shipped are stated, and the principal imports into Cleveland from these several sections are named. This part of the report is so informative that it merits quotation, although the multitude of details in the statement deprives it of the usual fascination of literature.

1. Commodities shipped from Cleveland to the following parts of the world during 1899:

A. West coast of Central and South America: Carbons, iron roofing, iron houses, wire, barb wire, wire nails, galvanized smooth wire, annealed wire, wire fencing, telegraph wires, oil stoves, gas stoves, twist drills, machinists' tools, tackle blocks, sewing machines, ironwork.

B. West coast of the United States and Canada: Sugar machinery, carbons, iron roofing, iron houses, iron magazines, pneumatic cranes, machine tools, bolts and nuts, steel springs, barb wire, wire nails, galvanized smooth wire, annealed wire, wire fencing, telegraph wires, malleable iron castings, oil stoves, gas stoves, cloaks and suits, manufactured wool stock, oil and grease, paint and varnish, wire brushes and brooms, foundry supplies, bristle brushes and brooms, twist drills and machinists' tools, steel plate and castings, hot-air registers, imported and domestic whiskies, brandies, gins, imported cordials, wines, tackle blocks, forgings, turn-buckles and railroad iron, sewing machines, ironwork.

C. Japan and China: Nail machinery, carbons, pneumatic cranes, jacks and pulleys, machines, barb wire, wire nails, galvanized smooth wire, annealed wire, wire fencing, telegraph wires, oil stoves, gas stoves, twist drills and machinists' tools, automatic or self-filling buckets, rolling-mill machinery, sewing machines, ironwork.

D. Australia and Oceania: Nail machinery, carbons, bolts and nuts, barb wire, wire nails, galvanized smooth wire, annealed wire, wire fencing, telegraph wires, malleable iron castings, oil stoves, gas stoves, wire brushes, twist drills, machinists' tools, tackle blocks, sewing machines.

E. The Indian Ocean: Barb wire, wire nails, galvanized smooth wire, annealed wire, wire fencing, telegraph wires, oil stoves, gas stoves, sewing machines, ironwork.

2. Routes over which these commodities were shipped to each of the destinations named:

A. West coast of Central and South America: Via New York, through New York exporters; via Cape Horn; via Isthmus of Panama (railroad).

B. West coast of the United States and Canada: Southern Pacific Railway via San Francisco; over various railways and lakes; via Isthmus of Panama (railroad).

C. Japan and China: Via New York; via Pacific coast; Suez Canal; from Cleveland to San Francisco by rail, to Vladivostok via Nagasaki, Japan.

D. Australia and Oceania: New York exporters; via steamers from New York and around Cape of Good Hope; by rail to San Francisco, thence by steamer.

E. The Indian Ocean: Via New York, Suez Canal.

3. Commodities received from the countries and sections named:

A. West coast of central and South America: Wool, nitrate of soda.

B. West coast of the United States and Canada: Canned goods, dried fruits, wine, brandy, beans, raisins, canned fruits, salmon, nuts, wool.

C. Japan and China: Straw mattings, mattings and rugs, tea, notions, rattan cane, china reeds, split bamboos.

D. Australia and Oceania: Wool.

E. The Indian Ocean: Burlaps and jute bags.

The results of the inquiry concerning Cleveland's trade in Pacific countries may be summarized by saying that this great manufacturing center has begun to trade with practically all sections of the Pacific, and that some firms are now doing a business of considerable importance. The chamber of commerce and numerous individuals conferred with believe that Cleveland's interests will be largely promoted by an increase in the city's trade with Pacific countries. The present Pacific trade of the city is widely distributed and comprises a wide range of commodities.

CINCINNATI AND THE CANAL.

The industries of Cincinnati differ largely from those of Cleveland, but are quite as typical of the manufacturing activities of Ohio, because they are even more diversified. The articles produced include a large number of commodities created by the application of skilled labor to the cruder manufactures of steel, lumber, and leather. Besides being able to secure those materials advantageously, Cincinnati has the advantage of possessing in its population a homogeneous body of skilled labor well trained in a variety of arts. The Ohio River has assured the city cheap transportation for much of the crude and raw material required, and has aided in the economical distribution of its manufactures; and although the railroads now carry the greater volume of freight, a part of their business is now subject to a water competition.

From information obtained from the chamber of commerce, it appears that the industries which would derive most benefit from the canal are those engaged in the manufacture of machinery in large variety, vehicles, electric-railway equipment, saddlery and harness, pianos, office appliances, pork products, liquors, shoes, and furniture made from native and tropical woods.

There is at present a trade of some importance between Cincinnati and foreign Pacific countries; but the business with the west coast of the United States is of greater consequence. This Pacific coast trade is now much restricted by the cost of rail transportation. Cincinnati manufacturers, moreover, find difficulty in competing in all Pacific markets with domestic and foreign producers so situated that shipments can be made by water. The home market east of the Rocky Mountains can be reached cheaply from Cincinnati, but in order to give her ready access to the Pacific trade, the cheaper transportation is reported to be necessary.

THE CANAL AND INDIANA.

The inquiries sent out by the Indianapolis Board of Trade to the manufacturers in Indianapolis and other parts of Indiana, concerning their business in the Pacific markets of the United States and foreign countries and the effects of the canal, were replied to by 150 firms. An analysis of the letters received shows that 63 of the 150 firms making answer are now doing business either on the west coast of the United States or in foreign Pacific countries; 87 of the 150 firms have as yet developed no trade in those markets; 77 of the respondents say that the canal would either directly or indirectly assist them in the development of the Pacific trade; 73 of the firms make no suggestion as to the effects of the canal. It is probable that these 150 firms may be taken as fairly representative of the large manufacturing concerns of Indiana, and, if so, somewhat more than two-fifths of the Indiana manufactories now have trade in American and foreign Pacific markets. Somewhat over half of these representative Indiana firms foresee that the canal would be of direct or indirect assistance to them.

When one considers the present costs of reaching trans-Pacific markets from such a section as that of the State of Indiana, the significance of the foregoing showing, in regard to the present Pacific trade of Indiana firms, becomes manifest. A manufacturer in Indiana stated in a letter to the Commission that a shipment to Australia in 1899 was sent by way of New York at a total freight cost of $105. The freight on the same shipment would have been about $150 to San Francisco or Portland. The firm stated that it could usually reach Australia more cheaply than our Pacific coast.

THE CANAL AND ILLINOIS AND WISCONSIN.

The National Business League, whose offices are in Chicago, forwarded to the Commission 45 replies to the circular letter of inquiry sent to the members of the league. Twenty-one of these letters were from Chicago firms, 10 from concerns in other cities of Illinois, 8 were from Wisconsin, and 6 from other States; 34 of the respondents reported a Pacific trade, and 11 no present business in that section of the world; 35 believed that the canal would assist them, 7 said they would receive no aid, 2 gave no opinion, and 1 believed the waterway would be an injury to his business.

In the city of Chicago a great variety of manufacturing industries is carried on, and shipments are made to all the countries of the Pacific. Railway materials and mining and agricultural machinery, however, are especially important, mining machinery being sent to all parts of the world, wherever mining operations are carried on. The foreign trade of one Chicago firm engaged in the manufacture of mining machinery amounts to 15,000 tons annually. The agricultural machinery manufactured in and about Chicago is now shipped to the west coast of South America, to eastern Siberia, and to various parts of Australasia. The Australasian trade of one firm in 1899 amounted to 11,000 tons. The shipments of this firm and presumably of others of that part of the country are made by way of New York, except on rare occasions, when, for the purpose of economizing time, the goods are routed by way of San Francisco or Vancouver. The rates from New York are usually much lower than those by way of the Pacific coast. The time taken to get goods from Chicago to Australia varies from sixty-five to eighty-five days, ten days of that time being required for getting the goods to New York City. The average time from Chicago to the Pacific coast is eighteen days, and steamers from our Pacific coast to Australasia take from twenty-two to twenty-eight days for the passage. The canal will shorten the distance by water from our Atlantic seaboard to Australasia by approximately 4,000 nautical miles and the distance to South America more than twice that number of miles.

The southern and central parts of Wisconsin are developing important manufacturing industries and a Pacific trade, although the cost of reaching Pacific markets is a heavy burden. A carriage company, for instance, situated near Racine, Wis., reports that it has for some time past exported vehicles to the western coast of South America, Australia, and the Orient, the shipments in the majority of cases being made via Atlantic seaports, "on account of the high cost of transportation by the transcontinental lines from here to the Pacific coast." The firm states that on business to Pacific coast points "we have to pay on a car of goods valued at $1,500 $320 for transportation." An Oshkosh, Wis., firm engaged in the manufacture of sash, doors, and blinds ships some of its products to jobbers in England who export the commodities to various Pacific markets. A Milwaukee company which manufactures engines, pumping, mining, and other heavy machinery, and has branch offices in many parts of the United States and in several foreign countries, reports a large trade with the Pacific coast of the United States and foreign Pacific countries. This firm states that "the rates from the European ports we generally find to be somewhat lower than from various United States ports, and this feature makes European competition more difficult to overcome."

There is a direct Pacific export business from all of the States of the Middle West except those forming the second tier of States west of the Mississippi River. In these four States—the two Dakotas, Nebraska, and Kansas—agricultural and food products comprise nearly all the commodities sent beyond their borders. Should the canal create larger home and foreign markets for those products it would work to the indirect, if not direct, benefit of these strictly agricultural commonwealths.

THE CANAL AND ST. LOUIS.

It remains only to speak of the State of Missouri. Most of the activities of the people of this large State are devoted to agriculture. Its hard-wood forests, however, yield an export product of much importance. The city of St. Louis is a prominent manufacturing center, and is one of the largest jobbing and distributing cities of the United States. Situated almost at the center of the United States, on the largest river of our country, and being the center of railway systems radiating in all directions, it has peculiar advantages both for manufacturing and for distributing articles required by the people living in that great stretch of country west of the Mississippi and south of the Missouri River. Our rapidly growing trade with Mexico is also largely controlled by St. Louis.

The circular letter of inquiry sent out by the Merchants' Exchange of St. Louis was generally responded to, and the exchange forwarded to the Commission 65 letters. Of these 65 firms making reply 32 stated that they were carrying on a trade in the western part of the United States or in foreign Pacific countries, and 33 answered that they have no present business in those sections; 48 of the 65 firms expressed the opinion that the canal would assist them either in developing their present business or in securing a trade that they were not able to engage in under present transportation conditions. Six companies reported that the canal would not be of any assistance to their business. Ten gave no opinion as to the effect of the canal, and 1 person expressed the belief that the canal would enable the New York exporters to injure his business. The most characteristic business of the city is its jobbing trade, which is now somewhat facilitated by the cheap river transportation. The St. Louis jobbers of heavy commodities will in the future have the advantage of economical water transportation, not only to and from the Gulf ports, but also between their city and all points reached by the canal route.

THE EFFECT OF THE CANAL UPON THE TRANSPORTATION FACILITIES OF THE CENTRAL WEST.

The large and varied industrial development which the Central West has enjoyed, in spite of its situation near the center of a great continent, has been due to its excellent transportation facilities. Throughout the past fifty years the Great Lakes have given the Central West the opportunity to trade with the eastern part of the United States under peculiarly favorable conditions. The commerce on the Great Lakes is growing with marvelous rapidity, and at the present time these lakes afford the cheapest inland transportation to be found in any part of the world. The Ohio, the Mississippi, and other rivers of the Central West have in the past been important auxiliaries to the commercial development of that section, and at the present time the Ohio River is of much assistance to southern Ohio and the other regions adjacent to the stream. With the decreasing costs of railway transportation, the importance of river navigation has grown less; but Ohio, Indiana, Missouri, Iowa, Minnesota, and Wisconsin will in the future derive no small benefit from the opportunities which they will possess of shipping their commodities by river to Gulf ports. The opening of the isthmian canal will unquestionably emphasize the commercial importance of the Gulf cities, and will strengthen the reasons for improving the great river systems of the Central West.

The existence of the canal, the larger commerce at Gulf ports, the more favorable conditions for river navigation, and the continued growth in mileage and efficiency of the railway systems leading from the Central West to the Gulf, will tend to strengthen the power of the Gulf seaports to share with the cities, situated on the Atlantic, the traffic from and to the Middle West. While it is not probable, for reasons that are elaborated in a subsequent chapter, that so large a share of the traffic of the Central West will be handled by the Gulf routes as by those connecting with the Atlantic, nearly all parts of the Central West will have the advantage of being able to choose between the Gulf and Atlantic routes, and this power of choice will insure to them that competition in transportation which always quickens industrial activity. The transportation facilities of the Central West will be made better by the canal, and the increased traffic to which the canal will give rise will lead to the extension and improvement of the agencies for rail and inland water transportation. Whatever affects the transportation facilities of the Central West touches its economic life at the very center.

Chapter V.

THE CANAL AND THE PACIFIC COAST STATES.

With the exception of that part of the United States comprised within the great Cordilleran Plateau or Rocky Mountain section of the United States, the Pacific coast States have been and still are the portion of our country most burdened by transportation costs, because the most highly developed manufacturing sections of the United States and of the world are adjacent to the North Atlantic and its tributary waters. The economies that have been effected in the cost of transportation by rail have so reduced freight charges as to make possible the movement of considerable quantities of valuable commodities across the great mountain divide, and to a limited extent bulky freight, such as cedar shingles and finishing lumber toward the East, and raw cotton and heavy machinery and flour toward the West, will now bear the cost of transportation by rail. The amount of rail freight, however, now being carried between the Pacific and the States east of the Cordilleras, as is shown in another part of this report, is comparatively small, so small, indeed, that it is well within the facts to say that the Pacific section of our country is able to market its products by rail east of the Rocky Mountains only to a limited extent. The railroads have not yet satisfactorily connected the Pacific coast States with their largest and most natural markets.

Although the Pacific coast States of our country are developing an oriental trade of very satisfactory proportions, and there is every reason to believe that this commerce will grow in the future, nevertheless the trans-Pacific trade of our west coast will probably be small in comparison with the commerce of that section with the markets adjacent to the North Atlantic. The western part of the United States is now, and will be for a long time to come, devoted very largely to the production of food products. lumber, and the basic materials of industry. The natural markets for products of this kind are in the eastern part of our country and in Europe.

THE CANAL AND CALIFORNIA.

It would be impossible, even if it were desirable, to consider every industry of California and discuss the manner in which it would be affected by the canal. This survey being intended to be suggestive rather than exhaustive, the purpose of the discussion can be accomplished better by considering only the grain, lumber, and horticultural and mining interests of the State. These are the industries that wil. make the largest use of the canal, and the industrial effects which that waterway will accomplish will be fully illustrated by a consideration of these characteristic economic activities of the State.

The two cereals that California produces for export are wheat and barley, both of which are now produced in large quantity. The average annual wheat crop of California for the past fifteen years has been about 30,000,000 bushels. The annual barley crop of the State during recent years has been about 20,000,000 bushels.

It is a noticeable fact that the wheat crop of California has not increased since 1893; indeed the recent annual productions have been less than they were in former years. The reasons for this are to be found partly in the low prices of wheat that have prevailed much of the time during the past decade, and in the fact that the transportation charges from the Pacific coast to the principal grain markets are relatively higher than from most of the other wheat-growing regions of the world. While the wheat production has declined, the amount of California wheat consumed at home and in the neighboring States has increased with the growth of population, and the consequence has been lighter foreign shipments than were formerly made. Twenty years ago wheat raising was the most attractive industry of the State, but since then the crops of the State have become diversified, the great wheat farms are being divided up, and single-crop agriculture on an extensive scale has to some extent given way to more intensive cultivation of smaller farms devoted to the production of several crops.

The wheat crop of California is, however, a large and valuable one at the present time, and will probably continue to be. It is quite possible that better methods of culture, the use of fertilizers, and the ability to reach Atlantic markets more cheaply will largely increase the future wheat production of the State.

California barley is of excellent quality and is being exported in increasing quantity to England, where it is in demand for brewing purposes. The barley of California can meet the competition of other regions of production more easily than the wheat can, and cheaper transportation charges would enable the State to increase largely the sales of this cereal in foreign countries and the brewing centers in the central and eastern parts of the United States.

Corn and oats are not grown to much extent in California, barley being used instead of them for feeding stock. Corn and oats will not be exported from California after the canal has been opened, but a small quantity of them may be imported from the eastern half of the United States.

California has both an import and export trade in lumber. The exports by sea are comparatively light, being only 23,041,058 feet in 1899, and are sent mainly to Europe, Australia, Mexico, and Central America, less than one-third of the shipments being to Europe and the eastern United States. Although the annual output of the California sawmills is about 600,000,000 feet, the State is a large buyer of lumber for use at home and for sale in the mountain States east of her. About 200,000,000 feet of lumber—two-thirds of Washington's maritime shipments—are sent annually from Puget Sound to California.

The Sierras of California are well wooded with pines, spruce, and cedar, and the redwood forests extend along the coast from Oregon south half the length of the State. The redwood lumber is much in demand in Atlantic countries, and in the future will probably be exported more largely than at present. The costs of shipping lumber by the sailing vessels which now carry the traffic have averaged about 65s. ($15.85) per ton from the Pacific coast to Europe during the past ten years. During the past two years, 1899–1900, the charges have been even higher, on account of the scarcity of ships. By way of an isthmian canal the rates for large cargoes would not need to be more than half the average charges of the past to the eastern United States and to European ports.

In the production of fruits, nuts, and wine, California has reached a position of eminence, and the extensive horticultural interests of this and the other Pacific coast States are rapidly increasing in value with the betterment of the facilities for quick transportation in refrigerator cars to the Eastern markets. Formerly nearly all the excellent fruit of the West was dried or canned before shipment, but now a large part of it is marketed as green fruit. The following figures will indicate the increasing magnitude of the business of selling our west coast fruit in the central and eastern parts of the United States and in Europe. In 1895, 4,568 cars of green deciduous fruit were shipped from California to the Eastern cities, and in 1899, 9,694 carloads were sent. Efforts are being made to ship the Western green fruits to Europe, 42 carloads having been shipped from California in 1896, 58 in 1897, 42 in 1898, and 123 in 1899. The citrus-fruit shipments average 15,000 cars a year from California to our Eastern markets. Western dried and canned fruits find a ready and increasing market in Europe. There were 8,692 carloads of dried fruit shipped out of California in 1899, about 20 per cent of which went to Europe. The growth in the sales of California canned fruit in Europe has been especially rapid. In 1894 there were 85,817 cases sent to England, whereas in 1899 over half a million cases were shipped.

The production of nuts, raisins, and olives has reached large proportions. California raised 14,000,000 pounds of almonds in 1899—one-third the total large consumption in the United States. The California raisin crop is from 70,000,000 to 100,000,000 pounds a year, the shipments out of the State being 3,600 carloads in 1899. California olive oil is now being sold in many parts of the United States.

The foregoing figures refer particularly to California, but the development they indicate is typical of all the Pacific States. California preceded Oregon and Washington in the development of her horticultural industries, but these two States have latterly, with the increase in their population and the formation of better railway connections with the East, been making the valley of the Columbia River and its tributaries a section of large production and exportation of fruit. Although fruit is a commodity with a relatively high value for its bulk, it is also an article the consumption of which is most readily stimulated by a reduction in price. The production of fruits and other horticultural products is capable of being largely increased in California and the other Pacific coast States. If cheaper transportation can be secured for horticultural products from the Pacific coast to the Eastern United States and Europe, the production and consumption of fruits will expand. The figures of present shipments indicate that fair progress is being made in reaching our Eastern markets, but what has thus far been accomplished is reported to be but a good beginning.

The shipment of fruit long distances will always be made to a large extent by rail. There is, however, no doubt about the ability of the isthmian canal route to reduce the costs of shipping canned and dried fruits from the Pacific coast to our Eastern States and Europe. It is perhaps uncertain whether green fruits will be largely shipped by the canal route instead of by rail. Most varieties of green fruit, however, can be successfully shipped by water, provided proper arrangements for refrigeration are made, and provided the market permits of regular cargo or large berth shipments. Whether the water route will be used for the shipment of green fruits or not will depend upon the size of the market and the arrangements for prompt distribution among retail buyers. If the market is large enough and well organized, shipments will probably be made in vessels especially equipped for the service.

The production and shipment of California wine is such an important industry that it calls for special discussion in considering the industrial effects which the isthmian canal will produce. In 1897 no less than 34,000,000 gallons of wine were manufactured in California, the production having doubled in a decade. Since 1897 the amount made has fallen off, because of the ravages of the phylloxera, but the decline will probably be only temporary. Varieties of resistant stocks are being planted that are not subject to the attack of the insect, and there is every reason to suppose that the amount of wine produced in the future will more than equal the figures of the past.

Wine is mainly shipped in casks, and is a kind of freight adapted equally well to shipment by rail or by vessel, and at the present time shippers are making use of both means of transportation. In 1899 California shipped by sea to the Eastern States, most of it being consigned to the port of New York, 13,373 tons of wine. To Europe 570 tons were sent direct. Doubtless a part of that consignment to New York was exported to Europe. Shipments to Europe and the eastern part of the United States are partly direct by way of the Panama Railroad and in part around South America. Some of the 585 tons sent to Mexico crossed the Isthmus. During this same year the shipments of wine by rail from the State were 64,520 tons, the amounts sent by rail being between four and five times the total cargoes sent by water to Atlantic ports. In addition to the wine, there were shipped by rail 3,599 tons of brandy and 1,475 tons of "wine and brandy not segregated." The brandy shipments by water amounted to 346 tons. Under the present conditions of expensive transportation a fair beginning has been made in the exportation of California wine to Atlantic countries, but it is certain that the wine production of the State can be largely increased with the more favorable conditions of competition that would result from lowering the expenses of reaching markets.

Among the other industries of California are those of fishing, mining, and grazing. These industries being common to all the Pacific coast States, they will be considered later in connection with the discussion of the relation of the canal to the industries of Oregon and Washington.

THE CANAL AND THE LUMBER AND GRAIN INDUSTRIES OF OREGON AND WASHINGTON.

The manufacture of lumber, the raising of grain, and the catching and packing of fish are industries of prime importance in both Oregon and Washington. The growth of fruit, particularly in Oregon, and the mining of coal in Washington are industries of secondary but increasing rank. The commerce of this section of the United States centers at Portland and in the cities on Puget Sound.

The supply of timber in Oregon and Washington is so abundant and of such excellent quality that the amount of lumber marketed is fixed entirely by the costs of transportation to the distant markets of the Orient, and particularly of the north Atlantic. It is estimated by the United States Geological Survey that the forests of Washington now contain about 115,000,000,000 feet of merchantable lumber. In the four northwestern counties of Oregon there are said to be 1,800,000 acres of standing timber, containing between fifty and sixty billion feet of lumber. These estimates may not be accurate, but they serve to show the magnitude of the forest resources from which Washington and Oregon will draw traffic for an isthmian canal.

Exports of lumber from the Pacific coast of the United States and British Columbia are now made to the countries of the Pacific, and a limited amount takes the long voyage around the Horn. In 1899 our three Pacific coast States shipped 13,354,000 feet to Europe, 5,149,000 feet to Argentina, and 15,944,000 feet to South Africa.

Although western Europe and the eastern coast of the United States would be the largest markets for Pacific coast lumber if the costs of transportation were not so heavy, the present difficulty of shipping lumber from the Pacific to the Atlantic is such that California usually sends to Europe, where the demand for redwood would be large if the price were lower, but one-fourth to one one-third of her foreign exports of lumber. There were 422,211,000 feet of lumber shipped by sea from Washington in 1899. California usually takes 60 per cent of the whole amount and Hawaii one-sixth. After these countries comes Australia, then South Africa, Asia, Africa, Europe, and the east coast of the United States. The shipments to Europe and our east coast are chiefly spars for ships, while South Africa buys bridge material and other choice lumber. The opening of an isthmian canal would reduce by about 50 per cent the freight costs of marketing our west-coast lumber in Atlantic countries, and this reduction in freight expenses would add a corresponding amount to the value of all that part of the Pacific coast lumber for which there is a demand in these countries.

All three of our Pacific coast States are heavy exporters of wheat. The total amount produced in the three States in 1899 was 77,404,000 bushels, about one-seventh of the total production of the United States for that year. The exports to Europe were 17,396,712 bushels of wheat and 378,763 barrels of flour. Counting 5½ bushels of wheat for 1 barrel of flour, the total exports equaled 19,479,908 bushels of wheat. To South Africa 1,508,100 bushels were sent, making the total shipments to the Atlantic nearly 21,000,000 bushels, or about 562,000 gross tons. In addition to this, 638,094 bushels, or about 17,100 gross tons, of barley were shipped from California and Oregon to Europe.

The wheat exports from our west coast during the fiscal year ending June 30, 1899, were unusually light on account of the shortage in the crop. During the previous fiscal year the total exports of wheat from the three Pacific States to Europe, including flour expressed in bushels of wheat, were 34,869,921 bushels. The exports of wheat and flour to South Africa and Brazil equaled 5,344,145 bushels. Thus in 1898 the total exports of wheat from our Pacific coast to the Atlantic were 40,214,066 bushels, or 1,077,207 gross tons. The barley exports of 1898 were 5,628,747 bushels from San Francisco and 250,792 bushels from San Diego, a total of 5,879,539 bushels, or 125,918 gross tons. The total gross tonnage of these wheat and barley shipments to the Atlantic during the year ending June 30, 1898, were 1,203,125 gross tons, more than double the tonnage of the succeeding year. The 580,000 gross tons exported in 1899 could have been carried in 65 steamers of 4,000 tons net register. To have carried the 1,203,125 gross cargo tons of grain shipped around the Horn in 1898 would have required 135 steamers of 4,000 tons net, and that vessel tonnage, 540,000 tons net register, more nearly represents the average annual requirements of the Pacific coast grain shippers than does the tonnage of 1899.

At the present time this grain goes around the Horn in sailing vessels averaging about 1,800 tons register. After the isthmain canal has been opened the ship used will doubtless be a steamer of not less than double, and probably three or four times, the size of the sailing vessels now employed. The freight rates now vary from $5.50 to over $10 per long ton—from 15 to 26 cents a bushel—depending upon the available supply of ships. A steamer of large dimensions could doubtless carry the grain by way of a canal from our west coast to Europe for 10 cents a bushel—$3.73 a gross cargo ton—and pay from that freight receipt $1 per register ton—less than 50 cents per cargo ton—for canal tolls.

THE WEST-COAST FISHERIES.

The fisheries of the Pacific coast constitute an important industry that gives rise to the exportation of a large volume of valuable freight. The salmon pack of Alaska, British Columbia, and our west coast in 1899 amounted to 3,138,040 cases, each containing 48 1-pound cans. Three-fifths of this was packed in Alaska and British Columbia, and two-fifths in Washington and Oregon. A package of 48 pounds of salmon weighs 70 pounds, and 3,138,040 cases would occupy 80,000 measurement tons of 40 cubic feet each. It would require about twenty fully loaded vessels of 2,000 net register tons each to carry the freight.

The shipments of salmon to the Eastern part of the United States and to Europe are heavy, both from British Columbia and from San Francisco. From San Francisco the shipments by sea in 1899 to our Eastern States were 261,683 cases, valued at $1,157,608. The total ocean shipments from our Pacific ports (mainly from San Francisco) to foreign countries east of the Horn in 1899 were 21,014,989 pounds, or 437,801 cases, which would amount to 11,608 measurement tons of 40 cubic feet. At the present time these salmon exports by sea are shipped in English sailing vessels around the Horn, and the business is handled mostly by English houses.

In addition to the ocean shipments of salmon, there are fresh salmon, halibut, and other kinds of fish shipped east by rail. The American consul at Vancouver reports that one company "takes in the open sea to the north of Vancouver from a million to a million and a half pounds of halibut each year. The halibut steamers bring the fish to Vancouver, where they are packed in ice and shipped to Boston."

THE HOPS, WOOL, AND MINERAL INDUSTRIES OF THE PACIFIC COAST.

The three States under consideration produce three-fourths of all the hops grown in the United States, and a large share of the Western hops is shipped to our own and European consumers. The production of hops in the Western States can be much increased whenever the market conditions warrant a larger output. At the present time but a small share of the hops is shipped east to our own or foreign countries by water, and our west coast is compelled to compete with European growers and under the limitations imposed by expensive transportation.

The Pacific coast States and the neighboring commonwealths of the Cordilleran Plateau supply the woolen mills of the Eastern States with a large part of the fiber they require. Only a part of the wool would be shipped through the canal, but the freight on the large part of that shipped by rail from points west of the one hundred and fifth meridian would be affected by the isthmian waterway.

The principal mining industry of the Pacific States at the present time is that of gold. Some copper is mined and a variety of other minerals in small quantities. The effect of a canal upon them could hardly be important. Mining machinery would be obtained somewhat cheaper, and the canal, by promoting immigration and more rapid settlement in the West, might provide the mining companies with a large and a cheaper supply of labor.

EFFECT OF THE CANAL UPON THE TRADE OF WEST-COAST PORTS.

The general effect of the canal upon the people of the Pacific coast will be that of enabling them to buy cheaper and sell dearer and to carry on a larger trade with the people of their own and foreign countries. The manner in which the seaports of the west coast will share in this larger trade constitutes an inquiry of local and general interest. San Francisco is the centrally located port and has a harbor of great natural excellence. Formerly that city controlled nearly all our Pacific coast trade, and in the fiscal year 1899–1900 about 67 per cent of the foreign commerce of the Pacific ports was handled through San Francisco. The trade of San Francisco, however, has averaged but little more during the past five years than it averaged during the preceding quinquennial period. The value of the imports of the five years ending in June, 1900, shows a gain of 24 per cent over the total for the preceding five years, while the exports show a decline of 11 per cent. The other important ports of the Pacific coast, with one exception, have had an increase in both imports and exports, and in the case of the Puget Sonnd section the growth of foreign trade has been especially rapid.

The resources of the country about Puget Sound have been much developed during the past decade, and the transcontinental railways reaching the Sound have both increased the facilities for land transportation and have placed in service trans-Pacific steamship lines by means of which they are able to make through shipments between interior points in the United States and the Orient. There is one line from San Francisco to the Orient operated in connection with a railway company—the Pacific Mail Steamship Company; but from Puget Sound there are three steamship lines operated by the transcontinental railway companies. The consequence has been an increase in the foreign trade of the United States customs district of Puget Sound from $6,206,456 in 1890–91 to $25,051,670 in 1899–1900. During the past five years the total exports from the Puget Sound customs district were 146 per cent greater than the exports for the preceding period of equal length. The total imports show a gain of about 500 per cent.

In the case of Portland, or the customs district of Willamette, the growth has been less rapid, a comparison of the totals of the two quinquennial periods showing a gain of 60 per cent in exports and 38.6 per cent in imports. In the foreign trade of San Diego the exports of the last five years are nearly treble those of the preceding, but the imports have fallen off 17 per cent.

The foregoing figures indicate that with the exception of Puget Sound, where there has been very rapid increase, and Portland, where the growth has been moderately large, the maritime foreign trade of our west coast has not developed greatly during the past decade. The opening of the isthmian canal may be expected to increase the ocean commerce of the Pacific coast section as a whole and enable the southern seaports to make a better showing, as compared with the northern, than they have been making in the past decade.

San Diego, Los Angeles, and also San Francisco will not only have a better route to the Atlantic than they now possess, but will have the advantage of being convenient ports of call for vessels engaged in the coasting trade between our two seaboards and, to some extent, for the vessels plying between Atlantic and Oriental ports through the canal. The short-distance or great-circle route between the American isthmus and Japan and China runs close to the coast of the United States, and, with the exception of those vessels that desire to call at the Hawaiian Islands, this route will be the one naturally taken by vessel to and from the Orient. This great-circle route will also have the advantage of enabling steamers to coal on the west coast of the United States, or at Vancouver, where satisfactory steaming coal can be secured comparatively cheaply. Vessels bound for the East will be obliged to run against opposing winds and currents, but this disadvantage will probably be more than offset by the shortness of the route and by the coaling facilities.

How will the canal affect the maritime commerce of ports as far north as Portland and Puget Sound? If the industrial analysis made in the preceding pages is accurate there will be a large increase in the exportation of agricultural and forest products. These northern ports will also be the natural gateways for a large share of the export trade of Idaho, Montana, and Wyoming, and for a portion of the commerce of British Columbia. It would seem certain that the canal will enlarge the export business of the northern Pacific ports.

The canal doubtless will secure some import business that would otherwise be turned over to the transcontinental railways at Puget Sound points and at other more southerly Pacific ports, but a study of the through business now being done by the transcontinental railroads shows it to be of small amount, so small that the canal would not have to create a large tonnage of new traffic for the railways to cover what it could divert from the roads. A discussion of the transcontinental railway traffic may be found in Chapter X of this report.

There are two forces that will favor Puget Sound as a gateway for imports from Japan and the Continent of Asia. Vessels on their eastward voyage across the northern Pacific along the great-circle route for the southern Pacific ports of the United States, or for the American isthmus, will add only about 500 to 600 nautical miles to their voyage by calling at Puget Sound. Under those conditions it would seem that Puget Sound points would naturally become important centers for the distribution of Japanese and Asiatic goods. But in addition to being near to the ocean highway, along which a large quantity of imports will travel, the Puget Sound ports will be able to supply steamers with coal. The coal obtainable in these ports will be required by the vessels engaged in the commerce of the north Pacific, and this fuel supply will give to Washington and British Columbia the possession of a magnet that will attract commerce with great force. That region is now deriving from its coal much assistance in the development of its commerce; the opening of a canal will inaugurate commercial conditions on the Pacific that will enhance rather than lessen the efficiency of Puget Sound coal as an agency for the promotion of commerce.

In this discussion of the relation of an isthmian canal to the industries and commerce of the Pacific coast States, only the larger industries of the section have been considered. The business activities here dealt with are concerned mainly with the production of food and the raw materials of manufacture. The fisheries and horticultural business of our Western States require a considerable amount of auxiliary manufacturing for local purposes; but, with the exception of lumber and flour and a small amount of leather, the Pacific coast manufactures but little for export. This will be characteristic of the section for some time to come, although the use of the Puget Sound coal, and the petroleum oil of southern California, and the application, by means of electricity, of the abundant water power of California to industrial purposes will make possible a greater diversification of industry than has yet been accomplished.

The most general statement that can be made of the effect which an isthmian canal will have on the Pacific coast is that the waterway will enable that section to meet more easily and successfully the growing competition of those countries whose similar productions make them commercial rivals of our Western States. Argentina is a large and growing exporter of grain, wool, and hides; but it possesses all the requisites of successful horticulture, and just as our Western States have done, so will Argentina become a large producer of fruits and wine, both for domestic and foreign markets. Much the same development may safely be predicted of South Africa and Chile. Without an isthmian canal our west coast will have increasing difficulty in meeting the competition of these rival sections.

Chapter VI.

THE COAL SUPPLY FOR THE COMMERCE AND COUNTRIES OF THE PACIFIC—THE CANAL AND THE COAL TRADE OF THE UNITED STATES.

Abundant and cheap coal and iron are resources fundamental to highly diversified industries and an extensive domestic and foreign commerce, and their importance increases rather than diminishes with the development of the economic organization of society. Whatever affects these resources and the activities directly connected with them strengthens or weakens the foundation upon which the industrial and commercial superstructure of society is based. Coal has become the almost universal fuel force of manufacturing and commerce; and except in that limited field where electricity generated by water power can be utilized it is the motive power of business activity. It more than any other factor determines where most industries shall be located, and the price of coal is, at the present time, not only determining which sections within each country shall succeed most largely, but it is also deciding which of the industrially resourceful and well-equipped nations of the world is to achieve the highest measure of economic success.

If the abundant supply of coal in the eastern half of our country is available for export at a moderate cost, it will tend to increase the use of the isthmian canal by the merchant marine of our own and foreign countries, to facilitate the development of the commerce of the Pacific, and to enhance the industrial changes that may be wrought by the waterway on the west coast of South America and North America as far north as southern California. With the exception of the coal beds of the section of country adjacent to Puget Sound in Washington and British Columbia, there are as yet no large and valuable coal supplies on the entire west coast of the Americas available for the vessels engaged in the commerce of the Pacific or for the fuel which future industrial development will require. There are coal deposits in northern Mexico, northern Peru, and southern Chile, and there are petroleum fields in Peru. These several sources of fuel may possibly become valuable for the commerce and industry of the Pacific coast generally, but what has thus far been accomplished in connection with these fields would hardly warrant one in expecting them to become of much more than local importance. Probably during the early years of the use of the canal, and possibly for many years, the west coast of America from California south, and the coaling stations of the Pacific generally, will draw their supply from other than Mexican and South American sources.

The routes followed by steamers is determined, when a choice is possible, almost as much by coal costs as by distances. The larger share of the world's ocean commerce originates or ends in the countries about the North Atlantic, and a large share of the North Atlantic trade with the nations of the Pacific will have the choice of the Suez and American canal routes. For a part of this Atlantic-Pacific trade the Suez route will be shorter, and for another portion the American route will have an advantage in distance. The route chosen will, to some extent, depend upon the relative cost of coal at the stations along the respective routes. This is equivalent to saying that, in the competition of the two canals for the traffic free to choose between the two waterways, the route will be more successful that can furnish vessels with the cheaper coal, unless a disparity in toll charges and the chances for securing and delivering cargo at intermediate ports should be sufficient to offset the advantage of cheaper fuel.

An abundant supply of good coal, obtainable at moderate prices in the coaling stations of the Pacific, in addition to the commercial and industrial benefits conferred, will be of advantage to our Navy, because of the necessity of our maintaining a number of naval vessels on that ocean. The efficiency of a naval squadron is even more dependent than that of a merchant fleet upon an adequate and sure supply of good coal, and whatever will increase and cheapen the coal supply of the Pacific will enable the United States to protect its commercial and colonial interests with fewer risks and less expenditure.

SOURCES FROM WHICH THE COAL CONSUMED ON THE PACIFIC IS NOW OBTAINED.

The Pacific States of the United States are not only unable to export much coal, but are, with the exception of the State of Washington, obliged to import large quantities. The fuel required by the steamers on the Pacific Ocean and for industrial purposes by the countries in and adjacent to the Pacific Ocean is practically all supplied by other countries than our own. In 1899 we sent a small amount of coal for the first time, 34,000 tons, to the British East Indies, and less than 2,000 tons to the Dutch East Indies. This, however, was due to unusual conditions, and does not indicate the probable beginning of coal exports to the East Indies. For several years we have sent a little coal to the Hawaiian Islands, probably as ballast, and in 1898 our shipments to the Hawaiian and Philippine Islands reached 16,580 tons, and in 1899, 80,209 tons. Nearly all of this tonnage, however, can probably be accounted for by the military operations which we carried on in the East after the spring of 1898.

Washington, our only Pacific State having a surplus of coal, produced 2,000,000 tons in 1899, the output having doubled since 1893. The larger part of this coal is consumed locally, some of it is used by the steamers calling at Puget Sound ports, and California imports about 400,000 tons annually.

The State of Oregon has coal mines of minor importance, but which may possibly be so developed as to enable that State to supply a part of its own fuel needs. In 1898 the output of the Oregon mines was but 52,000 tons, and the statistics for the last ten years do not reveal any tendency toward the increased output. However, there are said to be veins in Oregon which are expected to yield considerable quantities of low-grade bituminous coal in the future.

British Columbia has well-developed coal mines on Vancouver Island, and veins that are probably extensive are being opened up on the mainland. The total coal production of Canada in 1898 was 4,172,655 tons; ten years earlier it was 2,658,000 tons. The greater part of the present output is obtained in British Columbia, although Nova Scotia, Quebec, and Ontario all produce limited quantities.

Regarding the coal mines of Vancouver, the United States consul at Victoria reports that the total output of the island in 1898 was 1,117,915 tons, and for 1899, 1,666,251. The shipments to foreign countries in 1898 were 765,961 tons, and in 1899, 769,091 tons. San Francisco and the southern ports of California, the Hawaiian Islands, and the steamships engaged in the trade between America and China and Australia are consumers of this British Columbia fuel. The imports of British Columbian coal into California in 1899 amounted to 652,926 tons, which figures represent an increase of 50 per cent during the last ten years, although the amount of British Columbian coal imported into the United States at the present time is considerably less than it would be had not the coal from the State of Washington become available for the California trade. The constantly increasing use of petroleum and electricity in California has probably made the demand for coal in that State less than it would otherwise have been.

At the present time neither the State of Washington nor British Columbia is furnishing any considerable amount of coal to the coaling stations of the Pacific nor sending very much coal to Pacific countries generally. It would seem, nevertheless, that the supply of coal in this section of the United States and Canada was large enough to make possible the development of an important coal export business. Although a large part of the coal thus far discovered and worked is either lignite or low-grade bituminous, and but little, if any, bituminous coal equal to the best bituminous of the eastern part of the United States has yet been found, the best coal of Vancouver and the State of Washington is satisfactory for steaming purposes and is now employed for both industrial and commercial uses. There is no genuine anthracite coal mined in this district.

For many years Japan has been developing her coal mines, with the result that the total production rose from 1,402,000 tons in 1886 to 5,080,000 tons in 1896. During this decade the domestic consumption rose from 726,000 tons to 2,936,000 tons. Thus, while the consumption grew rapidly, it had not increased so fast as the total production, and Japan was able to increase her exports during the decade from 776,000 tons to 2,144,000 tons. Since 1896 the coal exports from Japan have increased largely. The tonnage figures for the recent production and exportation are not available; but the value of the coal exported rose from 11,545,801 yen ($5,772,900) in 1897 to 15,168,799 yen ($7,584,400) in 1898. Japan supplies a large quantity of coal to steamers engaged in the oriental trade, and also sends coal to Pacific ports.

Australia is a country producing a moderate but increasing amount of coal of good quality, the total production growing from 4,179,000 tons in 1888 to 6,313,000 tons in 1898. The only colony of Australia that has a surplus for export is New South Wales, whose foreign shipments in 1898 amounted to 2,791,796 tons. The shipments out of New South Wales are larger than the total exportation of Australia, which fact indicates that some of the New South Wales exports were to other Australian colonies. The total coal imports of the Australian colonies were 1,000,000 tons, and two-fifths of this amount was drawn from sources outside of Australia. Australian coal is at the present time distributed quite generally throughout the Pacific, the shipments being facilitated by the cheap transportation available. A large number of vessels leave Australia for America with coal as ballast, and this has enabled Australia to market her coal readily in Hawaii and in both North and South America. For the last decade California has annually procured from 200,000 to 400,000 tons of Australian coal, and Australia and Japan are at the present time supplying the larger part of the coal to be found in the tropical and southern sections of the Pacific.

Another important source of the coal used in the Pacific is Great Britain. The vessels which carry the grain, lumber, and nitrates of the west coast of America are frequently obliged to make the outbound voyage from Europe in ballast. This enables Wales to compete even with British Columbia and Washington in the California coal trade. A part of the coal thus imported, a portion of which is Welsh anthracite, is used for domestic purposes. The continued use of British coal on the Pacific is due, in part, to its superior quality and in part to the exceedingly cheap transportation which the coal is able to obtain.

In addition to the coal supply mentioned above, California annually purchases in the eastern part of the United States a limited amount of anthracite. There is also brought from the Eastern States a limited quantity of high-grade bituminous coal for smithing purposes. This anthracite and smithing coal are obtained from Pennsylvania and Maryland, and have not amounted to 50,000 tons in any year during the past decade.

The foregoing survey of the principal sources from which the coal used on the Pacific is now secured, will serve to show that the coal fields are widely scattered and are by no means so productive as those in the eastern part of the United States or in Europe. The Australian, Washington, British Columbia, and Japanese coal fields are all capable of development, but the increase in their output will be only moderately rapid. Much is said but comparatively little is known in regard to the coal fields of China. It is possible that within the next decade and a half railroads will have been constructed from the Chinese fields to the seaboard and that foreign capital will have opened up the Chinese mines. Should that take place, the largest future coal supply for the Pacific will be China. Unless that does take place, however, the Pacific coal supply, until the isthmian canal has been constructed, will be drawn from the four countries mentioned above, unless that which is highly improbable should occur and there should be found in Mexico and western South America richer fields of available coal than are now known to exist.

PUGET SOUND COAL.

The proximity of the coal resources of Puget Sound to Oregon and California, and their availability for the use of the steamers engaged in the American-Asiatic trade of the North Pacific, make desirable a further inquiry into the quantity, quality, and marketability of the coal of this section.

Although the Canadian coal production, most of which is to be accredited to British Columbia, was only 4,172,655 tons in 1898 and had increased only a little over 1,000,000 tons since 1890, the reports of our consuls and other sources of information indicate the existence of extensive deposits. These coal beds, however, are not especially thick, and the costs of mining have not been so low as in the great coal-mining regions of the world. The best mines yet developed are those of Vancouver Island and Crows Nest Pass, both of which produce a fair grade of bituminous coal from which coke can be made. The Crows Nest Pass field, at the eastern edge of the Cordillera Mountains, near the Canadian Pacific Railway, is a valuable source of supply for the metal-mining industries of the mountain district and for the section of the country just east of that region, but is too far from the coast to be marketed profitably at tide water. The Vancouver coal is favorably located for transportation, and it has been the source of most of Canada's exports of the mineral. Most of the foreign sales of this coal have been in the United States, where it has competed successfully with the product of other countries, without being able, however, to monopolize the market.

The coal mines of the State of Washington, although the product is somewhat inferior to the better grades of the British Columbia output, have been developed more rapidly than have the rival Canadian fields. The figures of production remained nearly constant at about 1,000,000 tons from 1886 to 1893, but for the five years ending in 1899 there was a rapid growth, the amounts being, in short tons, for 1895, 1,191,410; 1896, 1,195,504; 1897, 1,434,112; 1898, 1,884,571; 1899, 2,020,260. The latest report of the United States Geological Survey, that for 1899, says:

> Washington is the only one of the Pacific coast States whose coal product amounts to as much as 1 per cent of the total bituminous output of the United States. It is also the only State on the Pacific coast producing true bituminous coal, the entire product of California and Oregon being lignite or brown coals. Some of the Washington coals are true coking coals, over 50,000 tons in 1899 being made into coke. Some of the coals produced in Washington approach anthracite in character, and some "natural coke" has been observed.

These fields have an area about three times that of the Pennsylvania anthracite beds, but are not especially rich deposits except in limited and scattered areas. Like those of the Cordilleran Mountains generally, they have suffered badly by the irregular fracturing of the earth's crust.

As regards the quality of the Puget Sound coal three sources of information may be drawn upon in this discussion—the studies of the United States Geological Survey, to which reference has just been made, the experience of those using the coal on vessels and in industries, and the tests made by the United States Navy.

Several large consumers of coal, including the ocean steamship companies, report that the Puget Sound coal can be used to advantage for steaming purposes, although it is inferior to the product of the best bituminous fields. The president of one of the steamship companies states:

The British Columbia coals that are now being mined are considered fair average steam coals. The Washington coals are lignites, semibituminous, and bituminous. The lignites are used principally as house coals, the screenings from such lignites being used at points close to the mines for steam purposes, as they are sold at a very low figure. The semibituminous and bituminous coals range from fair to good steam-producing coals.

One firm, using as much coal as any industrial concern on the Pacific, which ordinarily secures its coal from the Washington mines, and an authority regarding the sources of the coal used in California, wrote in reply to the question, "Is the coal from Washington and British Columbia good for steaming purposes?"—

The lignite coals are not. Those of a more bituminous character are so used, but they have not the evaporative power of the better grades of bituminous used on the Atlantic seaboard, nor are they so good as the bituminous grade from Australia or the semianthracite coals from Cardiff and Wales.

The numerous analyses and tests made by the United States Navy of coals mined in different parts of the world indicate that the bituminous coals of West Virginia and Wales rank highest, that the Alabama coal is somewhat better than the Australian, and that the Australian product is superior to that exported from Washington or British Columbia.

On account of their different qualities these several coals will sell in the same market for different prices; and the decision of the question whether the Puget Sound mines will in the future control the market, in which the ships and industries of the Pacific coast will secure their coal, will depend both on the relative qualities and on the costs of mining and delivering the competing products. The foregoing review of the present sources of the coal used in Pacific markets shows that there are, and will be, several regions competing for this coal trade. The nature of this competition can be shown to advantage by a brief reference to the coal trade of California at the present time.

THE FUEL SUPPLY OF CALIFORNIA.

The sources of California's coal supply constitute one of the interesting facts of the world's commerce. Every continent, except Africa and South America, is drawn upon. Europe, Asia, Australia, and both sides of North America export coal to California. The annual production of the State being only 160,000 tons of low-grade coal, nearly all the supply has to be imported. At the present time about half the amount consumed is received from foreign countries, and half from the United States. The following table shows the origin of the foreign and domestic imports, and indicates that the American product is gaining on the foreign:

Coal imports of California.[a]

	1889.		1894.		1899.	
	Tons.	Per cent.	Tons.	Per cent.	Tons.	Per cent.
Foreign:						
British Columbia	417,904	31.0	647,110	42.4	623,133	36.2
Australia	408,032	30.0	211,733	13.9	139,333	8.1
Great Britain	45,617	3.5	176,198	11.5	93,263	5.4
Japan	1,340	....	15,637	1.0	9,390	.6
Total	872,893	64.5	1,050,678	68.8	865,059	50.3
Domestic:						
Washington	372,514	27.5	395,173	25.9	627,450	36.4
California and Oregon	87,600	6.5	65,263	4.2	189,507	11.0
Pennsylvania and Maryland	18,950	1.5	16,640	1.1	38,951	2.3
Total	479,064	35.5	477,076	31.2	855,908	49.7
Grand Total	1,351,957	100.0	1,527,754	100.0	1,720,967	100.0

[a] In addition to the amounts given in this table there has been a small quantity of anthracite annually obtained from Utah and Wyoming since 1893. The figures for alternate years are, for 1893, 21,562 tons; 1895, 37,530 tons; 1897, 44,343 tons, and 1899, 19,000 tons. The anthracite imported from Wales is included in the figures for Great Britain given in the table.

The prominence of the United Kingdom as an ocean carrier and the possibilities of her foreign trade in coal are well illustrated by her large shipments of that bulky commodity halfway around the world. In past years California has received a part of her coal from Australia and Great Britain in ships that carry her wheat to Europe. The coal from Great Britain has varied from 3½ to 15 per cent of the total imports during the last dozen years, while the supply obtained from Australia has ranged from 11½ per cent to 30 per cent of the total. In the past from 25 to 35 per cent of the California supply has been drawn from these two foreign sources. For several reasons, however, coal shipments from these countries are falling off. The price at which British and Australia coal can be sold in California fluctuates sharply, and rises and falls according to the prospect of the cereal crops and the expectation on the part of shipowners of remunerative homeward business. Under extremely favorable conditions freights on coal from Great Britain have been as low as 8s. per ton, while during the succeeding year they have reached 19s. from the same ports.

When California was largely dependent upon Great Britain and Australia for her coal supply, the practice was common of importing the coal from those countries on a speculative basis, the coal shippers sending out the cargo with the intention of selling the coal on or before its arrival at the port of destination. During recent years California buyers have adopted the practice of making contracts for the delivery of coal at fixed prices for periods of time, and the speculative shipments have nearly ceased. This change in business methods has given an advantage to the coal miners of the Puget Sound section.

The decline of the Australian and British coal in the California trade, and the concurrent development of the Puget Sound coal, is well illustrated by the statistics of the coal imports of that State. In 1889 Australia furnished 30 per cent of California's coal needs; in 1899 the Australian shipments formed only 8 per cent. In 1899 but a small amount of coal was shipped from Great Britain, whereas in 1892 15 per cent of the coal imports of California came from the United Kingdom. In 1899 the supply obtained from Great Britain amounted to only 5½ per cent. The State of Washington, on the contrary, supplied California with 27½ per cent of her coal in 1889, and with 36.4 per cent in 1899. In 1899 the Puget Sound section, including British Columbia, Vancouver, and the State of Washington, furnished California with nearly three-fourths of her coal supply. Ten years earlier the amount from this section was 58½ per cent of the total.

The importations of coal into California have increased very slowly, the present amount being only 1¾ million tons, whereas twelve years ago 1⅓ million tons were brought into the State. These figures show clearly enough that California has not yet become a State with diversified manufacturing industries, her principal business activities being concerned with the production of grain, fruit, and wine, the sawing of lumber, and the mining of metals. Most of the manufacturing is auxiliary to these industries.

As has been stated in another chapter of this report, the auxiliary manufacturing industries of California are making an increasing use of electrically transmitted water power. Electricity thus generated is also extensively used for power and lighting purposes in the towns. Furthermore, California would be obliged to use more coal than she does at the present time were there not petroleum oil fields in the southern part of the State, from which increasing supplies of oil are being annually taken for industrial and domestic fuel purposes and for use in railroad locomotives.

Concerning the value of oil for fuel the secretary of the Los Angeles Chamber of Commerce makes the following statement:

> At the present time it is estimated that 4 barrels of oil are equal to 1 ton of coal, and the expense of handling the same is so much less that 3 barrels of oil are nearly equivalent to a ton of coal. As the development of the oil fields continues the price of oil will be reduced, and unless the present price of coal can be greatly reduced coal will cease to be a factor in our manufacturing industries.

This statement probably overestimates the industrial importance of the development of the oil fields of southern California; nevertheless, the opening of them has resulted in an extensive substitution of oil for coal. The oil is not adapted to lighting purposes, but makes a good fuel.

The foregoing facts indicate that, under the existing conditions of transportation and competition, the coal needs of the west coast of the United States and Canada will be drawn mainly, and within a few years almost entirely, from the fields near Puget Sound. The steamers of the north Pacific, excepting such as make the trip to Australia, will draw their chief supply from the same section. Will the opening of an isthmian canal enable the coal of the eastern and southern portion of the United States to enter the west coast markets of our country? Will this coal from east of the canal be able to compete with the Puget Sound product in the markets of the tropical and southern sections of the Pacific? In order to answer these questions it will be necessary, first, to inquire into the prices at which Puget Sound coal can be sold in Pacific markets, and then to examine the present and probable future costs of delivering our eastern and southern coal at tide water, and to take account of the methods that will probably prevail in the transportation of coal from the eastern and southern mines to the vicinity of the canal and beyond, when that waterway shall have become available.

PRICES AND COSTS OF COAL IN DIFFERENT SECTIONS OF THE UNITED STATES.

The prices of coal on the Pacific coast range higher than the prices of similar grades in the Atlantic ports. In the Puget Sound cities near the mines "good steam coals" range in price from $2.25 per gross ton, for the lower grades, to $3.25 per gross ton for the better qualities, free on board vessels. Vancouver coal sells for $2.50 to $3.50 per ton, according to quality, in the British Columbia coaling stations. Portland and Astoria secure their coal from the Washington mines at a cost, delivered, of $4.50 to $5.25 per ton. The authority for these figures is the general manager of a steamship company doing a large coasting business, and he also states:

San Francisco uses, for household purposes, a large quantity of Washington lignite coals and British Columbia bituminous house coal. For steam purposes the British Columbia and Washington bituminous coals are used, rates ranging from $4.80 to $5.50 per gross ton at the wharf.[a]

Another authority says:

The San Francisco prices are variable. Steam coals from Washington will vary from $5 to $6 per ton; from Vancouver Island from $5.50 to $7, and from Australia from $5.50 to $7.50 (gross tons in each case).

The same gentleman reports that the price paid by a San Francisco firm, whose business requires a large amount of coal, ranges from $4.75 to $5.25, delivered from the ship. This coal ordinarily comes from the Puget Sound mines in Washington.

The superior quality of the Comox and other British Columbia coal enables them to command a somewhat higher price than the Washington product, but the Washington mines, probably on account of our tariff of 67 cents a ton on bituminous coal, have been annually securing a larger percentage of the coal business of California and Oregon. The imports of the British Columbia coal into California have remained about constant during the last six years.[b]

The prices just cited are probably not the lowest ones possible in the future. When the market shall have become larger, when new mines shall have been developed, and those now in operation shall be worked on a larger scale, and, what is most important, when the means of land and ocean transportation shall have been improved, enlarged, and cheapened, the Puget Sound mine operators can doubtless deliver coal in California and elsewhere considerably cheaper than at present. It is the belief of one competent to speak that—

The foreign sources of supply are becoming less important to us (California) with the development of northern mines, and the day is not far distant when the northern capacity will be equal to the entire demand. At the moment it would seem to be a question of miners and water transportation, for certainly the northern coals can be laid down here at a cost so far below that of coals from Great Britain and Australia as to overcome any possible difference in quality.

The coal exported from the eastern half of the United States will be taken mainly from two sections, the Pennsylvania and West Virginia fields in the Upper Ohio Valley and the mines in north central Alabama. The coal from the Upper Ohio Valley section is shipped by rail to the several North Atlantic ports, where it is sold in large amounts to industrial plants and ocean vessels, and whence a limited quantity is now exported to foreign countries for naval and industrial purposes. In the handling of coal, both for domestic coastwise distribution and for foreign export, Norfolk and Newport News have some advantages over the Atlantic ports north of them, because of the exceptionally high grade of the coals handled and the spacious and inexpensive terminal facilities possible in their harbors, which are also, because of their nearness to the ocean, convenient stations for vessels desiring to coal.

The railway haul from the mines to Baltimore and Philadelphia is somewhat shorter and more economical than to Norfolk and Newport News, but the disadvantage of the longer railway distance to the ports at the mouth of the James is counterbalanced by the closer proximity of those cities to the sea, and their central situation on the Atlantic coast.

The Ohio River is another route used for the shipments of large quantities of coal from Pennsylvania and West Virginia. The coal sent down the Ohio is mainly destined for Cincinnati and other Ohio River points, but a considerable share of the total is distributed along the Mississippi, about 3,000,000 short tons reaching New Orleans each year. The distance from Pittsburg to New Orleans by river is about 2,200 miles, and, as will be shown presently, it is the extraordinarily cheap transportation which this river navigation makes possible that will in the future give importance to the Upper Ohio Valley as a coal-exporting section of the United States.

The city of Birmingham, in the Alabama coal and iron district, is about 260 miles by rail

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[a] The unavoidable use of both long and short tons in this discussion may be confusing. Bituminous coal from Pennsylvania and West Virginia and Virginia is sold in the Atlantic ports by the ton of 2,240 pounds; in the Gulf ports by the ton of 2,000 pounds. On the west coast coal prices are quoted on the ton of 2,240 pounds.

[b] These figures regarding the prices of western coal are for the year 1900. Coal prices were high that year and have since remained higher than they averaged during several years preceding 1900. However, it is not probable that the circumstances are permanent which have kept the price of coal at the high level of the four years ending in 1904.

from Mobile and Pensacola and 350 miles from New Orleans. The deposits are rich, the costs of mining are comparatively low, and the distance to good tide-water harbors is short.

The prices of coal have recently been high on account of the almost unprecedented industrial demands of the past two years. In September, 1900, two members of the Isthmian Canal Commission had a conference in Pittsburg with persons shipping large quantities of coal down the Ohio and Mississippi rivers, and the price at which bituminous coal was then selling in New Orleans was found to be 39 cents a bushel, or $4.32 a ton of 2,000 pounds. It was also stated by a prominent coal merchant that $3.50 a short ton in New Orleans would be as low a price as would be accepted at that time, even on a contract calling for the delivery of a large quantity. In reply to an inquiry addressed to the secretary of the New Orleans Board of Trade in July, 1900, the response received was:

> A large dealer here advises that $3.50 per short ton would about cover cost of Pittsburg coal, and Alabama would be about the same.

The same inquiry was made of the general freight agent of one of the Gulf railroads, and his reply, under date of July 10, 1900, was:

> I have addressed dealers in coal asking for their prices free on board vessels Pensacola and Mobile for export. I am quoted on coal free on board vessels at Pensacola $2.60 per ton of 2,240 pounds, and at Mobile $2.35 per ton of 2,000 tons ($2.64 per long ton).
>
> There is no export business moving through New Orleans, nor has it moved that way for some time, but the cost of coal free on board vessels at New Orleans would probably be at least 75 cents per ton higher than to Mobile and Pensacola.

The price of coal for local use was considerably higher at that time, because the railway companies regularly make a large rebate in their rate when the coal handled is exported or sold to vessels other than tugs or local harbor crafts. The export price for the best Pocahontas coal in October, 1900, was $2.50 per 2,240 pounds. The bunker price of that coal was then $3.10 per long ton trimmed in bunkers. At the same time the price of bituminous coal in vessel cargo lots at Philadelphia was $2.30 per gross ton. The price paid by local manufacturers was $3.75 per long ton.

The prices just quoted were so much above the charges which had prevailed during previous years, that it was necessary for the accomplishment of the purposes of this investigation to inquire what price conservative business men considered would, under existing conditions of transportation, cover the costs of mining and delivering the coal at the seaboard, including adequate business profits.

Pittsburg firms mining and shipping coal by rail and by river state that the cost of the coal at that section need not average over $1 per short ton on the barges in the Monongahela River, and that under the present conditions of Ohio River navigation, a rate of $1 per short ton would yield a good profit to the vessel men for transporting the coal from Pittsburg to New Orleans.

One of the Pittsburg firms doing a large business in mining coal and shipping it down the Ohio and Mississippi rivers prepared the following detailed statement of the cost of mining coal and getting it to New Orleans. The items are not estimates, but are the costs actually incurred. The word "ton" means 2,000 pounds:

One ton, mine-run coal, f. o. b. works .... per ton..	$0.75
Expense of transporting same to Pittsburg .... do....	.10
Transporting from Pittsburg to Louisville .... do....	.20
Transporting from Louisville to New Orleans .... do....	.37
Cost of boat containing coal .... do....	.70
Total cost of coal and boat at New Orleans .... do....	2.12

Only about 30 per cent of the coal barges or flats sent to New Orleans are brought back; the remaining seven-tenths are sold as rough lumber mainly to the planters. According to the above statement the purchaser of the coal is charged 70 cents per ton of coal for the boat containing the coal. The firm that submitted the statement accompanied the list of costs with the following explanation:

> In the event that we want the boat back after having been unloaded, we buy it back from the customer at a very low price, thus enabling us to get the boat back home with a profit to us.

The cost of coal in New Orleans is the same, whether the barge be towed back to the coal mines or not.

This statement as to the cost of coal on the barges seems to be corroborated by the fact that the price of Pennsylvania bituminous at the mine has, according to the reports of the United States Geological Survey, averaged 76.4 cents during the past decade. The testimony of the above-mentioned firm and of other Pittsburg coal merchants is, that Pittsburg coal could be delivered with profit, in large quantities on board vessels in New Orleans, at a total charge of $2 to $2.25 per short ton, or $2.50 per ton of 2,240 pounds.

In Birmingham, Ala., the committee of the Commission was informed in September, 1900, by the vice-president of one of the large mining and transportation companies, that Alabama coal could be profitably sold at that time, free on board vessels at Gulf ports, at $2.50 per short ton. That this estimate was a liberal one is proven by the fact that for the last ten years the average price of Alabama coal at the mines has been 96 cents, and that at the time the committee visited Birmingham the railroad freight rate on coal for export from the Birmingham district to Mobile, including "the cost of placing the coal into the ship's hold at the coal chute," was $1.10 per ton of 2,000 pounds.

In 1898 the average mine cost of Alabama coal, as a whole, was only 75 cents, according to the report of the United States Geological Survey, and in Jefferson County, where 57 per cent of the total production of the State originated, the average mine cost was but 69 cents per ton of 2,000 pounds. The railway charges in 1900 were generally higher than they were in previous years, and more than they need to be in the future for the conduct of a larger volume of traffic according to the most improved methods. Indeed, the export rate on pig iron from Birmingham has been $1 per ton. In view of these figures and of the testimony of several Alabama men engaged in the transportation and mining business, it would seem certain that coal from the Birmingham district can now be sold free on board vessels at Mobile and Pensacola for $1.75 to $2 per short ton ($1.96 to $2.24 per long ton).

Under the present (1900) conditions of mining and transportation the North Atlantic seaboard cost of bituminous coal free on board can be placed at $2.25 to $2.50 a long ton, or $2 to $2.25 a short ton, depending upon the quality of the coal and the ports through which it is handled.

Briefly stated, it appears that the cost of bituminous coal, under existing conditions of transportation, may be expected to be somewhat higher on the North Atlantic seaboard than in the Gulf ports of Pensacola and Mobile; and that in the New Orleans market the upper Ohio Valley coal will normally range about 25 cents above the price of Alabama coal in Pensacola and Mobile. In respect to the quality, however, the coal from the Pittsburg section is somewhat superior to that from Alabama, the difference probably being sufficient to offset the greater price of the more northern product. Speaking generally, the mine operators of the eastern and southern parts of the United States could offer bituminous coal for export for $1.75 to $2.25, or at an average price of about $2 a short ton.

RIVER TRANSPORTATION OF COAL FROM PENNSYLVANIA, WEST VIRGINIA, AND ALABAMA.

The Ohio River traffic is a matter of such importance, in connection with this discussion of the exportation of American coal to and beyond the isthmian canal, that a brief description ought perhaps to be given of the manner in which the coal transportation is now conducted on the river. The following statement of the methods of handling the coal traffic originating in the Monongahela River Valley is taken from a special report of the Chamber of Commerce of Pittsburg. After stating that the Monongahela River has been made navigable 102 miles above Pittsburg, by means of nine locks and dams constructed and operated by the United States Government, and that the river flows through the center of rich coal fields, the secretary says:

> Three species of boats loaded on the Monongahela River for the Ohio River trade are used by the shippers, viz: Coal boats, drawing 8 to 8½ feet and carrying 1,000 to 1,100 tons; coal barges, drawing 6 to 7 feet, carrying 500 tons, and coal floats carrying from 200 to 300 tons.
>
> The tow boats usually bring from the mines about 3,000 tons of coal in small fleets, arranged for passing the locks conveniently. * * * At Pittsburg * * * the small coal fleets are moored while awaiting rises sufficient for navigation on the Ohio River. * * * When rises of 10 feet occur, or sufficient for 8-foot coal barges, fleets from 10,000 to 15,000 tons are made up for shipment to Cincinnati or Louisville.
>
> At Louisville, two and sometimes three of the Pittsburg fleets are made up into monster fleets of from 35,000 to 40,000 tons and towed to New Orleans by powerful tow boats. A fleet conveying 40,000 tons covers about 10 acres.

The coal fields of Alabama lie along streams capable of providing navigation to Mobile for barges drawing about 6 feet of water; and these rivers, particularly the Warrior, which flows through the most productive coal deposits, are being improved by means of locks and dams. Coal can now be barged from a few miles above Tuscaloosa, Ala., through the Warrior and Tombigbee rivers to Mobile, and when the Warrior River improvements shall have been extended 45 miles farther to Jefferson County, it will be possible to ship coal in barges, carrying from 400 to 500 tons and drawing 6 feet of water, directly from the mines to the Gulf. The barges can be constructed of the low-priced steel obtainable in the Birmingham district, and by means of them coal can be profitably transported to tide water for 50 cents a ton.

The coal barges now so extensively used on the Ohio and Mississippi rivers are made of wood. Some of them are strongly built, and after discharging their cargoes are towed back to the mines for reloading. A large share of the coal barges (70 per cent of those used for shipping coal to New Orleans) are constructed as cheaply and fragilely as possible, and, as was stated above, are sold for rough lumber in or near New Orleans. That these types of barges will be used a decade or fifteen years hence seems improbable, in view of the increasing costs of lumber and the declining costs of steel. The pressed steel car is rapidly displacing the wooden one for railway coal traffic, and it is rational to expect that wood will give place to steel in barge construction.

Steel river barges with a draft of 6 to 10 feet and a capacity of 500 to 1,000 tons will have the added advantage of being strong enough to be towed on the Gulf and Caribbean. By means of them coal can be shipped directly from the Pennsylvania, West Virginia, and Alabama mines, not only to the Gulf ports, but also to the coaling stations of the West Indies, Mexico, and Central America, including the important stations that will certainly be established at the termini or along the line of the canal.

It is possible the opening of an isthmian canal will lead to the use of a special type of river barge for handling coal for export. A barge capable of drawing 15 to 20 feet of water might be loaded to a draft of 9 feet at the mines, to a draft of 12 feet at Louisville, and for six months of the year to 15 or 20 feet at Vicksburg. Barges of this size and type could, of course, be towed through to any desired seaport, American or foreign. The suggestion that such barges might be used was made by a gentleman who has had large experience in shipping coal down the Ohio. Under these conditions of transportation coal costing $1 per short ton, free on board at the mine, could be sold in Panama, Greytown, and other Caribbean or Gulf ports for $3 or less per ton. American coal at $3 a ton of 2,000 pounds in these ports will not only hold the market against all foreign competition, but will be so much less expensive than the price at which coal can be obtained along the Suez Canal route, as to give the American route a strong commercial advantage resulting from the possession of cheap coal for steamers.

In 1900, when the prices were high, coal was selling from $5.83 to $8.63 a gross ton under yearly contracts along the Suez Canal route, the price increasing with the distance from the British mines. The following average contract prices of coal have prevailed during each of the past five years at the more important stations along the Suez route, the figures having been obtained from a large coal merchant of London by the London representative of an American firm of shipbrokers.

Contract prices in shillings and pence for the past five years.

[London, E. C., October 31, 1900.]

Coal port.	1896.		1897.		1898.		1899.		1900.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Colombo	22	6	29	0	26	6	29	0	35	6
Aden	25	6	(a)		(a)		34	0	36	6
Port Said	16	6	18	0	19	6	23	0	26	0
Malta	15	6–16	15	6–16	18	0	22	0	24	0
Algiers	15	6	15	6	18	0	22	6	25	0
Gibraltar	15	6	15	6	17	0	21	6	24	0

a No contracts.

NOTE.—The above are prices at which contracts were made with the principal shipowners for the years named, and do not show variations in "current" prices that occurred from time to time. All large shipowners contract; therefore the variations in the respective "current" prices do not affect them. The contract prices in the autumn of 1900 at Port Said were 26s., but current prices there were 40s. The contract prices for 1901 were higher than those for 1900.

"During the years 1896 and 1897," according to the London informant, "the Welsh coal market was quiet and freights were much lower than for the past two years;" but even during those years the coal costs along the Suez route were higher than the probable future cost of coal in the stations of the West Indies and the Caribbean. Moreover, every indication points to increasing rather than diminishing costs of coal in Europe, and the future prices of European coal in the Mediterranean, Red, and Arabian seas can hardly be expected to be so low as they have prevailed in normal times in the past.

CONCERNING THE MARKETING OF APPALACHIAN COAL WEST OF THE CANAL.

Well-informed men engaged in mining and shipping coal testified in September, 1900, that the freight rate would then be about $3 per ton for shipping coal 5,000 knots in chartered vessels. Assuming a tide-water price of $2.50 per gross ton, a canal toll of 45 cents per cargo ton (this would be about equal to $1 per vessel net register), and a freight rate of $3 a ton, coal from the mines east of the Mississippi River would have sold for about $5.95 a long ton in 1900 in California, Hawaii, and the west coast of South America. This price of $5.95 is not suggested as the probable price of eastern coal in Pacific markets after the opening of the canal, but it has some value, inasmuch as it represents a maximum, and shows what would be quoted were the present conditions as regards costs of coal and transportation to prevail.

After the canal has become available, coal can be shipped through it to Pacific ports either as ballast, as berth, or part cargo freight, as full cargo shipments in chartered vessels, or in towed barges. The rates for part cargoes or berth lots will in all probability be so high as usually to preclude shipments of that character, but there will be a large amount of steam-vessel tonnage going in ballast or with light cargoes westward through the canal for the Chilean nitrate, the Hawaiian sugar, and the grain and lumber of the west coast of the United States and Canada. Such being the case, there will naturally be more or less coal carried as ballast to those ports of the Pacific and at a very low freight rate. Moreover, vessels may be owned or chartered by coal companies for the purposes of taking westward full cargoes of coal and bringing eastward nitrates, sugar, grain, or lumber.

It is furthermore probable that the steel barges described above, if they are adopted for river traffic, will be towed with their cargo through the canal to Central American and west South American ports within a thousand miles of the canal. The smooth water of this part of the Pacific coast will be favorable for towing, and there will be economy in shipping direct from the mine to the Pacific port without transfer of cargo.

In view of these favorable facilities for the transportation of coal westward it would seem conservative to expect the freight costs of sending coal from the Gulf ports and the Atlantic ports of Norfolk and Newport News to points 5,000 knots distant—that is, in general terms, to northern Chile, Hawaii, and our west coast—will be as low as $2 per ton of 2,240 pounds, and possibly less in exceptional cases. The foregoing estimates regarding the cost of coal were that, with the existing transportation agencies, coal can be sold at tide water on the Atlantic and Gulf for an average cost of $2 per gross ton, and that the costs of shipping coal to the Gulf will probably be less in the future than they now are. Assuming that the cost of coal at Gulf and Atlantic ports will at the time of the opening of the canal range from $1.50 to $2.25 per gross ton (depending upon the quality of the coal, the port of shipment, and the conditions of the market), that the ocean freight will be $2 per ton, and the canal tolls 45 cents per cargo ton, the cost of delivering Pennsylvania, West Virginia, and Alabama coal in the ports of the west coast of the United States, Mexico, Central America, South America as far south as northern Chile, and the ports of Hawaii will be from $3.95 to $4.70 per ton of 2,240 pounds. Having made this detailed inquiry concerning the present and probable future costs of delivering Appalachian coal at the Atlantic and Gulf seaboards and the cost of shipping this coal to Caribbean ports, it is now possible to consider whether and to what extent the Puget Sound coal and that from the eastern third of the United States will compete in Pacific markets, particularly in California.

In the earlier part of this chapter the present prices at which Puget Sound coal was selling in California and Oregon were given. Those prices can doubtless be reduced during the coming ten or fifteen years. According to the annual report of the United States Geological Survey, the average cost of Washington coal at the mines was $1.78 in 1899, and for the ten years ending in 1899 the average was $2.16 per short ton. As the supply of labor becomes greater, and when the mining operations are conducted on a larger scale, the wages of labor will be somewhat lower and the total cost of mining will be less per ton; how much it is impossible to say. Possibly $1.50 per short ton would be a fair estimate. An average railway rate from the Washington mines to the seaboard of $1 a ton is as low as may be expected.

These estimates would make the average cost of Washington coal at the seaboard $2.50 a short ton or $2.80 a ton of 2,240 pounds, except for the coal from those mines close to the seaboard, which could sell their product at a lower price because of the cheap railway haul. As was stated above, the prices of coal in the year 1900 in Puget Sound cities ranged from $2.25 to $3.25 per gross ton. The Vancouver coal cost $3.50 per ton on an average in the British Columbia coaling stations. The ocean freight rates in 1900 were high, and this accounts for differences of $2.50 to $3 per ton then prevailing between the Puget Sound and San Francisco prices. It would seem that $1.50 per ton would ordinarily be a remunerative ocean rate to San Francisco and also to Hawaii. On the basis of these estimates a possible future price of $4 a gross ton for Washington coal in California and Hawaii may probably be predicted. British Columbia coal will be obliged to pay the tariff of 67 cents unless the existing law is changed. These estimates are based on too meager data to make it safe to accept them as being closely accurate, but they are probably approximately correct; and, if they are, they indicate that Puget Sound coal will be sold in California and Hawaii at from $4 to $5 per long ton by the time the isthmian canal shall have been opened. To Central and South American ports the freight rates would doubtless be 50 cents a ton more than the California and Hawaiian points, and a selling price of from $4.50 to $5.50 per ton of 2,240 pounds would need to be predicted.

The conclusions to be drawn from these estimates regarding the prices at which Appalachian and Puget Sound coal can be sold in the Pacific markets are that the Appalachian coal will doubtless have an advantage over that from Puget Sound in Central and South American ports, and that in California and Hawaii the two coal-producing sections will be active competitors; the

Puget Sound mine owners will apparently be able to sell at a somewhat lower price than their Eastern rivals can afford to accept, but the producers of the Eastern and Southern States will have an article of slightly better quality to offer. The two chief reasons why the Appalachian coal can compete in the markets so near Puget Sound are the lower mining costs in the East and the exceptionally cheap transportation that will be available from the Appalachian mines to the seaboard and from the seaboard west, both in steel barges and in vessels seeking the Pacific coast for the eastbound cargoes of lumber, grain, sugar, and nitrates.

The general conclusions to this investigation of the probable sources of the future coal supply for the commerce and countries of the Pacific, and of this inquiry into the effects which the isthmian canal will have upon the coal trade of the United States, are:

1. That the coal consumed for commercial and industrial uses on the west coast of the American continents, in Hawaii, and in the coaling stations of the eastern half of the Pacific Ocean will be supplied in the future mainly from the mines of the United States and Canada, unless the opening of the Chinese mines should revolutionize the coal trade of the Pacific. It is not probable that coal from the Orient or Australia will in the future be sold on this side of the Pacific. In this case, however, China is, as usual, the uncertain and indeterminable factor.

2. The isthmian canal will enlarge the export markets for American coal, both by creating a demand for coal in Gulf, West Indian, and Central American stations to supply the steamers that will be engaged in our own and Europe's commerce through the canal, and also by opening in the Pacific ports of the American continents a coal market that is now important and which is certain to grow. We shall secure the larger share and probably nearly all of a coal trade that is now possessed by Great Britain and Australia, and the industrial progress that will result from the use of the canal will add to the volume of that trade.

At the present time the United States occupies an unimportant place as an exporter of coal to foreign countries other than Canada and Mexico, and while this promises to become less true in the future as the cost of the British product rises, and as the purchases of our high-grade steaming coal by foreign governments for their navies occur more frequently, nevertheless British coal producers will continue to have the great advantage which they now possess of of abundant facilities for shipping their coal to all parts of the globe. The volume of Great Britain's total imports is so much larger than the volume of her exports that a large number of vessels are regularly obliged to start in ballast from the United Kingdom on their outbound voyages.

This enables the coal exporters of that country to secure very low rates to distant and widely scattered foreign markets, and accounts for the fact that the foreign coal shipments from Great Britain have averaged 35,000,000 gross tons annually for the past five years.

While the total exports from the United States will continue to be more bulky than our imports, there will be a large tonnage movement westward through the isthmian canal of vessels with part cargoes or in balast, and the canal promises to develop an important foreign and domestic market for American coal. The ability to distribute the excellent coal of the United States extensively among the countries of the Caribbean Sea and the Pacific Ocean, will be of great benefit to the industries and commerce of those countries, and will redound to the advantage of our naval, maritime, and industrial interests.

Chapter VII.

THE ISTHMIAN CANAL AND THE IRON AND STEEL INDUSTRIES OF THE UNITED STATES.

The United States holds first place among the countries of the world in the amount of coal and iron ore mined. In 1899 three-tenths of the world's total output of iron ore and 32 per cent of the total coal supply were produced in the United States, and the production of both of these minerals is being increased rapidly, not with the prospect of exhausting a limited supply of raw materials, but by drawing upon abundant resources that have but recently been put under requisition.

In no other country has the increase in the amount of iron ore mined been so rapid as in the United States. Great Britain is now mining no more iron ore than she did thirty years ago. Germany, including Luxemberg, ranks next to our country in the amount of iron ore produced, and the production has developed rapidly during recent years; but although the German output was 18,000,000 tons in 1899, a large quantity of ore had to be imported, and the amount of pig iron turned out by German furnaces was barely two-thirds the pig-iron product of the United States, whose productions of iron equaled 13,620,703 tons of pig and 25,000,000 tons of ore.[a]

THE UNITED STATES AS AN EXPORTER OF IRON AND STEEL PRODUCTS.

Iron and steel and their manufactures now constitute the fourth largest general class of exports from the United States, breadstuffs, raw cotton, and provisions being the only categories having a greater value. For the years ending June 30, 1900 and 1903, the values of these commodities were—

	1900.	1903.
Breadstuffs	$262,734,026	$221,242,285
Raw cotton	241,832,737	316,180,429
Provisions, meat, and dairy products	184,431,716	179,839,714
Iron and steel, and manufactures of	121,858,344	96,642,467

The growth in the exportation of iron and steel in crude and manufactured form was very rapid from 1896 to 1900; since then the great demand at home has temporarily cut down foreign sales. In 1896 the total value was but slightly more than one-third of that of 1900. The trade is widely distributed, the most promising markets being in North and South America and the Orient. Of steel bars and rails British North America, Japan, and Asiatic countries are large buyers. Builders' hardware, saws, and tools found 45 per cent of their market in Europe in 1900, but Australia was also a large purchaser. Wire is very widely distributed. Electrical machinery, printing presses, and pumping machinery have been sold mainly in Europe, and also in the colonies of European nations. Our best foreign markets for locomotives have been Japan, Canada, Mexico, Brazil, and Russia. American producers are finding their way into the markets of all parts of the world.

Among the letters received from the manufacturers of iron and steel was one from a firm whose plant is on the Atlantic seaboard. This firm reported, among other things:

> At present 25 to 30 per cent of our products are exported. We expect, however, by reason of our location at tide water, to constantly increase this proportion and ultimately export from 50 to 75 per cent.

In the year 1899 the capacity of this firm was about $10,000,000 worth of products per annum. At the time this letter was written the firm was filling a foreign order for 70,000 tons of rails for the trans-Siberian railway, and also an order for 30,000 tons of rails received from the government of Victoria, Australia. A Philadelphia firm shipped two full vessel cargoes of locomotives to China and Siberia in 1898, one full cargo in 1899, and another shipload in 1900, 156 in all, sent out in two years.

[a] In 1902 there were 35,554,135 long tons of iron ore mined in the United States, from which 17,821,307 tons of pig iron were made.

A firm in the eastern part of Pennsylvania reported:

We shipped 3,000 tons of plates to Australia early this year (1900), and similar quantities to various points, especially to China and Japan. * * * We shipped many thousands of tons to the Pacific coast, a part of which goes to New Orleans and thence overland. Some goes by way of Panama and some around Cape Horn.

A firm manufacturing $750,000 worth of files and rasps, one-third of which is sold outside of the United States, reported:

We have lately developed a constantly growing business in all the Eastern countries, Japan, China, and the Straits Settlements. We are also selling to some extent on the west coast of South America.

One of the largest manufacturers of bridge material in the United States reports:

Business is developing throughout the world, having sold bridges for many years to South American countries, and lately to China, Japan, and Russia. Probably 10 per cent of our present business is for export, with every evidence of large increase in the future.

Examples of this nature might be given in large number. The foregoing, however, are sufficient to illustrate the truth of the general proposition that the present exportation of iron and steel products from the United States, although large, is but the beginning of a rapidly increasing business that is certain to assume great proportions. The great iron and steel manufacturers of Pittsburg, Cleveland, and Birmingham expect this, and a visit to their great establishments and an inspection of their methods of manufacturing and distributing their products will convince any observer that the feelings of these manufacturers are well founded.

THE CONDITIONS OF PRESENT COMPETITION OF THE UNITED STATES WITH EUROPE.

The chief competitors that the United States must meet in exporting iron and steel manufactures are Great Britain, Germany, and Belgium. In selling for delivery in Europe we are at a disadvantage as regards costs of transportation, and must expect to overcome the handicap, if at all, by being more inventive and by introducing more economical processes of production than are employed by our rivals; that is, by making a better article at a lower cost of manufacture.

That we are now able to sell many manufactures of iron and steel and even pig iron in Europe shows that great progress has been made in the United States in reducing the expenses of production; indeed, we are able to enter all markets where the competitor does not have a decided advantage in lower costs of transportation. The cost of manufacturing iron and steel is lower in most of the centers of production in this country than in Europe, and the expenses are certain to decrease during the coming ten or fifteen years. The continuation of the present rapid growth in our foreign sales of iron and steel products is essentially a question of securing cheaper transportation, and especially to South American and trans-Pacific countries.

Most foreign countries, however, can be reached more economically under existing conditions by European producers than by American. Not only the west coast of South America, but also the east side of that continent, south of the equator, can at present be reached more cheaply from western Europe than from the iron-producing sections of the United States. The Suez Canal has brought Europe nearer than the United States is to the East Indies, Australia, China, Japan, and oriental countries generally; and until the American canal route becomes available, American manufacturers and exporters of iron and steel and other articles, will find their lower costs of production largely offset by the greater expenses of transporting their commodities to these promising foreign markets.

AMERICAN IRON AND STEEL TRADE WITH PACIFIC COUNTRIES.

The isthmian canal will affect the iron and steel industries of the United States chiefly by lessening the time and expense of reaching the Pacific markets of our own and foreign countries. These are the markets in which Europe and America will strive for supremacy, and the prize is worthy of zealous effort. Though now at a disadvantage in the competitive struggle for this trade, the American producers have already secured a desirable trade. The direct exports of our iron and steel products to foreign Pacific countries in 1900 were as follows:

Chinese Empire	$822,074
Japan	5,460,205
British Australia	7,386,358
Chile	655,935
Bolivia	23,006
Ecuador	292,314
Peru	495,411
Total	15,135,303

The principal exports from the United States to Pacific countries are and will be breadstuffs, lumber, raw and manufactured cotton, petroleum, and iron and steel products. The exportation of the last three of these five classes of commodities will be facilitated by the canal; and in the case of iron and steel products, which have to meet a specially strong competition from Europe, the isthmian waterway will be of great assistance to American exporters. The table indicates that the canal's influence will be exerted where important results are possible. The total exports of iron and steel products from the United States in the year ending June 30, 1900, amounted to $121,858,344, and the exports of those commodities to Pacific countries comprised one-eighth of the total.

THE MANNER IN WHICH THE ISTHMIAN CANAL WILL AFFECT THE AMERICAN IRON AND STEEL INDUSTRIES AS A WHOLE AND THOSE OF THE SOUTHERN STATES IN PARTICULAR.

Iron and steel and the manufactures of them being heavy commodities, with a relatively low value per unit of weight, they constitute a class of traffic for which water transportation is especially well adapted. They will naturally seek the canal route to Pacific markets. The future exports of iron and steel will be sent out both from the Southern States and from those north of the Ohio and Potomac rivers. Of the iron ore mined in 1899, 19 per cent, or 4,800,000 tons, were taken from the mines of the Southern States; 72.6 per cent came from the Lake Superior region, and 8.4 per cent from other States.

The Southern States have special advantages for the manufacture and exportation of pig iron because of the juxtaposition of the coal, iron ore, and limestone, and the comparatively short distance of the furnaces from the seaboard. In shipping pig and other forms of iron to our Western States, the Hawaiian Islands, and the Pacific coast of Central and South America, by way of an isthmian canal, the Southern producers and the Gulf seaports will have the advantage of being nearer the canal than the producers in other sections of the United States will be, and this will probably give the Southern mines, furnaces, and mills a large share of the iron and steel export trade to Pacific markets. The Northern producer will, however, by no means be debarred from successful competition, because the North Atlantic ports will have a greater volume of shipping and trade with the East than the Southern ports will have, and consequently more abundant facilities for dispatching their exports.

The iron and steel manufacturers of this country anticipate a large foreign trade with Pacific countries. An ironmaster of Birmingham, Ala., states:

> The canal would open to this district a demand for pig iron from the Pacific coast, including South America, now filled from England because of the absence of freight communications from Birmingham, which could otherwise supply it more cheaply. It would open up a demand for pig iron in Honolulu, Japan, China, and Australia, which would then be supplied to them more cheaply than from European markets. It would open up a demand in the last-named countries for cast-iron pipe, which at present is largely supplied from Belgium, which could then be more cheaply supplied from this district.

In Pittsburg the iron and steel manufacturers, who already ship extensively to Pacific markets, believe that the present business could be much increased by the use of an isthmian canal, and a special report prepared for the Canal Commission by the chamber of commerce of that city lays stress upon the possibility of exporting from the section of which Pittsburg is the industrial center large quantities not only of iron and steel products but also of coal, glass, petroleum, and pottery. In Cleveland, Ohio, one firm engaged in the manufacture of relatively high-priced iron and steel products in that city and elsewhere reported in 1900 that it was shipping annually to foreign Pacific markets 77,000 net tons, and was doing a large business with the west coast of the United States, the amount of which was withheld for special reasons. Another firm having headquarters in Cleveland and doing an annual business of over $21,000,000 in mining iron and coal and manufacturing pig iron informed the Canal Commission that—

> The opening of a canal across the American isthmus would prove of very great benefit to the iron and steel industries to whom we sell our raw materials—hence of great benefit to us. The development of trade in the Orient promises a large volume of business to the iron and steel industries of the world. With a canal the United States should, and in our judgment would, control this trade.

From the reports prepared for the Commission by the commercial organizations of Pittsburg, Cleveland, and Birmingham, it is believed that these statements of large iron and steel manufacturers in these cities, represent the views held by practically all of those interested in the iron and steel industries of the United States.

Chapter VIII.

THE CANAL AND THE SHIPBUILDING AND MARITIME INTERESTS OF THE UNITED STATES.

The shipbuilding industry and the merchant marine are of great importance to the industrial, commercial, and naval welfare of our country. There are few industries of equal magnitude that require a larger number of auxiliary business activities, that employ so large a force of skilled labor, and that do more to call forth inventive genius. The permanent strength and efficiency of our merchant marine and our Navy are dependent upon our having well-equipped yards, owned by trained builders with inventive capacity. However much men may differ as to the policy to be adopted for building up our merchant marine, they are agreed as to the necessity for having a well-developed shipbuilding industry.

The desirability of having a large merchant marine under the American flag is also generally acknowledged. "The more facilities the more business." The existence of a greater number of vessels connecting our leading seaports with various parts of the world would be of assistance to us in developing our foreign trade. It is possible to secure a moderate amount of trade with a distant section of the world by depending entirely upon chartered vessels, but much more can be accomplished with the aid of regular lines of ships. The regular liners are needed, not only for the passenger and mail services between our own and foreign countries, but also for carrying on trade at scattered points where the business is not large enough to warrant the use of chartered steamers. In building up our trade with the Far East, and with South America, we need lines of vessels as well as chartered ships. Neither agency is sufficient by itself.

The value of a large merchant marine as a training school for the Navy, and as a source from which to draw both men and vessels when a sudden expansion of the naval fleet becomes necessary, is a fact recognized in the naval and maritime policy of many countries.

THE CANAL AND SHIPBUILDING.

The isthmian canal will operate as has the Suez Canal, and hasten the change from sail to steam power in ocean commerce. By doing this the isthmian waterway will modify both the shipbuilding and the ship-operating industries. Inasmuch as few, if any, steamers will be constructed with wooden hulls, the canal will necessitate a larger and earlier reorganization than would otherwise occur in many of the shipbuilding plants now employed in constructing wooden vessels. This change from wooden to steel vessels may be a burden to some builders, but the country as a whole will be benefited.

One sure result of the opening of an isthmian waterway will be a larger coasting trade between our two seaboards. A larger coasting fleet will be required, and the vessels for this fleet must be built in American yards. The coasting fleet engaged in traffic through a canal will consist mainly, if not entirely, of steamers.[a] A part of our present coasting vessels will doubtless use the canal, but it is probable that a large number of ships will be built especially for the long-distance traffic that will be carried on through the canal. Most of them will be comparatively large ships, and will be freight vessels of the most modern design. The use of steel barges on the Ohio, Mississippi, Warrior, and other rivers promises to enlarge the demand for barges, and they must be constructed in American yards. Likewise an increase in the exports of iron and steel products will necessitate the handling of more ore on the Great Lakes, and thus add to the tonnage of vessels constructed.

In securing data for the discussion of the effect which the canal would have on the shipbuilding and maritime interests of the United States, a circular letter containing six inquiries was sent to the American firms building and operating ships. Replies were received from forty of the persons addressed, and in most of the communications received each question was carefully answered. One of the interrogatories was: Will the opening of an isthmian canal and the development of its traffic stimulate American shipbuilding? Will the larger demand for coasting vessels so increase the output of American yards as to enable shipbuilders to construct all ships more economically, and thus to compete successfully with foreign builders in the construction of vessels for the foreign trade?

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[a] Consult following chapter on "The use of the canal by sailing vessels."

Nearly all the responses to this query were in the affirmative. The general character of the answers may be illustrated by quoting from two of the letters; one received from an eastern shipbuilder and the other from a west coast shipowner. The statement of the shipbuilder was:

In my judgment the opening of the isthmian canal and the development of its traffic would stimulate American shipbuilding, to the extent of an increased demand for vessels to be used in trade affected by said canal. As a rule increased demand develops increased sources of supply, and the cost of product is invariably reduced in proportion of increased business to fixed expenses of any manufacturing establishment, and therefore the canal would in this case tend to enable shipbuilders to construct ships more economically and more surely to compete with foreign builders.

The response of the shipowner was:

The increased facility afforded for the transfer of American vessels from ocean to ocean in trading between American ports will call for an increased number of vessels, which undoubtedly will result in new shipyards being established (both for the building and repairing of our vessels), which could be called upon when needed for the construction of vessels to carry on our foreign import and export trade. We already know that structural steel has been produced in the United States cheaper than in any other part of the world, owing to the almost inexhaustible beds of iron ore in the region of the Great Lakes, as well as in other sections, and the skill and economy with which it is mined and worked When we combine this advantage with the facility which will be developed by a large increase in our capacity for building coasting vessels, we see no reason why in the future ocean carrying vessels of the best class may not be built as cheaply here, if not already done, as in any other country.

The cost of building ships in American yards is generally admitted to be higher than in Europe in spite of the recent introduction in our yards of economical processes of handling material and doing work. Most of the large American shipyards are new and are equipped with the most approved labor-saving machinery. The labor costs are said to be higher in American than in foreign yards, but whether the cost of labor per unit of work done is greater in the United States is hard to determine. In most lines of iron and steel manufactures the labor costs of production in the United States can hardly be higher than in Europe. For many commodities the labor outlay is undoubtedly less, and it is not probable that the labor costs of building ships in the United States will continue permanently higher than in Europe. It is, however, not to be expected that American builders can construct the small merchant tonnage now being built by them at as low a cost per ton of shipping as can the foreign builders. Ships are built by retail in this country and by the wholesale abroad. "The British shipbuilders build many vessels from the same plans, buying or making not only duplicate or triplicate parts, shapes, machines, etc., but like parts by the dozen or score."[a]

The tonnage now being constructed by the American builders is nearly all for the coastwise and inland commerce, from which foreign-built vessels are excluded—that is, for the home market. It is, however, probable that the American shipbuilding industry will eventually repeat the history which other iron and steel manufactures have had during the past ten years. From importers of large quantities of iron and steel products we have become large exporters of them, and are now rapidly finding our way into new markets. The recent growth of the shipyards of the United States has been checked for the time being, and our yards are suffering from the present dull period in the shipping business. The increase which will occur in our domestic water commerce during the coming decade, and particularly after the isthmian canal shall have been opened, will enlarge the tonnage built in our yards, tend to lower the costs of construction and to induce American builders to seek foreign markets for their ships. The increase in the number of vessels built will be accumulatively beneficial to American builders. A larger American fleet means more repairing in the United States, and this will be a valuable aid to our shipyards.

THE OWNERSHIP OF OCEAN VESSELS BY EXPORTERS.

During the investigation of the relation of the canal to the maritime interests of the United States, some gentlemen well versed in maritime matters, expressed the opinion that a considerable tonnage was to be added to our merchant marine engaged in foreign commerce, by the purchase and operation of vessels by the large American manufacturing concerns, which are now rapidly developing a heavy foreign trade. Manufacturing for export is already largely concentrated in the hands of large combinations of producers, and some of these combinations now find their foreign trade so important that they are considering the desirability of providing themselves with ocean vessels.

For reasons stated in another part of this report, it is believed that the exportation of coal from the United States is going to increase and that it will assume large proportions after the canal is opened. The exportation of iron and steel products from the United States is growing and is certain to increase. The large corporations engaged in mining and in the manufacture of iron and steel, as well as those in the lumbering business, will doubtless find that provision must

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[a] Report of Commissioner of Navigation, 1900, page 33.

be made by themselves for handling their water-borne foreign trade. To a considerable extent the vessels which carry the exported oil are owned by the manufacturers of the oil. A part of this exported lumber is handled by the men who manufacture the commodity. The heavy purchases of European vessels by American capitalists during the spring of 1901 was doubtless in part for the purpose of securing better facilities for handling the export trade. The purchasers are also largely engaged in manufacturing for export.

THE CANAL AND THE AMERICAN MERCHANT MARINE.

The ownership and operation of ocean vessels by the large industrial firms as a part of their business, which has now in many cases come to include the entire process of obtaining the raw materials, converting them into usable commodities, and placing them in the hands of the consumer, whether foreign or domestic, will, to some extent, solve the question of our securing a larger merchant marine owned by Americans. Whether these vessels owned by American producers will be sailed under our flag, or under that of some foreign nation, will be determined by forces over which the isthmian canal will have but slight influence.

Some of the vessels employed in the commerce between our Eastern seaboard and the trans-Pacific countries will doubtless desire to participate in the interoceanic coasting trade of the United States, and in order to do so they will need to have the American registry. The action of Congress in restricting the commerce of Porto Rico and Hawaii with the United States to American ships has been followed by similar legislation regarding our trade with the Philippines, which, after July 1, 1906, will also be limited to the vessels flying our flag. It is probable that the restriction of our Philippine commerce to American ships may cause a larger share of the commerce of our Atlantic and Gulf ports with Japan and China to be carried in American vessels, because such ships would be able to participate in both our Philippine and foreign trade.

Any benefit conferred upon our shipbuilding industry will indirectly aid in the enlargement of the tonnage of American vessels engaged in the foreign trade of the United States. If the American purchaser could secure vessels at home as cheaply as in foreign yards, one of the present reasons for registering his ships under the flag of some other nation would be removed. The future growth of the merchant marine under the flag of the United States will depend on numerous factors, some economic and some political. The construction of the isthmian canal will apparently affect that growth favorably.

Chapter IX.

CONCERNING THE USE OF AN ISTHMIAN CANAL BY SAILING VESSELS.

In order to reach intelligent conclusions regarding the use which sailing vessels will make of a canal, there are at least three questions that must receive consideration. The first general question is concerning the place which those vessels now hold in the commerce of the world and of the United States; the rate at which steam has been displacing sail tonnage in our own and foreign shipping during the past twenty-five years, and the commercial position which the sailing vessel will occupy fifteen years hence, should the present tendency to substitute the engine for the sail continue to prevail. Another subject meriting careful inquiry is whether there are special classes of traffic, such as lumber, grain, nitrates, and unrefined sugar, which have found the steamer the more economical carrier. If there are commodities that can be freighted more cheaply by sail than by steam, are they articles that would naturally be carried through the canal? The third general question is whether an isthmian canal, either in Nicaragua or at Panama, is a waterway adapted to navigation by sailing vessels. Are the conditions of winds and currents that prevail at the approaches to the canal such as to enable sail craft to use the waterway; and if the route is possible for the sailing vessel, will the economies resulting from its use be sufficient to induce the owners of such ships to adopt the transisthmian route? In the discussion that follows these three general questions will be considered in the above order of statement.

THE PLACE OF THE SAILING VESSEL IN THE COMMERCE OF THE WORLD AND OF THE UNITED STATES.

That the sailing vessel is giving place to the steamer, both on the high seas and in domestic waters, is a well-known fact, to the significance of which attention has been drawn on many occasions. The United States, however, having certain obvious advantages over other nations for the construction of wooden ships, has given up the use of sails more slowly than any other important maritime nation, with the possible exception of Norway. In the enormous traffic of our Great Lakes we have come to use steam almost exclusively, but this is not the case with our seagoing marine.

The report of the United States Commissioner of Navigation for 1899 contains tables showing the extent to which the world's seagoing sail tonnage has declined during the last quarter of a century, and the increase which has taken place during the same period in the world's seagoing tonnage. The tables are taken from the records of the Bureau Veritas. The table regarding the sail tonnage is as follows:

Seagoing sail tonnage.

Country.	1873–74.	1878–79.	1888–89.	1898–99.	Decrease from 1874 to 1899.
					Per cent.
Great Britain	5,320,089	5,596,018	4,215,634	2,910,555	45
United States	2,132,838	2,075,832	1,913,090	1,285,859	40
Norway	1,137,177	1,374,824	1,328,296	1,144,482	....
Italy	1,126,032	963,625	718,889	463,767	59
Germany	893,952	914,674	737,028	535,937	40
France	768,059	595,933	352,418	279,412	64
All others	2,807,689	2,796,524	2,370,934	2,073,757	26
Total	14,185,836	14,317,430	11,636,289	8,693,769	40

The world's seagoing tonnage declined 40 per cent during the twenty-five years from 1874 to 1899, and the decline in the tonnage of the sailing vessels in our merchant marine has proceeded pari passu with the change occurring in the world's marine. This table, however, presents only one side of the change that has been taking place. When we come to study the figures of the growth of steam tonnage, we find that the United States has fallen far behind her rivals. The following table presents the gross tonnage of the seagoing steamships of over 100 gross tons operated under the flags of the various maritime nations of the world. For purposes of comparison there are appended to the table the statistics of the tonnage of the steamships engaged in foreign trade under the American flag:

Seagoing steam tonnage of the world.

Country.	1873–74.		1878–79.		1888–89.		1898–99.		Increase 1873–74 to 1898–99.
	Tonnage.	Per cent.	Tonnage.	Per cent.	Tonnage.	Per cent.	Tonnage.	Per cent.	Per cent.
Great Britain	2,624,431	60.4	3,465,187	62.4	6,873,552	62.3	10,993,111	58.5	311
United States	483,040	11.2	609,101	10.8	535,345	4.8	810,800	4.2	68
France	316,765	7.4	335,219	5.9	752,028	6.8	952,682	5.1	200
Germany	204,894	4.8	253,667	4.5	662,331	5.9	1,625,521	8.3	693
Spain	138,675	3.3	152,708	2.7	395,685	3.5	520,847	2.7	275
Italy	85,045	1.9	84,421	1.5	276,326	2.5	420,880	2.2	395
Holland	72,753	1.7	116,149	2.0	197,748	1.8	363,200	1.9	399
Russia	67,522	1.6	104,702	1.8	163,556	1.5	358,415	1.8	430
Norway	41,602	.9	53,331	.9	160,558	1.4	628,493	3.3	1,410
Japan	....	....	....	....	115,088	1.0	439,509	2.3	....
All others	293,466	6.8	420,690	7.5	913,720	8.3	1,773,674	9.5	504
Total	4,328,193	100.0	5,595,175	100.0	11,045,937	100.0	18,887,132	100.0	336
Atlantic coast	165,280	....	141,145	....	129,961	....	227,731	....	38
Pacific coast	20,451	....	20,010	....	57,144	....	131,953	....	545

The world's seagoing steam tonnage has grown from 4,328,193 gross tons to 18,887,132 gross tons, an increase of 336 per cent, during the twenty-five years. Our seagoing steam tonnage, however, has risen only 68 per cent, the percentage of increase being only one-third that of France, the nation next above us, who are the lowest on the list. While we have been raising our maritime steam tonnage from 483,040 gross tons in 1874 to 810,800 in 1899, Great Britain has lifted her figures from 2,624,431 gross tons to 10,993,111, an increase of 311 per cent over a tonnage that had already reached large proportions at the beginning of the period.

With the causes of our decline in the ocean-carrying trade we are not here concerned. It is evident that the decline in our seagoing sail tonnage presents no exception to the tendency of all countries to substitute steam for sails. Should our maritime sail tonnage decline only 40 per cent during the coming twenty-five years, it will be reduced to 771,515 gross tons; but there are strong reasons for thinking that the substitution of the engine for the sail will proceed more rapidly in the future than it has in the past. As the sailing vessels wear out they will be replaced by steamers. The American merchant marine engaged in the foreign trade has declined to small proportions, but there is no doubt that economic and political conditions favorable to the restoration of our carrying trade are rapidly developing, and that our new marine must almost certainly consist of steamships. The statistics of the tonnage of sailing vessels and steamers constructed in the United States, during the five years from 1894 to 1899, tend to confirm this view. During these five years 296,933 gross tons of sailing vessels were built in American yards and 570,831 tons of steamers. The figures, moreover, include the vessels built for the fleet on the Great Lakes, and this fleet consists partly of schooner-rigged barges that are classified as sailing vessels, although they are practically always towed.[a]

In the future construction of ocean-going vessels it is probable that we shall do as we have done in constructing our lake fleet, and substitute steamers for sailing vessels. The gross tonnage of the vessels on the Great Lakes in 1875, 1880, 1890, 1899, and 1903 (not including canal boats and small barges), is shown by the following table, which also indicates the division of the tonnage between sailing vessels and steamers:

Number and gross tonnage of sailing vessels and steamers on the Great Lakes, 1875, 1880, 1890, 1899, and 1903.

Year.	Sailing.		Steam.		Year.	Sailing.		Steam.	
	Number.	Tons.	Number.	Tons.		Number.	Tons.	Number.	Tons.
1875	1,710	339,787	891	202,307	1899	874	318,175	1,732	1,014,561
1880	1,459	304,933	931	212,045	1903	676	315,195	1,796	1,467,992
1890	1,272	328,656	1,527	652,923					

[a] During the calendar year 1903 the total tonnage of ships constructed in the world comprised 1,964,000 tons of steamers and 182,000 of sail. During that year the sail tonnage of the world decreased 143,000 tons and the steam tonnage increased 1,545,000 tons. During the decade 1893–1903 the steam tonnage under the American flag grew 1,224,816 tons, while the sail tonnage declined 152,272 tons.

The steam tonnage of the lakes grew from 203,298 tons in 1879 to 1,467,992 tons in 1903, a fourfold increase in twenty-four years. The sailing vessels, although they have decreased in number, have apparently not declined greatly in tonnage. This is more apparent than real because, as was stated above, a part of the tonnage, classified as sailing, consists of schooner-rigged barges. The sailing vessel has ceased to be an important factor on the Great Lakes.

It may probably be assumed that the canal across the Isthmus will have been completed and put in operation by 1914; according to the foregoing facts, what will then be the position of the sailing vessel in our maritime fleet? If the rate of change from sail to steam that has taken place during the ten years from 1889 to 1899 should simply be continued, our seagoing sail tonnage will have declined to about 650,000 gross tons by 1914, and our seagoing steam tonnage will have grown to about 1,500,000 gross tons. But the increase in our seagoing steam tonnage will undoubtedly be much more rapid during the coming fifteen years than it has been during the past decade and a half. During the fifteen years from 1884 to 1899 the steam tonnage on the Great Lakes increased 214 per cent. If the seagoing steam tonnage of the United States in 1899, 810,800 gross tons, should increase by a like percentage during fifteen years, it would amount to 2,546,000 gross tons in 1914. The assumption of such a growth as this in our seagoing steam tonnage during the first decade and a half of the twentieth century does not seem unwarranted. An estimate would seem to be conservative that placed our sail tonnage at about one-sixth of our total tonnage in 1914. Should the sailing vessel after 1914 continue to give way to the steamer, the isthmian canal will be used by sailing vessels only to a limited extent.

THE FUTURE USE OF SAILING VESSELS BY SPECIAL CLASSES OF TRAFFIC.

There are some kinds of freight, such as coal, lumber, grain, nitrate of soda, and sugar, especially adapted to movement by sail because they are shipped as full vessel cargoes and do not need to be transported rapidly or delivered promptly. Will this traffic continue to find the sailing vessel the more economical carrier?

If the sailing vessel is to be used for the carriage of commodities that can be shipped as full cargoes, the prevalent type of vessel will probably be large five and six masted steel schooners capable of carrying 5,000 or more tons of cargo. Two six-masted schooners were built on the Maine coast during 1899 and several other large four and five masted sailing vessels were built during 1898 and 1899. One of the two six-masted schooners is 302 feet 11 inches long on the keel and 345 feet long on deck. She has 48 feet 3 inches beam and is 22 feet 6 inches deep; her gross tonnage is 2,974, the net tonnage 2,743, and she will carry a little over 5,000 tons of coal. According to the owner, this vessel "was built expressly for the coal trade, yet she is built so as to go to any part of the world with any kind of cargo." The largest sailing vessel yet constructed is the *Thomas W. Lawson*, which is a seven-masted schooner of 5,218 tons gross register and having a cargo capacity of between 7,000 and 8,000 tons. The length of the vessel is 375 feet over all, the beam 50 feet. Two five-masted steel barks, the *Preussen* and *Potosi*, nearly as large as the *Lawson*, are owned in Hamburg, Germany. Like the *Lawson*, they date from 1902.

During 1899 and 1900 there was a revival in the business of building sailing vessels, both wooden and steel, caused by the great scarcity of ships, the high ocean freight rates, the high price of steel, and the unusual price of coal in Europe; but this was probably a temporary increase in the construction of sail tonnage. If the sailing vessel is in the future to occupy a prominent place in the ocean marines of the world, it will be because of its special adaptability to the transportation of such commodities as sugar, coal, nitrates, grain, and lumber. The best basis for deductions as to the future is the present practice of the large shippers and carriers of these special commodities.

The transportation of nitrates from Chile to Europe and the Atlantic seaboard of the United States is well adapted to the sailing vessel, and the *Preussen* and *Potosi* were built for that trade. It was formerly supposed that the steamer could not compete with the sailing vessel in this traffic; but during the past few years a large part of the nitrate shipments have been made by steamers. It is obvious that the isthmian canal will make it much more difficult for the sailing vessel to compete with the steamer for this traffic.

As regards the transportation of grain and lumber, much the same change seems probable, although the lumber of our west coast is at present all shipped in sailing vessels. If sailing vessels can not advantageously use the canal in competition with the steamer—a question that is considered at length in the latter part of this chapter—the grain and lumber cargoes will certainly be taken by the steamers. The action recently taken by a company of New York business men, who have acquired a large tract of timber in the Carolinas, is significant in this connection. The lumber gotten out by this company will be shipped from Georgetown, S. C., by two large steamers built especially for this business.

Not long since a New York firm operating a large fleet of sailing vessels between the two

American seaboards sold out the entire fleet and in 1900 and 1901 put in its place seven steamers which are plying between New York and Pacific Ocean ports and Hawaiian Islands via the Straits of Magellan.

The trade between the North Atlantic countries and Australia has long been considered one that would be held by the sailing vessels against steam competition. This was the opinion of Lieutenant Maury. Three or four years ago, however, this business was invaded by steamers, which now carry the larger percentage of the traffic.

The facts regarding the present division of the trade between the Suez route and the route followed by sailing vessels are especially important in connection with this inquiry. In order to determine the extent and nature of the present competition of sailing vessels with steamers in the trade between Europe and the East, the following table has been compiled from British reports. It gives the tonnage of steam and sailing vessels cleared from British ports for the foreign ports of the East in the years 1893 and 1898. While it does not include the clearances from other North Atlantic countries, it undoubtedly represents the facts for the entire trade, because the major share of the commerce between the North Atlantic and the East is in the hands of Great Britain. Moreover, this table is to some extent supplemented by figures regarding the sail and steam tonnage employed in the trade from Germany to the East.

Tonnage of steam and sailing vessels cleared from British ports for the East in 1893 and 1898.

Destination of vessels.	Steam and sail combined.			Steam.		
	1893.	1898.	Increase in five years.	1893.	1898.	Increase in five years.
Java	194,873	182,582	a 12,291	164,080	170,500	6,420
Borneo and other Dutch possessions in the Indian Sea	10,858	2,144	a 8,714	2,034	10,921	8,887
French possessions in East Africa and Asia and Pacific islands	3,357	12,580	9,223	14,490	11,623	a 2,867
Portuguese East Africa and India	8,118	346,706	338,588	7,657	337,645	329,988
Philippine and Ladrone islands	32,811	33,876	1,065	31,346	30,680	a 666
Abyssinia	2,743	6,948	4,205	2,743	6,948	4,205
Madagascar	706	7,054	6,348	....	2,186	2,186
Prussia	4,047	4,108	61	2,481	4,108	1,627
Siam	902	966	64	....	476	476
China, exclusive of Hongkong	34,027	71,283	37,256	30,590	66,441	35,851
Japan	83,401	413,906	330,505	74,644	389,900	315,256
Pacific islands	6,351	10,573	4,222	....	....	....
Zanzibar	6,416	3,683	a 2,733	4,861	3,683	a 1,178
Mauritius	34,920	71,977	37,057	12,633	55,706	43,073
Aden	85,183	96,654	11,471	85,183	96,654	11,471
British possessions in India:						
Bombay and Scinde	601,895	485,711	a 116,184	593,953	485,711	a 108,242
Madras	128,050	19,273	a 108,777	125,598	17,874	a 107,724
Bengal and Burmah	523,569	595,962 116,875	189,268	426,201	507,761 106,916	188,476
Ceylon	211,603	128,546	a 83,057	185,100	128,546	a 56,554
Straits Settlements	297,574	55,828	a 241,746	267,845	46,815	a 221,030
Hongkong	10,943	46,216	35,273	5,327	26,148	20,821
Australia and New Zealand:						
West Australia	43,692	50,353	6,661	22,559	26,041	3,482
South Australia	135,955	51,416	a 84,539	82,439	9,721	a 72,718
Victoria	143,309	73,247	a 70,062	97,329	9,328	a 88,001
New South Wales	199,200	393,843	194,643	122,658	293,952	171,294
Queensland	50,496	96,366	45,870	33,146	67,017	33,871
Tasmania	31,419	6,422	a 24,997	29,088	....	a 29,088
New Zealand	140,068	209,175	69,107	103,744	176,500	72,756
Total	3,026,486	3,594,273	567,787	2,527,729	3,089,801	562,072

a Decrease.

From the foregoing table it appears that the total clearances, steam and sail, from British ports for the East increased 567,784 tons during the five years from 1893 to 1898, and that nearly all of this increase was in steam tonnage, the growth in the tonnage of steam vessels being 562,072 tons, or all but 5,716 tons of the total increase. By making the proper subtractions, the sail tonnage for 1893 is found to be 498,757 tons; and for 1898, 504,472 tons. The facts, then, are that the sailing tonnage remained practically stationary, while the steam tonnage considerably increased. The sail tonnage did not fall off absolutely, but declined relatively. In 1893 the sail tonnage constituted 16.4 per cent of the total steam and sail, whereas in 1898 the sail tonnage constituted only 14 per cent of the total, the decline having been nearly 2½ per cent in five years.

The clearances from Great Britain to certain special ports in the East present figures quite as significant as the totals referred to above. The commerce entering Eastern Africa by way of the Portuguese possessions represents a comparatively new trade. In 1893 the trade was very small, but in 1898 it had grown to large proportions. It is interesting to note that practically all of this new tonnage consisted of steamers. Japan presents a similar showing. The recent rapid growth of the trade of Great Britain with Japan has brought into service a large amount of steam tonnage and but a very small number of sailing vessels. The figures for Bengal and Burmah also show that nearly all of the large increase in the clearances from Great Britain to those countries consisted of steam tonnage. The same statement applies to New South Wales. In the case of New Zealand the increase in the steam tonnage, during the five years under consideration, was larger than the total increase in steam and sail tonnage combined. This indicates a falling off in the use of sailing vessels.

In the trade from Germany to the Far East the change from sail to steam tonnage is taking place very rapidly. German trade directly with the East has largely increased during the past decade, and this new traffic has brought steamers, and not sailing vessels, into use. The following figures taken from the German reports indicate this, and also show that sail tonnage has fallen off. In 1890 there cleared from German ports for British India and the islands of the Indian Ocean, sail tonnage, 76,000 net tons; steam tonnage, 219,000 tons. In 1897 the figures were: For sail, 55,000, and for steam 319,000. That is to say, during those seven years the tonnage of sailing vessels cleared from Germany for British India and the islands of the Indian Ocean decreased 21,000 tons, while steam tonnage increased 100,000 tons. In 1890 there cleared from Germany for China sailing vessels with a net tonnage of 9,000, and steamers with a tonnage of 70,000. In 1897 no sailing vessels cleared for China, but the tonnage of steamers had grown to 110,000 net tons.

MERITS OF THE STEAMER AND SAILING VESSEL COMPARED.

The special advantages of the sailing vessel are that its motor power costs nothing and that it requires a smaller crew of men than is necessary for a steamer of the same size. The British reports show that a typical sailing vessel of 2,381 net tons is manned by a crew of 34 men, 22 of whom are seamen. A steam vessel of nearly the same tonnage, 2,315 tons net, has a crew of 38 men, of whom 11 are seamen and 17 are engineers, firemen, and coal passers. Taking the total British merchant marine, the number of men was 15.8 in 1898 per 1,000 net tons on British sailing vessels, while on the steam vessel the number of men was 22 per 1,000 tons.

In the foreign trade of Great Britain the number of persons employed on sailing vessels for each 100 tons net register was, in 1880, 2.32; 1890, 1.96; 1898, 1.65. On steam vessels the number employed for 100 tons net register was, in 1880, 2.95; 1890, 2.73; 1898, 2.32. These figures are sufficient to show that steamers require more men than sailing vessels for an equal amount of tonnage. In large, slow-going steam vessels the number of men required is relatively small and may, indeed, not exceed 1 man per 100 tons net register, but it is equally true that a large schooner requires a very small crew of men—even smaller than is needed by the large, modern, slow freight steamer.

There seems, moreover, to be but a small difference in the size of crews required by the more recently constructed steamers and sailing vessels of equal capacity. A steamer of 3,000 tons dead-weight cargo capacity (which would be a small steamer) and a sailing vessel of equal capacity (which would be a relatively large sailing ship) would each have a crew of 23 or 24 men. The sailing vessel's crew, however, would include a larger number of unskilled laborers—seamen—than would the steamer, and the sailing vessel's expenses for labor would be somewhat lower than the steamer's.

The disadvantages of the sailing vessel are its slow speed, its dependence upon the winds and currents, and the consequent uncertainty as to the time of delivering the cargo assigned to it. The superiority of the steamer consists in its speed and its ability to assure the delivery of its freight at a stipulated time, unless violent storms are encountered. The disadvantages of the steamer are the cost of coal, the large amount of space taken up by the coal bunkers and machinery—one-fourth to one-third of the hull capacity—and the somewhat larger crew ordinarily required.

As regards the cost of coal, mechanical improvements have done a great deal to lessen the steamer's handicap. Some of these new steamers for the trade between our two seaboards will carry 10,000 dead-weight tons, besides 2,500 tons of coal. They have quadruple expansion engines, with boiler pressure of 210 pounds to the square inch. These vessels will consume 40 tons of coal per day, running at 9 knots per hour. It is planned now that in making the trip via the Straits of Magellan they will coal only at Coronel, Chile. The consumption of coal between New York and San Francisco via the canal will be about 1,000 tons each way. This will make the consumption 224 pounds per ton of freight each one-way trip. Assuming the price of coal free on board vessels in Atlantic ports to be $2.50 per ton of 2,240 pounds, it would take one-tenth of a ton of coal, costing 25 cents, to transport one ton of cargo between New York and San Francisco.

The data presented in the foregoing paragraphs do not fully demonstrate the inability of the sailing vessel to compete with the steamer in the future for the transportation of special classes of commodities, but the evidence strongly indicates that result. That the sailing vessel will continue to be used for some time to come, especially by the people of the United States, seems probable, but our use of the sailing vessel, however, will be restricted mainly to two classes of service. One of these two fields of usefulness will be that part of our coasting trade that can not readily be so organized as to be performed by regular lines of steamers. The other use to which we shall continue to put the sailing vessel will be that of performing the irregular or skirmish work of international trade. There is at the present time an irregular trade developing between the United States and several parts of South America—such, for instance, as that being carried on between the Gulf ports and the River Plata. In the earlier stages of the development of such a traffic the sailing vessel is a convenient agent; but when the trade becomes larger and the exchange of commodities between the two sections becomes regular and continuous, a line of steamers will be established, and most of the sailing vessels will be obliged to withdraw from the business. The withdrawal of sailing vessels from the trade between the United States and the Orient and the substitution of steamers for the greater part of the traffic between our two seaboards are instances of the substitution of the steamer for the sailing vessel when the amount of business to be done had become regular and large in volume.

WOULD SAILING VESSELS USE A CANAL EITHER AT PANAMA OR ACROSS NICARAGUA?

It does not seem probable that coal, lumber, grain, nitrates, and sugar—commodities that will make up a large share of the canal's traffic—will in the future be carried to a large extent in sailing vessels. Nevertheless, the sailing vessel will be a carrier of some importance when the canal is opened, and possibly for a score of years thereafter. Such being the case, the relative advantages of the Panama and Nicaragua routes for sailing vessels should be compared. The extent to which sailing vessels will use an isthmian waterway will depend upon the actual saving in time which a sailing vessel could make by using the canal instead of the Cape route, and upon whether sailing vessels can compete with steamers, both using the canal route.

In the year 1866 Lieut. M. F. Maury, in a letter written to a friend, made the following statement:

> The result of my investigations into the winds and currents of the sea and their influence upon the routes of commerce authorize the opinion which I have expressed before, and which I repeat, namely, if nature, by one of her convulsions, should rend the continent of America in twain and make a channel across the Isthmus of Panama or Darien as deep, as wide, and as free as the Straits of Dover it would never become a commercial thoroughfare for sailing vessels, saving the outward bound and those that could reach it with leading winds. * * * You will observe at a glance that the Isthmus of Panama or Darien is, on account of these winds and calms, in a purely commercial point of view, the most out-of-the-way place of any part of the Pacific coast of intertropical America.

Those persons who have endeavored to prove that the Panama route could not be used by sailing vessels have quoted the foregoing statements of Lieutenant Maury, and have interpreted his statements to mean that no sailing vessel would or could make use of a canal across the Isthmus of Panama. It is well, however, to note the exception which Lieutenant Maury makes at the close of his general statement. He says the Panama route "would never become a commercial thoroughfare for sailing vessels, saving the outward bound and those that could reach it with leading winds." In view of this limiting clause, it would seem that Lieutenant Maury thought sailing vessels outward bound from Europe or from any North Atlantic port to the Pacific might pass through a Panama canal. His statement would also indicate him to think that vessels bound from the west coast of the United States for the Atlantic might pass through a Panama canal during the winter months, when the winds and currents are favorable for vessels sailing southward toward Panama. When we consider that the larger part of the Pacific coast grain would be exported during the later autumn and winter months, and that a large part of the lumber from the Pacific coast of North America might be shipped during the winter half of the year, we must conclude that Lieutenant Maury's apparently strong statement does not preclude the possibility of a considerable traffic in sailing vessels through that waterway.

Hydrographers, ship brokers, and sailing masters generally disbelieve in the practicability of the use of a Panama canal by sailing vessels. There is no doubt that sailing vessels can enter and clear the Bay of Panama—they now do so to a limited extent—nor would it be impossible for a sailing vessel to make use of a Panama canal; but there is little reason to think that the sailing ship would, under the conditions of competition that will prevail after the waterway has been opened, pass from one ocean to the other in any considerable numbers.

It perhaps ought to be stated in this connection that sailing vessels bound from Panama either to the north, south, or west are obliged to work their way southward and westward to the Galapagos Islands, and usually some distance west of that group, before getting the winds and currents that will take them to their destination. Vessels bound from Panama to San Francisco are advised by Maury's sailing directions to work their way down the Colombia coast, and during the months from June to January, inclusive, to change their course about latitude 2° north, standing off the coast to the westward, passing north of the Galapagos Islands. From February to June, inclusive, it is better for the vessel to work southward across the equator before turning to the west. The course toward the west is maintained until the one hundredth meridian is passed, and then the vessel may "edge away for Cipperton Rock (10° 18′ N. and 109° 10′ W.), after passing which they may push to the northward for the northern trades."

Before Maury worked out these sailing directions, as the result of his study of winds and currents, sailing vessels consumed 90 days, on an average, in sailing from Panama to San Francisco by the direct route. According to the geographer Berghaus, the average time taken to make the voyage by Maury's route is 37 days. The distance by the circuitous route is somewhat more than 5,000 nautical miles, The direct route, the one followed by steamers, is nearly 2,000 knots shorter than the one taken by sailing vessels.

A most careful study of the conditions affecting the use of the Panama and Nicaragua routes by sailing vessels was made by Lieut. Frederick Collins, U. S. Navy, in 1872. He studied the winds and currents prevailing at different seasons of the year in each part of that section of the ocean that would be traversed by sailing vessels plying between Panama, Nicaragua, and other Pacific ports, and then estimated the number of days that it would, on an average, take a sailing vessel to make the voyage between the two isthmian ports and other Pacific harbors. The general conclusion to which he came in regard to the navigation of the Bay of Panama was that "no great difficulty need be experienced in getting from the vicinity of the Bay of Panama to where good winds might be found. * * * A careful computation gave only 10 days as the average time that would be consumed in getting a sufficient offing to secure good winds, providing the correct route was pursued." The route considered correct by Lieutenant Collins was the one adopted by Lieutenant Maury, to which reference was made above.

The distances which Lieutenant Collins calculated sailing vessels would have to travel in proceeding from Panama and from Brito to reach San Francisco, and the number of days which each of these trips would require, are indicated by the following table:

	Miles.	Days.
Panama to San Francisco	5,350	37
Nicaragua to San Francisco	3,240	23
Difference in favor of Nicaragua	2,110	14

The table makes the time required for a sailing vessel to reach San Francisco to be 14 days less when the trip begins at Brito than when it begins at Panama. The distances and time required for the return trip from San Francisco to Panama and Brito are indicated by the following table:

	Miles.	Days.		Miles.	Days.
October to April:			April to October:		
San Francisco to Panama	3,600	26	San Francisco to Panama	4,000	31
San Francisco to Nicaragua	3,000	22	San Francisco to Nicaragua	3,400	26
Difference in favor of Nicaragua	600	4	Difference in favor of Nicaragua	600	5

According to the calculations of Lieutenant Collins, the time required for a sailing vessel to make a round trip from Nicaragua to San Francisco would be nineteen days less than for a round-trip voyage between Panama and San Francisco. These figures would seem to indicate that if either route is available for sailing vessels, the Nicaragua route would possess decided advantages over the one at Panama. However, other authorities differ from Lieutenant Collins as to some of these conclusions. The figures given for the length of the average voyage from Nicaragua to San Francisco is 3,240 nautical miles. This seems too short; indeed, the United States Hydrographic Office estimates the distance to be 4,500 miles. The great-circle distance, or the length of the route followed by full-powered steamers, is 2,700 miles. Furthermore, experienced navigators assert that a vessel bound for Brito must beat up and down the coast or go far to the westward; and that, although the Nicaragua route is more advantageous than the one from Panama for sailing vessels, it is nevertheless necessary for vessels to make a long detour from a direct course.

The distance for steamers from Panama to San Francisco being 3,277 nautical miles, a 9-knot steam freighter would make the run in 15 days, a 10-knot ship in 13.6 days, and a vessel of 12 knots in 11.3 days. These figures are to be contrasted with 37 days, the average time required by the sailing vessel. From Brito to San Francisco the distance for steamers is 2,700 nautical miles. To make this run, a 9-knot freighter would require 12½ days, a 10-knot ship 11¼ days, and a 12-knot vessel 9⅝ days. Lieutenant Collins made the time by sail between Nicaragua and San Francisco vary from 22 to 26 days, but, for reasons just stated, his calculations underestimate (possibly by about 5 days) the time that would actually be required.

SAVING TO SAILING VESSELS BY USE OF ISTHMIAN CANAL INSTEAD OF CAPE ROUTE.

Concerning the time required to make the voyage by sailing vessel from New York to San Francisco, abundant information is obtainable from the logs of the many sailing vessels that are now navigated between those two ports. A New York firm operating sailing vessels from New York to San Francisco has reported the time taken by eleven different sailing vessels that made the trip during the year 1898. The average time for these vessels was 138 days, the range being from 113 to 151 days. Another New York firm doing a large business with the Pacific coast has given the time required by seven sailing vessels whose voyages were made at different seasons of the year. The time taken ranges from 118 to 169 days, the average for the seven being 139 days. Both of these firms report that they consider 140 days to be a fair average for the westbound passage. For the return trip from San Francisco to New York the time taken is somewhat less, and is said to average from 110 to 115 days.

In order to arrive at the time a sailing vessel would require to make the trip from New York to San Francisco by way of an isthmian canal, it is necessary to add the time that would be taken for the voyage from New York to the Isthmus, the time that would be required for making the transit through the canal, and the number of days necessary for reaching San Francisco after leaving the Isthmus. When Commander (now Rear-Admiral) Selfridge gave Lieutenant Collins instructions to investigate and report upon the time it would take sailing vessels to make a voyage between the Isthmus of Panama and various Pacific ports, he said:

In composing the table you will allow an average of twenty days to and from the United States and the mouth of the Atrato; thirty days from the English Channel to the same point, and forty days homeward to Europe.

It would take a sailing vessel practically the same time to reach Panama or Greytown that it would to reach the mouth of the Atrato. On the basis of the averages accepted by Admiral Selfridge for the Atlantic part of the voyage, and by Lieutenant Collins for the Pacific portion of the trip, a vessel would be twenty days from New York to the Isthmus, thirty-eight days from Panama to San Francisco, a total of fifty-eight days, to which should be added one day for the passage of a Panama canal. Lieutenant Collins estimated twenty-three days as the time required by a sailing vessel to reach San Francisco from Brito. For reasons that have already been stated, this estimate seems to be too small. If twenty-eight days be accepted as a fair estimate of the sailing time required between Brito and San Francisco, the time required for a sailing vessel from New York to San Francisco would be twenty days for the Atlantic part of the trip from New York to Greytown, two days for the passage through the canal, and twenty-eight days from Brito to San Francisco, a total of fifty days. The probable time required by sailing vessels to make the trip from New York to San Francisco by way of the Cape and through the two canals would then be as follows:

For the Cape route one hundred and forty days; for the Panama route fifty-nine days, and for the Nicaragua route fifty days. According to these figures, a sailing vessel could save on an average eighty-one days by using a Panama canal instead of making the trip around the Cape, and ninety days by using the Nicaragua canal instead of the present route.

The east-bound trip from San Francisco to New York can, on account of the more favorable winds in the Southern Hemisphere, be made in a shorter time than is required for the westbound trip. One hundred and fifteen days can probably be assumed as a fair average for the trip from San Francisco to New York around the Horn. Lieutenant Collins estimated that a vessel would on an average require twenty-six days from San Francisco to Panama during the winter months, and thirty-one days during the summer months. On the basis of these estimates the time required for a sailing vessel to make a voyage from San Francisco to New York by way of a Panama canal would be forty-seven days during the winter months and fifty-two days during the summer season. That is to say, a general average of about fifty days for the year as a whole. The time estimated by Lieutenant Collins for a sailing vessel starting from San Francisco to reach Nicaragua was twenty-two days in the winter months and twenty-six days in the summer season. This would make the time from San Francisco to New York forty-four days for half of the year and forty-eight days for the other half, or an average for the year of forty-six days.

In view of the uncertainties attending the navigation of the Pacific Ocean near the American coast, where sailing vessels are obliged to beat for a considerable part of the distance, it would seem conservative to add five days to each of the foregoing averages and assume fifty-five days for the trip by way of Panama and fifty-one days for the voyage by the Nicaragua route. Assuming that one hundred and fifteen days is the average time required for a vessel to make the east-bound trip around Cape Horn, the Panama route would enable the vessel to save sixty days and the Nicaragua Canal sixty-four days.

Vessel owners report that $75 per day will cover all the expenses of operating a sailing vessel of 2,000 tons net (including wages, interest, repairs, insurance, and all other items of expense). The foregoing reduction in length of voyage would effect the following net saving in the cost of moving a cargo of freight by such a sailing vessel between New York and San Francisco, which may be taken as typical Atlantic and Pacific ports. A sailing vessel bound from New York to San Francisco could save eighty-one days by way of the Panama route, which would be equivalent, at the rate of $75 per day, to a saving of $6,075. If we assume a toll of $1 per net ton and a towage cost of $450 for a Panama canal, the saving effected by the vessel would be as follows:

Eighty-one days, at $75 per day		$6,075
Toll, at $1 per ton	$2,000	
Towage	450	
		2,450
Net saving		3,625

For the Nicaragua Canal the account would stand as follows:

Ninety days, at $75 per day		$6,750
Toll	$2,000	
Towage	600	
		2,600
Net saving		4,150

The towage costs adopted in the foregoing estimates are on the basis of a charge of 30 cents per net register ton for towage through a Nicaragua canal and 22½ cents per net register ton for a Panama canal. In order to secure a reliable estimate of the probable cost of securing towage through each of the proposed canals, a score of large towboat companies were requested to submit an estimate of the charges that would need to be made for the service of towing. The letter requesting the information stated that—

The total length of a canal at Nicaragua would be about 190 miles. Of this distance about 70 miles will consist of excavated channel, about 50 miles of improved river navigation, and about 70 miles of lake.

And—

The distance from anchorage at Colon to anchorage at Panama is about 47 miles, only a short distance being open for navigation. It is also probable that sailing vessels would usually desire to be towed about 100 miles from Panama out to sea, and in making your estimate of the cost of towage for the Panama Canal we should be pleased to have you give both the cost of towage between Colon and Panama and the cost of towing 100 miles on the Bay of Panama.

The replies received in response to this request varied so largely that they did not furnish the basis for so close an estimate as it was hoped might be made. The estimate adopted was one of those midway between the higher and lower extremes, and one submitted by a well-informed gentleman who was known to have given the question careful consideration. His estimate of the cost of towing loaded sailing vessels through a Nicaragua canal was 30 cents per net ton register, and for towing loaded ships through a Panama canal and 100 miles to sea—147 miles altogether—was 22½ cents per net ton register.

Provision was made in the Panama estimate for towing vessels 100 miles out to sea, because it was believed that a sailing ship would ordinarily save more than enough in the time of getting to sea to pay the additional charges. Indeed, it is probable that a tow of several hundred miles would at times be found profitable.

The foregoing estimates of the savings possible for a sailing vessel to effect by using a Panama or a Nicaragua canal, instead of the Horn route, do not take into consideration the saving in insurance that would be effected by the reduction in insurance charges that would result from the use of an isthmian instead of a Cape route. This reduction would be about 50 per cent of the existing insurance charges, and would be the same for each of the two routes.

The foregoing calculations, it may be well to repeat, are based upon the estimated saving which a sailing vessel could ordinarily make by the use of each of the proposed waterways. It is well known that sailing vessels require very different times for making the run between the same ports. The foregoing estimates are intended only to represent the average savings possible.

Among the general deductions that seem warranted by the facts set forth in the preceding pages are the following:

1. A canal across Nicaragua would enable a sailing vessel to accomplish a greater net saving over the expenses of the present route around the Horn than could be effected by using a Panama canal. The difference in the advantages of the two routes for sailing vessels, while not large, is

sufficient to be made a factor of some importance in deciding which route should be adopted were it probable that either route would be largely used by sailing ships.

2. Neither the Nicaragua Canal nor the one across the Isthmus of Panama would be much used by sailing vessels. The unmistakable tendency of commerce is to use steamers instead of sailing vessels for all classes of traffic. The sailing vessel would compete with the steamer for the traffic through either of the canals under conditions so unfavorable as to make practically certain the general substitution of the steamer for the sailing vessel for all lines of trade through the isthmian waterway.

The consideration of the Nicaragua and Panama Canal routes, from the standpoint of their relative usefulness as commercial highways, becomes mainly a question of determining which is the more advantageous route for the steamers engaged in the maritime commerce of the United States in particular and of the world in general.

Chapter X.

THE CANAL AND THE TRAFFIC OF AMERICAN RAILWAYS.

There are several ways in which the isthmian canal may affect the traffic of the railways serving the different sections of the United States. The canal will introduce a new and competing route for traffic between our two seaboards, and between the eastern half of the United States and Pacific foreign countries. There may result from this one or all of four consequences:

1. The railway lines competing with the new water route may reduce their rates, and thus be able to hold their traffic against the new competitor. Should this be the result, the effect of the canal upon the freight of the railroads might be small; their rates would be reduced, but the traffic secured by the water route would consist of new business developed because of the water route, instead of traffic diverted from the other transportation lines.

2. The waterway may divert from the railway lines a greater or less share of their through business. Should this be the result of the waterway, the railways will be obliged to secure a compensating amount of new business or suffer a shrinkage in their traffic as the result of the competition of the waterway.

3. The canal may bring new business to the railways by making them collectors and distributors of the commodities carried between our eastern and western seaboards by the way of the Isthmus. In our country of great distances and of diversified industrial activities, generally distributed throughout our wide territory, the origin and destination of but a small portion of the water-borne commerce of the United States can be at seaboard points. The collection and distribution of commodities for traffic by water is and must remain mainly the work of the railway line. The major part of the traffic of the canal must be rail traffic previous to or subsequent to being handled by the ocean vessels.

4. The canal may make possible the establishment of new industries along the railway lines or cause an expansion of activity in the business of existing plants, and thus add to the local traffic of the railways. In general, whatever facilitates commerce establishes the most important prerequisite to industrial development.

The traffic whose routes may be modified by the opening of the interoceanic waterway is:

1. That originating and terminating at or near the seaboard points of our eastern and western coasts. The traffic between the territory east of Buffalo and Pittsburg and that west of the Sierra Nevada and Cascade Mountain ranges will be most directly subject to the influence of the new waterway.

2. The trade of the central section of the United States with our Pacific slope and with foreign Pacific countries will, after the canal has been opened, be able to leave or enter the United States either by an Atlantic, a Gulf, or a Pacific port. If it passes in and out by an Atlantic or Gulf gateway, it will be canal traffic; if by a Pacific port, it will not.

CONCERNING THE STATISTICS OF TRANSCONTINENTAL RAILWAY TRAFFIC.

Statistics are not kept of the traffic which the railways now carry between the Atlantic and Pacific sections of the United States and between the Pacific and central parts of the country—the rail traffic that would be subject to canal competition were the waterway now in use. Some years ago the Transcontinental Freight Bureau, whose offices are in San Francisco, compiled figures of the through business of the transcontinental lines, but the chief of that bureau reports:

> This office has compiled no statistics whatever for several years past, neither has it been furnished with any reports of the movements of business.

The managing editor of Poor's Manual of Railways says:

> This matter [the statistics of transcontinental railway traffic] has been the subject of inquiry for some time, and without any result.

The officials of the Pacific railways who were conferred with in regard to the volume of business that would be affected by the canal were unable to supply the information. The traffic manager of one of the lines reported:

> So far as our line is concerned, would say that we have virtually discontinued compiling statistics of this nature, finding after many years' experience that the expense incurred in compiling these figures was unwarranted.

One of the Pacific railway companies furnished the Canal Commission with a statement of the tonnage east and west bound during 1899 for each of the important commodities comprising its total through traffic. By through traffic was meant that originating anywhere on the lines of the company and turned over by the company to some connecting railroad; also the freight received from some connecting road and carried to some point along its own system of lines. This classified statement comprises a total of nearly 2,000,000 tons of freight and gives an interesting exposé of the nature and volume of business being done by this important Pacific railway system. The figures, however, reveal but little information concerning what portion of this total traffic would be subject to canal competition were the isthmian waterway now in existence.

While information concerning the present volume of traffic of the Pacific railroads that would be subject to the competition of an isthmian canal, were the waterway now open, would be interesting and possess some value, it would not throw very much light upon the manner in which the business of the transcontinental railways will be affected some ten or fifteen years hence by the competition of an interoceanic canal. Between now and the opening of the canal the position of the railways as carriers will have become stronger, and, whatever their business may be at the time of the completion of the waterway, their policy with reference to the retention and development of their business will doubtless be much modified by the inauguration of water competition by the new route.

NATURE OF THE COMPETITION OF THE CANAL WITH THE RAILWAYS.

In addition to finding it impracticable to determine the amount of railway business that would be subject to competition by a canal were it in existence at the present time, it has likewise been impossible to draw a sharp line between the classes of commodities that would be liable to move by water, and those that will move by rail after both agencies have become available to the shipper. An intelligent railway official replied in response to the question: What kinds of traffic would be diverted from the railways to the canal?—

> All kinds of traffic would be diverted except that which is perishable or which demanded dispatch, unless the railroads met the competition of the canal by a reduction in rates.

Similar opinions were expressed by several other railway officials who were conferred with.

It seems probable that the competition of the canal route will not be confined entirely to the bulkier commodities of comparatively low value per unit of weight or bulk—articles universally recognized to be especially adapted to water transportation—but that the isthmian route will be available for the shipment of practically all articles except those whose perishable nature or whose unusually high value demand a quick service and a prompt delivery. The distance between our two seaboards by the isthmian canal will be about 5,000 nautical miles and the time required to make the run will be about three weeks for the slow freight steamers of 10 knots an hour, and about two weeks for the 15-knot vessel. The ordinary freight service of the railroads will be only a few day's shorter than the service by the faster steamers using the water route.

At the present time the American-Hawaiian Steamship Company, which is running steamers between New York and San Francisco through the Straits of Magellan, is carrying a large variety of commodities. The time required for the passage between the two seaboards by this route is from sixty to sixty-three days, but even this length of time does not restrict the freight to a limited number of articles.

On the other hand, the practice of a New York firm that manufactures a large quantity of structural steel and iron work for buildings and bridges, and all classes of ornamental steel and iron, shows that heavy freight must frequently be shipped by the quickest route. The firm states:

> It costs about $8 per ton to ship from New York to the Hawaiian Islands around the Horn, $12 per ton to send the freight by way of Panama and San Francisco to Honolulu, and about $19 per ton to ship across the United States by rail to San Francisco or Vancouver and thence to Honolulu. The first way of shipping takes about four to five months; the second way of shipping about three months, and the third way of shipping takes at least two months. The element of time very often enters into the question of whether it is possible to erect buildings in the time for the requirements, and often parties are compelled to ship by the most expensive lines in order to gain time. In fact, probably seven or eight thousand tons of materials will be shipped by us in this season (1900) via the transcontinental lines, and only two or three thousand tons around the Horn.

When the canal has been opened the railways will not permit their traffic to be taken away from them if they can hold it, and they will unquestionably so adjust their business as to retain the maximum amount of business. It is the belief of many railway officials that they will be able to hold most of their traffic against water competition. Whether that is so or not, is not just now under consideration, the present purpose being to illustrate the nature and extent of the competition that the opening of the canal will inaugurate. The competition will be keen and will not be restricted to a limited number of commodities.

THE CANAL AND THE TRAFFIC OF THE ATLANTIC ROADS.

From the nature of the subject under discussion the treatment can not be statistical. The only bases upon which to rest conclusions are theoretical analysis and the opinions of traffic experts. The main purpose of the following pages will be to present impartially the views of transportation experts whose opinions are worthy of consideration. Several officials of the Atlantic lines were asked the following question: "Will the canal promote the commerce and industries of the Atlantic slope in such a way as to give the railway lines to the Atlantic a larger traffic in coal, iron and steel manufactures, machinery, and other commodities?"

Two traffic managers of the Atlantic railroads handling the largest volume of freight expressed the opinion that the opening of the canal by giving the American manufactures readier access to western South America and the Far East would largely increase the exports of manufactured commodities. The major share of the manufacturing done in the United States is carried on within the territory of the lines leading to the North Atlantic ports; and those roads, accordingly, expect to secure a greater volume of traffic when the canal has become available. It was said that the amount of freight that now moves from seaboard to seaboard by rail is comparatively small; consequently the trunk lines to the Atlantic will receive more than they will lose from the operation of the isthmian waterway. Much the same view was expressed by a traffic manager of one of the Pacific railways.

Some railway officials, particularly those whose roads lead to the Gulf ports, believe that one effect of the canal on the railway traffic in the United States will be to divert a considerable share of the business at present done through the Atlantic ports to the cities situated on the Gulf. This view, however, seems not to be shared by the officials of the North Atlantic trunk lines, for the reason that the railway lines to the Atlantic are shorter, from points east of Chicago and north of Kentucky and Virginia, than those to the Gulf are, and for the reason that the ocean rates from Atlantic ports to the Pacific coast of the United States and the foreign Pacific countries will be practically the same as those from Gulf ports.

Officials of the Atlantic lines were also asked whether "one result of the canal will be to cause a larger share of total imports of the United States to enter the country through the Gulf ports;" and whether "the canal will divert to the Gulf gateways imports that would otherwise enter through the Atlantic ports." The opinion seemed to be that the Atlantic lines will be able to retain their present strong position in the import traffic, in competition with the Gulf lines, partly because most of the export business will continue to be handled at the Atlantic. Both the Atlantic and Gulf roads load light from the seaboard to interior points, the heavier volume of traffic being outbound. The North Atlantic ports have a much larger ship tonnage at their service than the Gulf cities now have or will secure. The northeastern section of the United States, being the most important manufacturing region, will continue to be the chief importing section. Thus, while it was believed that the imports by way of the Gulf cities will probably be larger after the canal has been constructed than they can be before that event, it was not thought that this larger trade would be secured by drawing traffic away from the North Atlantic cities and the railroads serving them.

Another question asked the officials of the North Atlantic lines was whether "the roads to the Atlantic will exchange less traffic with the Pacific lines as the result of the canal." The replies indicated that the Atlantic lines did not expect the canal to have the effect of reducing the volume of business exchanged between Atlantic lines and Pacific roads. The railways will not permit their business to be taken away without an effort to retain it, and wherever possible arrangements will be made for transcontinental shipments on through bills of lading to the west coast of the United States and to countries beyond. The present volume of business exchanged between the Atlantic and Pacific roads is comparatively small. It will not be less after the canal has been put into operation.

While the officials of the eastern roads are by no means unanimous in their opinions, the foregoing statement of their opinions is believed to represent fairly their views.

THE CANAL AND THE TRAFFIC OF THE GULF ROADS.

It seems uncertain how much of the import and export business of the section north of the Ohio and east of the Mississippi will be done by way of the Gulf ports; the testimony is not unanimous. Probably some of the trade of this region will be handled by the Gulf ports; and the competition of the Gulf lines will affect the rates on a large share of the business that is handled by the Atlantic roads and ports. The opening of the isthmian canal will give the people of the States north of the Ohio and the Missouri rivers the choice of three routes for their trade with our west coast and Pacific countries, and the volume of their trade will be a prize for which the Atlantic, the Gulf, and the Pacific lines may be expected to strive with zeal.

There can be little uncertainty as to the general effect of the canal upon the traffic of the railways located in the Southern and Southwestern States. The railways serving the Southern States will have the same measure of benefits that may come to the industries and trade of the region. The canal can take no business away from the South or the southern railways. It can only increase existing railway business and draw new industries and trade to the section.

The import business handled by the Gulf lines is small at present, and it will doubtless always remain less than the volume of outbound traffic, although the opening of the canal may be expected to increase the amount of inbound business handled by the Gulf cities. The officials of the Gulf lines who were consulted believe that the canal will cause a moderate though not a large volume of imports to enter through the Gulf cities.

THE CANAL AND THE TRAFFIC OF THE RAILWAYS OF THE CENTRAL WEST.

In that large stretch of country north of the Ohio and Missouri rivers and west of Chicago, that is to say, in the region west of the territory served by the trunk lines to the Atlantic Ocean and north of the States occupied by the railway systems terminating at Gulf ports, there is a network of important railways having a large volume of traffic. Until recently the traffic of these railways in the Central West consisted almost exclusively of agricultural products, but the diversification of industries in that part of the United States is now proceeding with great rapidity. There is an immense volume of export business, the major part of which is now handled by the lines leading to the Atlantic Ocean, although latterly the lines to the Gulf have handled a portion of this traffic, and the volume of business handled from the Central West by the transcontinental railways has grown to considerable dimensions. The imports brought into the Central West from foreign countries come mainly by way of the Atlantic gateways. A certain amount of fruit comes through the Gulf cities, and an appreciable volume of oriental goods is brought in by way of Pacific ports.

As to the effects of the canal upon the railway traffic in the Central West opinions are not unanimous. Manufacturers and most, though not all railway officials, anticipate that the canal will develop a large volume of new business. The views of those railway officials who expect but small results from the canal were well summarized by a prominent official of one of the strongest roads of the Central West—a system that ramifies in seven States. He said that inasmuch as the industries of the territory served by this road were chiefly agricultural, no large volume of traffic would ever be exchanged with the agricultural States of our own Pacific slope. This gentleman said that if the canal were to affect the business of railroads situated as his system is, it must be accomplished by the creation of manufacturing industries, and it was his opinion that the volume of this kind of business would not and could not become very large. If the canal should divert this new business from the Pacific roads to the Atlantic trunk lines, or to the roads leading to the Gulf, that result would not affect the roads of the Central West, because this diversion would do little more than to change the direction in which the traffic was hauled by his and similarly situated roads. Believing that the development of manufacture would be limited to small proportions, and that any diversion of traffic would simply change the direction in which the outbound and inbound business was handled, it was the opinion of this gentleman that the canal could not affect the business of his railway and other similarly situated systems to any large extent.

The traffic manager of another equally strong railway system in the Central West was of the opinion that an isthmian canal would help build up the upper Mississippi Valley and be a benefit to the railways of that section. As a general proof of this proposition he cited the Lake Shore and Michigan Southern Railway as one that was particularly subject to water competition, and which was nevertheless one of the most profitable freight roads in the United States. The canal, he said in substance, will doubtless take from the railroads some shipments they would otherwise secure, but by increasing the total volume of business, by causing the centers of distribution and manufacturing to grow and multiply, and population to increase, the water route will add to the traffic seeking transportation by the railroads. This gentleman believes that water competition is a help instead of an injury to the railroad, because of the larger industrial development made possible by the cheaper water transportation. He called attention to some of the large wholesale and jobbing houses in St. Louis, and said that the prominence of that city as a wholesale jobbing center was partly due to the cheap transportation from the East by way of the Gulf and the Mississippi River. This official also laid down the proposition that the best conditions for a heavy railway traffic are produced by the existence of a large number of manufacturing and distributing centers. Some railway officials, he said, seem to believe it better for the railroads to favor the concentration of business in a few large centers; but such a policy experience had shown would restrict the possible development of railway traffic within unnecessarily narrow limits. Believing that the canal will develop the territory, diversify and distribute industry, he was of the opinion that the effect of the waterway upon the business of the railway lines situated in the Central West would be beneficial.

While these views regarding the efficacy of water competition to develop the industries of the interior part of the United States, and to increase the traffic of the railways of that part of the country, are not shared by all the railway officials that were consulted, the history of transportation, the evidence afforded by a study of business conditions in different parts of the United States, and the opinions entertained by the manufacturers and large shippers of commodities, tend to substantiate the accuracy of the position taken by those railway officials, who expect their lines to profit rather than suffer injury by the opening of the proposed isthmian canal. No one can visit the great industrial centers of the central West, study the vast resources of the States of that section, and acquaint himself with the activities of the business men without feeling certain that increased transportation facilities are certain to result in a very large expansion of industry. The history of the great central West shows that the measure of its industrial development has always been the measure of its transportation facilities. New facilities mean new business; and this is more true to-day than it was twenty-five or even ten years ago.

EFFECT OF THE CANAL UPON THE TRAFFIC OF THE PACIFIC RAILWAYS.

The railway systems that will feel the competition of the new water route across the Isthmus most severely are those whose lines connect the Mississippi Valley with the Pacific coast. This competition may apply to nearly all kinds of traffic. The only articles wholly exempt will be the perishable fruits and those goods of high value sent by express and as fast freight. The more southerly Pacific lines will feel this competition more keenly than will those situated farther north. The northern lines, moreover, will be able to meet the canal competition more readily than will those farther south, because the territory crossed by the southern roads includes such a wide belt of relatively unproductive country. The northern half of the Cordilleran highland is not only rich in mineral resources, but is also capable of raising considerable quantities of agricultural products. In some parts of this region irrigation is necessary and in others not. The southern part of this great highland, however, is capable of but a limited development. The mineral resources are less extensive. Wherever agriculture is possible it is dependent upon irrigation, and the irrigable areas are very limited. Thus the northern lines have a territory capable of producing a much larger amount of local traffic than can be secured by the southern lines from the country across which they are located.

Traffic officials of the three southern lines to the Pacific stated their views with frankness and in some detail. The opinions of these gentlemen, however, differ largely. The views of those who believe that the effect of the canal will not be to create business, but that it will compel a large reduction in railway rates without affording compensation to the railroads, were fully stated by an official in charge of the traffic business of one of the Pacific roads. He said in substance:

> During the early years of the transcontinental railways the traffic from the Atlantic section of the United States to the Pacific section was drawn almost entirely from the Atlantic seaboard. Before the railways were built the traffic was all handled by the sea route, and the costs of transportation from the interior to the ocean were such that the traffic was drawn almost entirely from the seaboard cities. The effect of the transcontinental railways has been to cause a large part—three-fourths, it is estimated—of the business carried across the country westward by the transcontinental railways, to originate in and west of Pittsburg. The effect of the canal will be to tend to cause traffic to originate nearer the Atlantic seaboard again, and thus affect deleteriously not only the business of the transcontinental railways, but the general industries of the middle section of the United States.
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> The traffic of a canal will consist of all kinds of commodities except those of a perishable nature. The competition of the waterway with the railway lines will be very severe, but the railways will not permit their traffic to be taken away from them by the canal. The competition will necessitate a reduction in rates—such a reduction as may throw the transcontinental railways into insolvency and require the scaling down of capital. The railways will continue in business, however, after the owners of the property have suffered a great reduction in the value of their holdings.
>
> As far as the export trade across the Pacific is concerned, the canal would be an injury to the Pacific coast seaboard, because the export traffic very largely originates in the central and eastern part of the United States. That traffic would be carried directly to the Eastern and South American countries by way of the canal.
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> The establishment of industries along the transcontinental railway lines as a result of the opening of the canal will be possible only to a small extent by any of the transcontinental railways south of the Northern Pacific. The Southern roads cross such a long stretch of arid country that general industries can not be developed except relatively near the termini. California and the Pacific coast generally do not constitute a manufacturing section, nor will they become such.

Before criticising the remarks contained in the foregoing statements, the views of a traffic manager of one other Pacific line may be stated. This traffic manager says that the canal will compel a reduction in rail rates to Pacific terminal points below the charges that would otherwise prevail, and that the adjustment of charges will probably result in the establishment of blanket or identical rates between Pacific ports and all points in the central and eastern part of the United States. The effect of this will be to take from the cities in the central part of the United States the advantages which they have over the Eastern cities for trade with the Pacific coast. This official does not believe that the canal will be of much help to California, because the trade in grain, which is and will always be the principal item of export, is going to be carried on less with Europe and more and more with China and Japan, where the consumption of wheat is even now taking the place of rice. He believes that the surplus grain products of the Pacific coast will be milled and shipped to the Orient, and that the canal will not be of benefit to this industry. Concerning the general effects of a canal upon the commerce and industry of the United States as a whole, this traffic official is more optimistic than the others above quoted. He says, and very accurately, that the transportation business of this country is so organized that if touched at one point the effect is felt everywhere. The opening of the canal will afford a new transportation agent of importance, and while it will compel an adjustment of business, a revision, and in some cases a reduction, of rates, the railroads will nevertheless find business to do, and the travel and traffic of this country and the business done at home and abroad will so increase as ultimately to make both the railways and the canal a necessity. The construction of the canal was regarded by this traffic official as inevitable, as something which the American people have decided to be necessary for naval reasons and for the purpose of securing the quickest and best transportation facilities for their domestic and foreign trade. The transcontinental railways, in his opinion, will temporarily suffer from the reduction in rates, but the growth of the country will be such that twenty-five years from now the railways will have nothing to fear from the canal.

In the opinion of the Pacific railway officials above quoted, and of others, the isthmian canal will be an active and rate-controlling competitor. That this is true will hardly be questioned, and if the canal can not compensate the railways with a larger volume of business they will not share with the producing and manufacturing interests in the benefits accomplished by the water route. Whether the canal will give the Pacific railroads a larger traffic than they would otherwise have is partly a matter of judgment and partly a question of safe deduction from past experience.

The belief entertained by one of the officials above referred to, that the isthmian canal will draw traffic and the centers of industry back from the central section of the United States to the Eastern States, is based on an inadequate conception of the industrial strength of the Central States, as compared with the Eastern. The Central States possess vast stores of coal, iron, and timber, and these and their other natural resources are causing the population and industrial activities of our country to become generally distributed. The railways that serve the Central States are wisely fostering this tendency, and these railway systems are among the strongest and most efficient of any in the United States. After ten or twelve years more of progress on the part of the industries and railway systems of the central portion of the country, they will be quite secure against defeat from competition with the East. Indeed, the canal will so facilitate the foreign trade of the Central States as to make them stronger than they now are as compared with the Eastern section.

It is asserted by one of the railway officials whose opinions are given above, that the isthmian canal will injure the Pacific States by diverting from them the imports destined for points east of the Rocky Mountains. The present volume of these imports by way of the Pacific coast cities, however, is small and will probably remain so. Without an isthmian canal the goods brought in from foreign Pacific countries will be imported into the eastern half of the United States, as most of them now are, by way of New York and other Atlantic ports. The importations of teas, silks, mattings, and curios by way of our Pacific ports and the transcontinental railroads is increasing, it is true, and may be expected to grow in volume as the costs of railway transportation decline. After the canal route has been opened the railways will be obliged to share this traffic with the steamers using the canal. Here again, however, it is probable that additional facilities for transportation will be accompanied by a larger demand for commodities and an increased traffic for the old routes as well as the new. If the isthmian canal produces any changes of importance, one effect will be to give greater prosperity to the western third of the United States, where the Pacific railroads must always perform the transportation service, to stimulate the growth of population there, and to increase the consumption of such articles as are imported from the Orient.

One of the witnesses above quoted thinks that the wheat exported from the Pacific coast will, within a few years, be sent entirely to Pacific instead of Atlantic markets. There is a growing trans-Pacific trade in flour and an increasing quantity is required at home by the growing population of the Rocky Mountain and Pacific slope States. This, moreover, is being accompanied by a diversification of agriculture and the production of other cereal crops and of fruits and vegetables. Nevertheless, the western section, particularly the States of Washington and Oregon, may be expected to remain large exporters of wheat and also of barley to Atlantic countries for several decades to come.

CONCLUSIONS.

The competition of the canal will affect, first, the volume and rates of the through business of the Pacific railroads, and secondly, the amount of their local traffic. At the beginning of their existence these railways depended almost entirely upon their through traffic; but their chief aim throughout their history has been to increase the local business, which is always more profitable than the through traffic; and although the great stretch of country crossed by them is still in the infancy of its industrial development, the local traffic of some, if not all, of the Pacific roads has already become of chief importance. A vice-president of one of the railway systems states that since 1893 "the increase in business of the transcontinental lines has not come from the seaports, but from the development of the intermediate country." The canal can certainly in no wise check the growth of this local traffic, and the evidence strongly supports the belief entertained by many persons that the canal will assist largely in the industrial expansion of the territory served by the Pacific railways.

If this be true, the proximate effect of the isthmian canal in compelling a reduction and readjustment of the rates, on the share of the transcontinental railway business that will be subject to the competition of the new water route, will be more than offset by the ultimate and not distant expansion of the through and local traffic, that must necessarily be handled by rail. It seems probable that the increase in the population of the country, and the growth in our home and foreign trade, will early demonstrate the need of the transporation service of both the canal and the railways.

CHAPTER XI.

THE TRADE AND INDUSTRIES OF WESTERN SOUTH AMERICA AND THE EFFECT OF THE CANAL UPON THEM.

The benefits of an isthmian waterway will be felt in varying degrees by more than half the countries of the world. In some regions this influence will be slight and indirect, or will modify only a small part of the trade, while in others it will affect the greater part of the commerce and will work changes that will be almost revolutionary. The United States will obtain the most direct and far-reaching results from the canal; South America will probably be the second greatest recipient of its advantages.

AREA AND POPULATION COMPARED WITH NORTH AMERICA.

South America is but slightly smaller than North America. It is wider between Pernambuco and Guayaquil than the United States is between Oregon and Maine, and is long enough to reach from the isthmian canal to Baffin Bay, a thousand miles beyond the southern point of Greenland, yet none of her shores are frozen. These rather surprising dimensions are seen more clearly by a glance at the globe, which will correct the erroneous impressions that flat maps make by exaggerating the size of countries of high latitude and diminishing the area of equatorial regions. Viewed on a wall map, North America appears much larger than South America, when, in reality, there is but slight difference in the area of the continents. By drawing a map on the polyconic projection, as has been done in Plate 75 accompanying the report of the Commission, the relative areas of the two continents can be shown.

Brazil alone is larger than the combined area of England, France, and the United States, exclusive of Alaska, while each of five other South American Republics exceeds in area the original thirteen States of North America with Maine, Vermont, and Florida added, and the State of Massachusetts with its irregular shape could be completely hidden away by being put down in the midst of the unexplored areas of the great forests of the Amazon Valley. Although large, South America does not have a greater proportion of worthless territory than have most of the other continents. There are deserts in Peru and Chile, and mountain wastes and swampy forests in the center of the continent; but these areas are small compared with the unoccupiable parts of North America. Canada and Alaska, comprising a third of the continent, are largely uninhabitable because of the cold climate. The plains and plateaus west of the Missouri River embrace a third of the territory of the United States, that can be only sparsely inhabited because of its aridity. The proportion of arid land in Mexico is greater than in the United States.

In South America the present sparse population has but touched the resources that can support commonwealths as populous as those of Europe when immigration and settlement shall have occupied the country. The present sparseness of population and backward development of South America are due to three causes. The first is the difference in character of the races inhabiting England and Spain—a difference as marked in their colonies as in the mother countries. England and her colonies have prospered, while Spain and her dependencies have languished. Had England, not Spain, possessed South America after the sixteenth century, the continent would now be more highly developed, although its social institutions might have differed from those of North America, as the result of climatic dissimilarities.

South America's sparse population is furthermore due to the fact that Europe has not yet needed South America as a home for overcrowded peoples. Canada is still giving away farms, the United States has scarcely ceased doing the same, and in the old-settled commonwealths of the Eastern and Southern States of our country hardly more than half of the available area is cultivated. The United States is still a comparatively empty country. The emigrating races of Europe, which have been chiefly the Teutonic, have found stable and friendly governments, fellowship of race, and familiar climate in the United States, Canada, and Australia. These attractions were not offered by South America. Settlement there was impeded by the tropical climate of a large part of the continent, and by the fact that the most suitable districts for white colonization were on the inland plateaus, separated from the ocean by unhealthy lowlands which must be crossed by railroads before commercial relations could be established with the rest of the world. Under these conditions an extensive occupation of the country has waited for corporate enterprises to provide the needed transportation facilities. There have been no large European emigrations except to Argentina and southern Brazil, where the climate is similar to that of the temperate latitudes of North America, and where the governments, being fairly stable, have provided the political prerequisites for industrial growth.

THE TRADE ZONES OF SOUTH AMERICA.

In discussing the industries and trade of South America, and the manner in which they will be affected by an isthmian canal, it is necessary to divide the continent into trade zones. The various countries do not form a satisfactory division, because in some cases two or three adjoining States have similar climate, resources, and trade connections. Nor is a separation of the continent into zones of latitude helpful, because very dissimilar regions are found in the same latitude. The shape of the continent and the lack of internal communication make it necessary to treat the Pacific and Atlantic sections separately, and each of these sections has a temperate and a tropic division calling for separate treatment. In the discussion that follows, the continent has been divided into (1) the Temperate Pacific section; (2) the Tropic Pacific section; (3) the Temperate Atlantic section, and (4) the Tropic Atlantic section. The political divisions comprised in each section are shown in the accompanying map of South America.

From the standpoint of the world's trade, the Atlantic sections of South America are more important than the Pacific side, but as regards the traffic and effects of an isthmian canal the western third of the continent is of greater consequence. The effect of the canal on the trade of the Atlantic region will be slight, but on the Pacific side the canal will change the routes and in some measure the destination and origin of the larger part of its foreign commerce. The references to the Atlantic sections will be brief in the following discussions, the space given to the four trade divisions of South America being in proportion to the importance of the canal to the economic development of each.

Western South America will be considered first.[a] This section of the continent includes the Pacific coastal strip and also the Andean plateau, and reaches from the southern limits of the habitable part of the temperate zone northward well into northern tropical latitudes. The Republic of Chile, in the temperate zone, is as large in area as our New England and middle Atlantic States with Maryland and the Virginias added. Northward in Peru and Bolivia the ranges of the Andes broaden, so that in addition to the coastal plain, often 60 miles across, there is an extensive plateau a thousand miles long and in places several hundred miles wide. On this broad highland is the Titicaca Basin, with a system of rivers flowing into a lake about half the size of Lake Erie, and furnishing hundreds of miles of navigable waterways.

INADEQUATE TRANSPORTATION FACILITIES OF WESTERN SOUTH AMERICA.

The Pacific frontage of South America has more than double the population and area of our Pacific coast States of California, Oregon, and Washington. The western sections of the two American continents are, however, very differently situated commercially. Our Pacific slope has the advantage of seven transcontinental railroads; the Pacific coast of South America has but one, and that is incomplete. The foreign commerce, and to a large extent the domestic trade of the west coast of South America, is dependent upon inadequate and circuitous water transportation. The building of the Panama Railroad has been of comparatively small importance to the trade of South America. The costs of transshipment at the Isthmus and the high freight rates charged, limit the use of this route mainly to passenger traffic and the freighting of articles that need quick transportation. Cheaper commodities take the longer route around the continent. A prosperous industrial growth requires transporting agencies that can profitably and cheaply move such commodities as coal, iron and other ores, grain, etc. This the Panama Railroad can not do, and such commodities, if moved at all, must go through the Straits of Magellan or around the Horn.

The great distance that must be traversed by the ship passing between the commercial countries of the North Atlantic and the west coast of South America, has caused the commerce of those countries until recently to be chiefly dependent upon the sailing vessel. The introduction of regular steam connection promises better transportation facilities for the future, especially after the canal shall have been completed. Callao, Peru, is now farther by steam from New York than is the South Pole, but an isthmian canal will bring the city 1,000 miles nearer to New York by steam than San Francisco will then be.

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[a] Consult Plates 76, 77, and 78, upon which are located the places, resources, and industries mentioned in this chapter.

The present difficulties of transportation restrict travel, and thus prevent the people of the United States and Europe from becoming acquainted with the people and trade conditions of western South America. Commercial exchanges prosper only when knowledge and intimacy break down mistrust and reveal the commercial needs of the trading nations.

In Pacific South America generally, as in other Latin American countries, the difficulties of inland transportation are a great hindrance to industrial and commercial progress. Excepting a few lines of railroads, there are practically no means of communication in western South America save the pack mule. This state of affairs makes the commerce of the interior districts similar to that of Europe in the Middle Ages, when international trade was limited to silks and spices and other light commodities of high value, that could be carried long distances by caravan and to the few bulkier articles produced along the seacoast and navigable rivers. The inland districts of England, France, and Germany then had considerable populations, but each community raised its own food, made its own clothing, and knew little of the products of other countries. The improvements that have transformed the European countries have not yet had much effect upon the tropic section of Pacific South America. Only a small proportion of the population contributes anything to the foreign trade. The rest live in isolated communities, each of which is practically self-supporting.

DEPENDENCE OF WESTERN SOUTH AMERICA UPON FOREIGN CAPITAL AND LARGE ORGANIZATIONS OF CAPITAL.

The nineteenth century witnessed an enormous expansion of commerce throughout the greater part of the world, largely because industries developed in new countries by means of the capital that Europe had slowly accumulated through several preceding centuries. The foreign trade which South America now has is almost entirely the result of European investments. Foreign capital has worked the coffee plantations of Brazil, and built her railroads and those of Argentina. The flocks of Argentina are owned by Englishmen and Scotchmen, the nitrate works of Chile are in the hands of English and German owners, and the sugar plantations of Peru are the property of Americans and other foreigners.

The capitalistic development of western South America, particularly the northern part, has, however, not yet progressed very far. It has great stores of natural wealth, but the obstacles in the way of their utilization have not been overcome. Large organizations of capital are especially necessary in the Andean region and on the west coast. In Argentina the European owner can cultivate his grain and pasture his flocks in a level country watered by rainfall, but in Peru irrigation is necessary to agriculture. The building of a railroad across the level pampas, to carry away the wool and grain of Argentina, is a very much easier task than building a line up the defiles of the Andes to tap the mineral wealth of the plateau. Operation on the east side can be conducted with moderate capital, but on the west side the large capitalist, the mining expert, and the complicated machine are necessary. The return to capital, however, promises to be liberal.

Foreign capital has made less headway than would otherwise have been made in western South America, because of the frequency of political disturbances and civil wars. The deleterious effects of frequent revolutions and unstable political conditions are known to be great, and are felt even more by the merchant than by the capitalist who is engaged in mining, agriculture, or transportation. The manager for a strong corporation, which has for years operated a large sugar plantation in the Peruvian irrigated belt, reports that the per cent of loss that has actually occurred from civil wars has been, on the whole, surprisingly small. The country, however, suffers greatly because capitalists are deterred from making investments.

The western part of South America has been lying idle, while more accessible resources elsewhere have been levied upon. But a new era seems to be at hand. The constant tendency everywhere is to organize capital on a large scale, and it seems probable that the development of western South American will be undertaken by organizations of capital, similar to those that are giving the United States its industrial preeminence. In fact, a substantial beginning has already been made, and that beginning is responsible for the present importance of western South America to the world's trade. In 1899 Chile exported more tons of nitrate of soda than the port of New York exported tons of wheat. This nitrate was produced by large foreign corporations owning their own nitrate beds and reducing plants, the railroads to carry the product to the seacoast, and the piers and warehouses from which to ship it. In 1899 Peru exported 110,000 tons of sugar, which had been produced by firms that could irrigate their plantations, install expensive machinery, build lines of railway to the port or to some main line, and, in some cases, the product was exported in the ships of the producers. By the increase of enterprises of this character the west coast can double and treble the amount of her contributions to international trade.

The first step to be made in the direction of these changes will be in bettering the means of transportation by the building of railways, or starting industrial undertakings which include, as a part of the enterprise, an improvement in the existing method of transportation. This will come about easier after the opening of an isthmian canal, which will tend to quicken the industrial and commercial life of the west coast of South America. Cheaper freights will enable the commodities now exported to be marketed more cheaply and other articles not now utilized will find their way into commerce. With the greater possibilities of securing freight will come new inducements to build railways and make other improvements in transportation. Railway materials and the machinery necessary for the equipment of industrial plants will be cheaper, because of lower freight rates from the iron-producing countries north of the Isthmus.

The supply of capital for South America will in the future come from the United States as well as from Europe. We have become large exporters of the iron and steel and machinery needed by new countries. Our increasing wealth and population will furnish money and men for industrial enterprises in foreign lands. American ownership and direction of railroads, mines, and other enterprises in Mexico have been chiefly responsible for the industrial revolution in that country during the past twenty years, and for the accompanying expansion of her commerce, the chief part of which has been with the United States. This work is still going steadily forward in Mexico, but we shall likewise welcome opportunities lying beyond the Isthmus of Panama.

DISADVANTAGES OF THE UNITED STATES IN TRADING WITH WESTERN SOUTH AMERICA—GENERAL EFFECT OF THE ISTHMIAN CANAL.

With very few exceptions the industries of western South America may be classed as mining and agricultural. This is the case even in the seacoast regions engaging in foreign trade. There are, of course, local manufactures of various articles in the towns and villages, such work as is done locally in any community, but the nature of the resources of western South America is such that the region is likely to continue permanently in the extractive stage of industry, or at least until a period too remote for consideration here. Pacific South America is now but half of an industrial unit; the other half, the manufacturing complement, is in Europe and the United States. Each one of these industrial half units needs better facilities for marketing its produce in the other. One important service of an isthmian canal will be to bring these separated commercial and industrial complements into closer relation.

The west coast of South America bears a relation to the manufacturing centers of Europe and the United States similar to that which Montana, Colorado, and Texas, with their raw products, bear to the manufacturing States of the East. The countries of the North Atlantic need and are buying the export products of the west coast of South America—the nitrate and the ores of copper, silver, and gold, the grain, sugar, cotton, cocoa, coffee, wool, hides, rubber, and woods. In return for this export these South American Republics are importing from many countries, but chiefly from the United Kingdom, all kinds of manufactures, from steel rails to jewelry and fine clothes. Both parties will be benefited by increasing this trade. The production of raw material will be stimulated no less than the production of manufactures. For any gain that comes to South America the rest of the world must receive an accompanying or complementary advantage.

The United States will derive especial advantage from the shortening of the roundabout path of this large and increasing commerce. Because of the present route around the continent the trade of the west coast is mainly with Europe, but on the opening of the canal there will be a change of front toward the United States. Both European and American traders will have greatly improved opportunities, but the larger relative improvement will come to the east coast of North America. Our ports will then have from 2,000 to 3,000 miles advantage over Europe in the journey to the west coast, whereas at present the distance from New York and the ports of the English Channel to that section of the world are nearly equal, the southern cities of Europe having a slight advantage over the ports of the United States. Nearly all of South America lies east of North America. The meridian of Washington is that of Callao, on the coast of Peru. Antofagasta and Iquique, the chief nitrate ports of Chile, have the longitude of Boston. Valparaiso is 71° 40′ west longitude and New York 74° 03′. The eastern point of Brazil lies 2,600 miles east of New York, and is equidistant from New York Bay and the English Channel. These facts are well shown by Plate 75.

The sailing vessels bound from New York for the west coast of South America must go eastward nearly to the Canaries, so as to be able to take advantage of the trade winds and get past Cape St. Roque, on the coast of Brazil. The European sailing ship goes directly past the Canaries, and has an advantage of ten days over the American in a voyage to any part of South America south or west of the eastern point of Brazil. For many decades our direct commerce with South America has been chiefly by sail, and we have competed with Europe under most unfavorable conditions. The small part of our trade that has not gone by sail has gone by steamers to Panama for transshipment to the two lines of steamers going down the west coast.

These lines have combined to keep the rates at such a figure that for most of the time during the last thirty-five years it has been cheaper to ship American goods to South America via England or Germany. It has often cost the American shipper from 30 to 50 per cent more to send freight 3,500 miles direct to western South America by Panama than to send it 14,000 miles indirectly by way of Europe. Shipping around the Horn by sail is such a slow and irregular means of reaching the markets as to prevent the development of a satisfactory commerce in these modern times, when expedition is the order of business. Our share in the trade of the west coast of South America has not been gratifying to national pride; indeed, we have done little more than to sell in those countries the commodities that they could not secure elsewhere. Europe has taken nearly all of their exports and supplied them with most of their imports.

Since 1890 two American companies have been running chartered British vessels around to Guayaquil, and during this period the value of our exports to the west coast has increased 16 per cent; this, however, is less than one-third the rate of the increase of our total exports. Fortunately the steamer is rapidly taking the place of the sailing vessel. In 1890 steam vessels carried, largely via Panama, 36 per cent of our exports to the countries of western South America. In 1900 81 per cent of our exports to those countries went by steam, a gain of 225 per cent in the proportion carried by steam.

The starting of the lines of steamers from New York has not, however, given our manufacturers an even chance with those of Europe. American merchants and consuls on the west coast complain that the steamers from New York charge higher rates than those from Europe, and nearly as high as the Panama lines. Nevertheless, these steamers always leave New York fully loaded with export freight, and the profitableness of the business is attested by the addition from time to time of more vessels to the fleets. This suggests what may be expected to occur when the isthmian canal and more lines of steamers give us shorter and better means of communication with Pacific countries.

We have a thriving trade with the American countries near to us. Fifty-nine per cent of Canada's imports come from the United States. The ocean route to Mexico is longer than to Canada, and the railroad connections over the land frontier are much less satisfactory, yet we furnish 49 per cent of the Mexican imports. The northern countries of South America are about 2,000 miles from New York, but we have fairly good steamship connection and a growing trade, Colombia and Venezuela drawing about 30 per cent of their imports from this country. In contrast with this, however, the United States furnishes less than 10 per cent of the imports into the countries of the west coast of South America; and our trade there has increased slowly at a time when the growth of our exports as a whole has been rapid. Under the present adverse conditions, our share in the trade of the west coast of South America is only one-third as great as it is in the South American countries bordering on the Caribbean Sea, one-fifth as great as in Mexico, and only one-sixth of the percentage which we control of the trade of Canada. An isthmian canal, and the lines of communication that it will open up, may be expected to give this country a larger share in the trade of the Pacific.

This conclusion is strengthed by some incidents in the history of the foreign trade of Chile. In years past, the British share of that trade was greater than it is at present. The British commissioners, sent in 1898 to investigate the cause of this decline, reported as the first cause that British merchants did not secure as low freight rates for their commodities as were obtained by their continental rivals, the difference in favor of Antwerp and German ports being sometimes 25 per cent. It was found that English merchants sometimes sent British goods to those ports for reshipment to Chile. The lower rates from Germany were due to the nitrate trade. Germany being the largest importer of Chilean nitrate of soda, the ships returning from that country to Chile could offer the best rates on outgoing freight, and this was one of the causes that had enabled the German merchant to build up a large South American trade.

A similar advantage will come to the traders of this country when the canal has been opened. By that time the United States will have a larger consumption of nitrate, our vessels will go directly down the South American coast, and the favorable shipping facilities that are now giving Germany an advantage over the United Kingdom will be possessed in a more marked degree by American merchants. Moreover, it is probable that the vessels en route from Europe to South America will aid our exporters by calling at our ports for coal and other cargo.

The advantage of cheaper transportation is already shown in the export cotton trade of the United States to Chile. At certain times nitrate ships returning to South America offer very favorable rates from New York, and exporters then dispose of cotton cloth in large lots at Chilean ports, thereby securing a trade which the regular conditions of freight would not permit.

The future trade between our east coast and the west coast of South America will have the advantage of a heavy traffic both ways, a phenomenon rarely met with in international commercial movements. Our east coast trade with Europe consists mainly in the exchange of large quantities of agricultural and other heavy produce for a small quantity of manufactured products, and this necessitates a large ballast movement westward across the North Atlantic. Our exports from New York to Australia are but partly balanced by the small return trade. Our exports to the Orient of iron, cotton, and foodstuffs are exchanged for light curios, tea, and mattings. Our trade to South America is certain to give rise to an increasing exportation of articles similar to those we are sending to China and Australia, with the probable addition of coal, and these commodities will be exchanged for Peruvian sugar, Chilean nitrate, ores, and heavy produce, so that vessels will readily secure cargoes both ways. This will be an advantage both to the steamship companies and the shippers.

GEOGRAPHY, RESOURCES, AND INDUSTRIES OF CHILE.[a]

Having discussed the general industrial and commercial conditions of western South America as a whole, it will be profitable to examine the temperate and tropical regions separately and with some detail. The temperate division of the continent, for the purposes of this discussion, may be considered practically coextensive with Chile; for although the northern boundary of Chile extends beyond the Tropic of Capricorn, the aridity of that part of the country makes mining the only industry. Mining industries being independent of climate, the activities of Chile that are determined by climate are located within the Temperate Zone. Chile is long and narrow, but her area is large—larger, in fact, than that of France, Germany, or the United Kingdom, or the combined area of the New England and Middle Atlantic States with Maryland and the Virginias added. Her length of 2,600 miles would reach from New York to Utah. The country extends from a tropic district to Tierra del Fuego, where the latitude and climate are like those of Scotland. Nitrate of soda is the chief product of the arid northern part of Chile, which is the source of supply for the entire world. The agricultural districts and the center of population are farther south, the products being similar to those of our Pacific coast States, with which Chile possesses many points of similarity.

The temperate shores of the Pacific show a succession of similar geographic and climatic features in both North and South America. These resemblances would appear plainly if Chile could be inverted and placed beside the coast of North America. The lower end of the inverted Chile would be opposite the City of Mexico, and Tierra del Fuego would be about the latitude of Sitka, Alaska. The 800 miles of Chilean desert with its nitrate beds would lie against the arid coast of Mexico where its silver is mined. Patagonia would be opposite British Columbia and Alaska, both regions being damp, fringed with rugged islands, and cut into sharp fiords walled in by forest-clad mountains, having snow fields on their summits and glaciers on their sides. The tropical and cold sections are unproductive agriculturally, but in the temperate belt of each region civilization and diversified industry are possible. The climate is that of western Europe and the United States.

It is by comparing the productive region of the north temperate Pacific with the south temperate Pacific that the greatest resemblances and likewise the difference of the two coasts appear. Their difference is due to the absence of a South American duplicate for the State of Washington. California and Oregon are reproduced, but the Antarctic current, sweeping up the coast of South America, shortens the temperate section of Chile so much that the region corresponding to the State of Washington is replaced by a longer continuation of the rugged and forest-clad coast similar to that of Alaska and British Columbia.

Near the Mexican boundary of the United States the resemblances to the corresponding agricultural parts of Chile are obvious. In Chile the arid country, by means of irrigation, produces grapes and raisins, citrus and other fruits, and alfalfa, the alfalfa being used as a supplementary fodder for the cattle pasturing on the higher hills. The arid belt extends several hundred miles, and is succeeded on the south by wheat fields and general agriculture. The Chilean forests corresponding to those of central and northern California, Oregon, Washington, and British Columbia exist in the lower half of the Chilean agricultural region and along the extensive coast of Patagonia.

The best section of the western slope of both Chile and the United States is found in a large interior valley. The valley of California, bounded on the east by the Sierra Nevadas, on the west by the Coast Range, and drained by the Sacramento and the San Joaquin rivers, is of high fertility. Chile also has a valley similar to this, but larger and superior to it in several particulars. It is inclosed by the Andes on the east and by a coast range near the shore of the Pacific; but this coast range is not so continuous as that of California, being broken at frequent intervals where rivers make their way to the ocean. Instead of being drained by two rivers flowing lengthwise, and having a common outlet to the sea, the Chilean Valley has several small rivers flowing across it and discharging into the ocean. The basins of these rivers are not separated by high divides, but are practically continuous, so that the whole district is properly spoken of as one great valley.

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[a] Consult Plates 76 and 77.

The Andes are higher than the Sierra Nevadas, and westerly winds bring a larger amount of moisture than California has. The streams have a larger and more constant flow of water from the mountain snows and furnish an abundant supply for irrigation, and in some places provide good power.

As in most arid countries where irrigation can be practiced, the soil is fertile. The crops produced are identical with those of California. All of the cereals, vegetables, and fruits thrive and provide a food supply sufficient both for the present and prospective home demands and for a large export trade. This valley is about 700 miles in length—a distance equal to that from New York to Charleston—and is divided into thirteen prosperous provinces, which had a population in 1895 of 2,400,000 people—as many as there were in California, Oregon, and Washington in the census year 1900. California has less than ten persons to the square mile, while the Chilean Valley has from three to five times as many, and is about equal in density of population to Maine, New Hampshire, and Vermont, or to our Southern States, exclusive of Florida.

The great trunk line of the Government railway goes through most of this region from north to south. It is being extended in both directions, and will eventually connect Coquimbo, in latitude 29°, with Porto Montt, in latitude 41°. The line to the last point is already surveyed. This road, most of which is now completed, will be about 1,300 miles long, and will connect with many branches and private lines from the various mining and agricultural centers. The several rivers breaking through the coastal mountain range make it easy for the railroad to connect with seaports, and there are now railway lines to six harbors, giving the producing centers of the country opportunity to take advantage of the water transportation supplied by the lines of coasting steamers that are doing a large business in both directions. In the valley of California the coast ranges make necessary a much longer railway haul to reach the ports.

The northern part of the agricultural region, the district around Valparaiso and Santiago, is older and more fully developed. Of this section the Aconcagua Valley, which may be taken as a type, is a plain highly irrigated, famed for its agriculture. The grape crop of this valley alone, it is estimated, would make 1,000,000 gallons of claret wine were it so used instead of being manufactured into the local drink called "chica." Potatoes are exported to the nitrate deserts of the north and to Panama, alfalfa hay to Brazil, and honey and wax are sent to Europe. Local canneries preserve the fruit crop, which is mainly marketed in other sections of the country. There is pasturage on the neighboring hills above the level of irrigation, where a peculiar kind of wiry grass, well adapted to its dry surroundings, grows for months after a soaking rain.

The sides of the Andes throughout this whole belt are forest clad. In latitude 37° south, the forest growth becomes general, and the country is similar to many parts of the eastern United States. This latitude is now the Chilean industrial frontier, the opening up of the region having been recently begun as the result of the advent of better means of transportation. New railroads are being built, forests are being cleared, and stock raising and cereal agriculture are increasing. The forest regions have tanning industries, sole leather being exported to Europe.

The agricultural and mining regions of Chile are north of 40 degrees. South of that there is as yet practically nothing of commercial importance except the sheep pastures of Terra del Fuego. The 1,000 miles of intervening coast is as little known as is the coast between the port of Vancouver and the mainland of Alaska. Nearly all of the present and prospective Chilean commerce and population are from 1,000 to 2,000 miles north of the Straits of Magellan, through which their commerce must find its way to the Atlantic, until the canal provides a shorter outlet.

Chile exported something over 3,000,000 bushels of grain to Europe in 1898–99, but the larger part of the exports of the country consists of the minerals mined in the northern and arid part of the State. The agricultural part of the country sends large quantities of food products to the mining regions of the northern provinces. The greater part of Chile's export wealth originates in regions that are almost a desert. Their dryness causes their richness; indeed, a moist climate, instead of being a blessing, would cause the disappearance of the greater part of the wealth of this section, which consists of such soluble minerals as nitrate of soda, iodine, borax, and common salt.

Nitrate of soda, the chief export of Chile, lies in a nearly continuous deposit parallel to the seacoast, extending 150 miles from north to south, with scattering deposits reaching 250 miles farther, the total covering 220,356 acres, and estimated to contain about 228,000,000 long tons, a quantity sufficient to last the world for many decades to come. The nitrate is found under the surface layer of sand, and when shoveled out has the consistency of cheese. It is refined in numerous and extensive plants requiring large capital. The crude product is dissolved, chemically treated, and crystallized to get rid of the impurities. Among these impurities are iodine and common salt, which are separated for export.

The city of Iquique, the most important nitrate port, may be taken as a type of the towns that depend upon the nitrate industry for their existence. Here 30,000 people, having the conveniences of a modern city, live in the desert, where every supply for man and beast must be imported from other ports of Chile or from foreign countries. Water for the city is brought by pipe-line 200 miles from the Andes. A railroad zigzags up to the plateau and winds around among numerous nitrate works situated in the desert. The railroad company is English, and most though not all of the nitrate plants are owned by foreigners. Borax is obtained in the dry districts, and in some places common salt is taken from the surface of the earth by sawing it out in cakes that are handled like ice. Besides these desert mineral products the same region contains a large amount of copper, silver, and lead. Antofagasta is the port of this section and is also the outlet for the mines of Bolivia, which ship their antimony, bismuth, tin, mercury, and sulphur over the Antofagasta railroad. Most of these products are in the form of ores, some of which are refined at Antofagasta while the rest is exported, mostly to Europe, for treatment.

The rise in the price of copper has greatly increased the copper-mining industry of Chile, and the deposits of copper promise to contribute largely to the world's supply of this metal. Low-grade copper ores have been found in abundance in the district near Santiago, near to the ocean. Copper now ranks second among Chile's exports, amounting in 1900 to 25,178 metric tons of the metal and 20,210 tons of the ore. In coal Chile has an asset that will assist with the development of other resources, although she has small prospects of ever becoming a coal exporter. In the south, about latitude 37°, the ports of Coronel and Lota are the points of shipment for mines located near by. The deposits are large, but the quality is inferior to English and American coal, and the output is insufficient for home demands, although it is largely used by steamers going up and down the coast and to Europe.

THE CANAL AND THE TRADE OF THE UNITED STATES WITH CHILE.

The interest of the American people in the commerce of Chile is greater than our present share of that trade would indicate. The foreign commerce of Chile now amounts to about $100,000,000 and is increasing. In 1899 the exports were $59,000,000 and the imports $39,000,000; about nine-tenths of the imports came from Europe, while nineteen-twentieths of the exports went to that continent. Our trade is slight compared with that of the United Kingdom, Germany, or France. An examination of the elements of the trade of Chile shows why the canal will increase our share. Of the Chilean exports, nitrate of soda comprises nearly 60 per cent, although the percentage is slightly declining, owing to the increased export of copper and copper ores. Next in the order of importance come silver and silver ores, then wheat and barley, wool, hides, and other scattering and agricultural and mineral products, most of which are needed in the United States. We need the nitrate for our fertilizers and chemical manufactures, we have the coal to smelt the copper and silver ores, we need the wool for our carpet manufactures, and the hides to furnish raw material for our leather manufactures. Of course, the grain products are needed in Europe and not in the United States.

Of the Chilean imports cotton manufactures comprise by far the largest part. Then come machinery of all kinds, kerosene, woolens, coal, bagging, and all kinds of miscellaneous manufactures and supplies. The cotton manufactures are made from the raw material grown in the southern part of the United States and carried to Europe for manufacture, whence the goods are shipped through the Straits of Magellan. Much of that cotton cloth will in the future go direct from American mills via New York, Charleston, Mobile, or New Orleans, and save transshipments and 7,000 miles or more of transportation. We have the materials and manufacturing ability to furnish the Chileans their machinery. We are now furnishing them with kerosene, and when the canal is opened we will probably be able to send them coal and many miscellaneous manufactures.

The reduction of freight rates that may be expected to follow the opening of the canal will not only extend our present trade with western South America, but will increase the number of the articles that enter into it. With a few exceptions the goods Chile secures in this country are those which we produce under especially favorable circumstances—lard, lumber, kerosene, breadstuffs, patented articles, like medicines, firearms, electrical appliances, farming machinery, and improved hardware. These articles can be sold readily in Chile after the canal has been opened. We have just begun to send Chile iron and steel. The bulk of the pig, bar, and hoop iron, rails, and castings now come from Europe, although we can make them more cheaply than our European rivals can. The railroads of Chile have iron rails that must soon be exchanged for steel. The towns and cities of Chile will use an increasing amount of structural iron for building purposes. The growing favor of electricity, in a country having many mountain streams for water power, is opening up a demand for electrical machinery which American manufacturers are already able to supply. We are sending small quantities of many other articles, in which transportation is a large factor, such as earthenware, glass and glassware, cordage, paper, and coal. Our cotton exports to Chile consist mainly of one or two plain staple grades made without reference to the Chilean market and shipped in bulk, as chance opportunities occur. With attention to the demands of the market and cheaper transportation that business can be greatly extended.

It is probable that some of the trade of the western part of Argentina, lying on the east slope of the Andes, will be handled through Chilean ports and will use the canal. The foothill provinces of Argentina, like those of Chile, produce fruit, wine, and grain, and are a prosperous region. This region being from 700 to 900 miles from the Atlantic ports of Argentina and within 200 miles of the ports of the Pacific, which, when the canal has been opened, will be much nearer North America than Buenos Ayers will be, the mails, passenger traffic, express business, and some classes of freight may be taken across the Andes and sent north from Valparaiso or some other Chilean port. A boundary controversy has delayed the completion of the Trans-Andean Railroad, but contracts have been let for finishing the work.

TROPICAL SECTION OF WESTERN SOUTH AMERICA—GENERAL DESCRIPTION.[a]

The tropical section of western South America is nearly double the area of the temperate Pacific region, and includes practically all of Bolivia, Peru, Ecuador, and a part of Colombia. In this discussion of the trade of the Pacific, however, the portion of each of these States is omitted that lies in the almost unexplored forest plain extending eastward from the Andes. The region here considered has an area of nearly half a million square miles. It is more than twice as large as France, is greater than our Middle Atlantic States and Southern States east of the Mississippi River, and is equal to our three Pacific Coast States with the addition of Idaho, Wyoming, and Colorado.

The region consists of a costal plain and a high plateau. The plain is either matted with tropic vegetation and drenched with rain or is a sandy desert, and neither of these conditions favors the establishment of communication with the plateau 30 to 100 miles inland, which must be surmounted by ascending a steep and forbidding mountain wall. The mineral wealth of the plateau is abundant, but is at present available only to a small extent.

This South American region has a population of over 6,000,000, but is made up chiefly of Indians and half-breeds, with a comparatively small proportion of the dominant Spanish race. The latter race lives in the towns, devoting itself to political and mercantile affairs, the proportion of Spanish blood decreasing as the distance from the towns increases. All the labor of the country is done by the half-breed Indians or by imported Chinese and Japanese labor. Industrially, the South American Indian is said to be superior to the North American Indian, and when properly supervised to be nearly equal to the negro as a laborer. The social and economic conditions do not tend to make the laborers ambitious. Some of the natives own the lands from which they glean a living, but throughout Ecuador, Peru, and Bolivia a system of industrial servitude exists that places the majority of the laboring classes in a condition similar to that of the English serf in the Middle Ages. The laborer is in debt to his employer, who manages to keep him so. Theoretically, every man can work for whom he wishes, but the debtor is practically prevented from changing masters by legal difficulties.

The Andean region of South America now has but little international trade, because the development of its natural resources has been prevented by untoward political conditions, by the mountainous character of the country, and the absence of an isthmian canal.

THE PERUVIAN COAST—ITS INDUSTRIES AND THE EFFECTS OF THE CANAL UPON THEM.

Taking Guayaquil as a center, it will be found that the coast running 800 miles to the north of it includes a costal plain sparsely populated by a few Indians and negroes, who can inhabit its unwholesome forests. To the south extends some 1,200 miles of seacoast, known as "Zona Seca," or dry zone, which has considerable industry at present, has had more in the past, and promises to be the scene of greater activity in the future.

The Peruvian coast for 1,200 miles is too dry for ordinary agriculture. Regular crops can be raised only by irrigation, the supply of water being the rainfall on the Andean slopes at an elevation of 7,000 feet and more. During the winter months the fifty streams crossing the plain are raging torrents, overflowing their banks, but during the heat of the summer they dry away to mere rivulets, only two of the northern ones having sufficient depth to be of any use for navigation.

If the Peruvian coast had abundant rains, it would be so malarious and unwholesome as to be unsuitable for white men, whereas its climate is said to be healthful and cooler than that of other regions in the same latitude, owing to the Antarctic current flowing up the west coast and to the sea breezes.

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[a] See Plate 78.

The Peruvian coast is desolate except where irrigation has produced green fields in the dry plains. Its present population and the amount of land cultivated are doubtless much smaller than they were before massacres, slavery, and white men's diseases, particularly smallpox, had greatly reduced the native population.

The soil in this coast plain is fertile when irrigated, and well suited to the production of sugar, cotton, and rice. Experts claim that sugar can be produced here as cheaply as in any other place in the world. The sugar industry, indeed, had made a good start before 1885, when the desolating war with Chile destroyed many of the plantations. The business has recovered, 110,000 tons having been exported during 1900.

The cotton crop of this section is one in which the United States is particularly interested. Some of the valleys of the north, particularly those of the Piura and Chira rivers, grow a peculiar kind of rough fiber cotton of a reddish color, that will not grow in any other part of the world, and is valuable because it mixes well with wool. The irregular supply of about 10,000 tons a year grows largely without cultivation along the rivers. At the present the United States imports much of this cotton by way of Liverpool. We can use many times as much of this product as we now receive, and its cultivation can be largely extended by the introduction of proper irrigation works.

Some rice is exported from the port of Trujillo, and farther south, at Pisco, there is some shipment of the wine and grape products which grow in the irrigated orchards near the Andes. Aside from these crops, however, the agricultural products of this plain will be used to supply food products for the Peruvian population.

As agriculture advances there must be a reorganization and extension of the railroads from the coast inland. Several lines now extend a short distance from the Pacific, but as industry and traffic increase, these scattered pieces of roadway must be combined into one or two systems, centering at a harbor or harbors that can be improved by the construction of piers suitable for the easy handling of the freight. When these improvements are made, they will require materials with which the United States is well supplied.

Petroleum fields are located near the Ecuadorean boundary at the west point of South America, the deposits lying along the coast for a distance of 200 miles, extending inland a considerable distance, and reaching outward under the sea. The development of this resource has not met with much success up to the present time, although the oil deposits are said to be rich. An English company is now operating there with an American director, and is securing a constantly increasing output, which reached about 2,000 tons a month in May, 1900. Thus far only 3 or 4 square miles situated on the seacoast have been prospected, and that not thoroughly, in a field which is supposed to be extensive in area. The oil is not suitable for illumination, but makes a valuable fuel. It is used on all the railroads of Peru, and may give much assistance to the industrial development of the Pacific coast of South America.

THE ANDEAN PLATEAU.

The Andean Mountain system, with its plateaus, may be compared with the Rocky Mountain region of the United States. Beginning in northern Colombia and reaching to the boundaries of Argentina and Chile, it has greater length than our Rocky Mountain region, an equal or greater width, and probably more individual mountain ranges. In point of population the Andean region exceeds its North American counterpart, for our seven Rocky Mountain States and Territories—not including the Pacific coast States—contained in 1900 only 1,500,000 people, while the Andean region contains at least 4,000,000. The industrial capacities of the people of the United States, it need hardly be mentioned, are far greater than those of the Andes.

The great elevation of the plateau, situated in tropical latitudes, gives it a variety of agricultural produce. On the intermediate heights beans, potatoes, and wheat are grown, while in the hot valleys, which here and there intersect the plateau, the people raise sugar cane, oranges, and bananas. There are single estates on which the owner grows all of the crops of both tropical and temperate climates.

The plateau of Ecuador may be taken as a typical section of this Andean region. The Ecuadorian plateau has an elevation of 8,000 to 10,000 feet, and is really an inclosed valley some 400 miles long and about 50 miles wide, hemmed in on both sides by the high chains of the Andes. The rainfall is scanty on the whole plateau, and agriculture usually depends upon irrigation, for which the snows of the mountains furnish abundant water. The soil is largely of volcanic origin and is very fertile. The climate is mild and springlike. The population is about 900,000.

This Ecuadorian population of nearly a million depends for its connection with the outside world upon a neglected and dangerous mule trail to Guayaquil. During the rainy season this precarious route sometimes becomes impassable, and the interior is left entirely without means of communicating with the outside world. A railroad 350 miles in length is being built from Guayaquil to Quito, and the American company constructing it confidently expects that it will be completed long before the opening of the isthmian canal.

With the coming of the railroad the people of interior Ecuador will use much larger quantities of imported manufactures than they have been able to get in the past, and they will want various kinds of machinery. They will secure the money to buy these things by working for the foreign capitalists engaged in developing the mines, by supplying the coast regions with food products, and by exporting hides and other agricultural commodities. The railroad will also enable them to secure the wood and lumber needed on the whole plateau region, which is in many places destitute of timber. The railroad will help in the introduction of modern industrial methods. The old wooden plow will gradually disappear; shovels and wheelbarrows will come into use; the people will thrash and clean their grain with machines instead of treading it out with animals and winnowing it in the wind. Their huts, made of reeds or poles and put together without a bolt or a nail, will gradually give way to houses, and in time the towns will be better built.

This description of the plateau of Ecuador would apply to many districts in Peru and Bolivia, the climate, people, and industrial conditions being very similar throughout the Andean plateau; the high parts of one country resemble those of another just as the plateaus of Colorado resemble those of Montana.

The plateau region reaches its greatest width near the boundaries of Peru and Bolivia, where such a State as Pennsylvania might easily be put down and be in every part at least 10,000 feet above the level of the sea. Lake Titicaca is as large as Connecticut, and drains into Lake Poopo, which is as large as Rhode Island. These lakes are connected by the Desoguadero River, 180 miles long, and navigated a part of the way by steamers. These lakes are the center of a great treeless plain, chiefly devoted to stock raising. The Bolivian part of this plain supports about 7,000,000 sheep, a number one-ninth as great as all of those in the United States, and there are in addition many cattle, mules, and swine. Barley and potatoes are grown—the surplus crops of the Indian agriculturist being marketed in the mining towns.

The people of the Andean plateau are now very poor. They make their own clothes, raise their own food, receive low wages, have a low standard of living, and buy but little from the outside world. But their needs and standards can and will change. On this point the experience of Mexico is interesting. Twenty years ago foreign merchants in the interior of Mexico despaired of the people ever becoming large consumers. Five-sixths of them were Indians, who received for their wages 5 cents per day in cash and 5 cents in rations. Communication was by stagecoach. The people wore sandals, unbleached cotton, and straw hats, and bought practically nothing. Since that time railroads have been built through these districts and the laborer is receiving from 50 cents to $1.50 a day as an agricultural or mining laborer, and every Indian wants a watch. With their higher wages they have become good buyers of manufactures from their own and foreign countries. The Andean plateau offers conditions to-day similar to those of interior Mexico twenty years ago, and there is reason to believe that what happened in Mexico will happen in South America.

Attention was called above to the general resemblance of the Andean plateau to our own Rocky Mountain region. The tropic Andes are admitted to be richer in mineral resources than the Rocky Mountains, but the present industrial development is very different. Our Rocky Mountain States and Territories are served by a good network of railroads, the State of Colorado alone having nearly 5,000 miles, while the whole Andean plateau has less than 500 miles, and the lines have not penetrated to the richest mineral deposits.

In spite of their poor connection with the outside world, the Andes have produced enormous wealth. The bullion from their mines furnished the civilized world with the greater part of its money during the centuries of Spanish dominion. Between 1630 and 1803 Peru sent out $1,250,000,000 worth of silver. Bolivia has produced about $4,000,000,000 worth. Of this enormous sum the famous mines of Potosi, which to-day can be reached only by a bridle path, yielded $3,000,000,000.

Mining operations have changed but little during the past century. The mining district of Hualgayoc, Peru, for instance, has 400 silver mines in an area of 40 square leagues. Some of these mines are now yielding ores having 300 ounces of silver per ton. The work is done by the Indians, who burrow around through the viens as best they can, getting out the ore with a drill and hammer and carrying only the richest of it to the surface in rawhide sacks. It is then picked over, crushed, reduced to a sulphate by crude methods, and taken on mule back to the coast and shipped to Europe for refinement. At Huallanca, Peru, 200 miles from the coast, ores worth $30 per ton are thrown upon the waste heap because they are not worth transportation to the seaports. Yet to-day, in our own Western States, companies with large capital and expensive machinery are profitably reducing ores yielding from $4 to $7 per ton. In the copper mines at Corcoro, Bolivia, to the south of Lake Titicaca, the ores are blasted out and then hammered to pieces by women, who pick out the best portions. Owing to the scarcity of fuel, little of the ore can be treated on the spot, and that above 70 per cent pure is carried away on pack animals. In many mines of the United States ores with but 3 or 4 per cent copper are smelted.

The Bolivian mineral districts, in some places 200 miles wide, rich in tin, copper, silver, and gold, extend north and south for a distance of 700 miles. The Antofagasta Railroad has but just touched a corner of this field. The terminus of its line at Oruro is 195 miles south of Lake Titicaca, and as the greater part of the Bolivian minerals are in the eastern ranges of the Andes, the railroads have not reached them. The city of La Paz, with a population of about 100,000, is dependent upon a stage road 45 miles long, and Cochabamba, with 25,000 people, has no outlet except a bridle path of greater length.

The improvements resulting from better transportation facilities are illustrated in the limited district that the Antofagasta Railroad has reached, where changes have been made in the methods of operating the mines, and large quantities of ore are sent to the coast. One English company connected its mines with the railroad by building a branch line 15 miles long, including 2 miles of tunnel. The venture is said to have paid well.

The railroad connecting the Peruvian seaport of Mollendo with the lake port of Puno carries out large quantities of mineral products, but, like the Antofagasta Railroad, it has not tapped the main fields. The railroad has connections with the lake steamers that carry the products of the interior across from Chililaya, the port of La Paz, and many smaller towns. Some of these places are hundreds of miles away, and all freighting is done by pack animals.

A successful mining industry requires rail or water transportation. Mining machinery is costly and heavy and can not be introduced where pack-mule transportation is necessary. The securing of fuel and supplies and the marketing of the product are nearly as dependent on good transportation as is the introduction of machinery. Only the choicest ores can be carried on mule back, while the metal in such ores is almost infinitesimal in comparison with that contained in the low-grade ores.

When the railroads thoroughly open up the Andean Plateau to the American capitalist and mining engineer there will be abundant opportunities for their enterprise. There are numerous mines that have been worked and abandoned at various times during the past three centuries, and in many cases their refuse ores are rich enough to yield good dividends. Not only can the old tailings be worked at a profit, but many of the abandoned mines themselves can be reopened, and the ores, the early workers were forced to leave, will make a good return when scientifically treated. The mines are now rarely worked beyond a few hundred feet, because they are not ventilated, and the ore is taken out by man power. With modern hoisting machinery, crushers, mills, furnaces, and railroads, the mineral output can be very greatly increased.

The water power obtainable from mountains of the plateau makes possible the use of electricity instead of coal, as has been done in California where coal is scarce. The great elevation of the mountains, and the frequent falls in the constant streams that flow from their snow fields and glaciers, combine to furnish the best conditions for the installation of electric plants driven by water power. Some of the most important mines of Mexico are now being operated by electricity supplied by the mountain streams, although the water power of Mexico is slight as compared with that of the Andes.

A description of the conditions in the Cerro Pasco mining district in Peru will show more definitely what is to be done in the new era of railroads that the canal will help to introduce. The Cerro Pasco deposits are supposed by some to be an old volcanic crater, covering an area 1½ miles long and three-fourths of a mile wide. Here are 2,000 veins of silver, making a network through the hill in which there are no less than 360 mines. From 1630 to 1824 these mines yielded 27,200 tons of pure silver. These deposits have been worked only 250 feet and could be drained by a tunnel of smaller magnitude than a number that have been made in various mines in the Rocky Mountain States. After the building of a railroad the introduction of the necessary machinery to complete this tunnel will become easy, the silver deposits will again become workable, and a new lease of life will be given to the Cerro Pasco mines, which have not yet been worked to a tenth of the depth reached in many mines in this country.

Underlying the silver of the Cerro Pasco district are valuable deposits of low-grade copper. The ore containing more than 30 per cent of copper is now carried 90 miles to Casapalca, on the Oroya Railroad, where it is smelted by American smelters or sent by rail to Callao for export to Europe by way of Magellan. At the present time more than a thousand tons of ore per month are being shipped from Cerro Pasco by this method, and some of the lower grade ores are being treated on the spot by using coal brought from good deposits but a few miles distant. The present difficulties encountered in working these rich mineral deposits are shown by the fact that the railroad ties for tram lines at the mines had to be brought by pack mules from the railroad, 90 miles away.

A railroad will ere long join the Cerro Pasco mines with the Oroya line at the town of Oroya, the city which promises to become the railroad center of that part of the plateau, and to be connected by a line eastward with the head of navigation on the Perene, one of the branches of the Amazon, where tropical products can be secured for the mining regions around Cerro Pasco. Another line of road may possibly start from Oroya southward through some of the already populous valleys of Peru possessing mineral resources.

RELATION OF CANAL TO INDUSTRIES AND TRADE OF EASTERN SLOPE OF ANDEAN PLATEAU.

The thorough development of the resources of the plateau, by the building of railroads and the investment of foreign capital, will necessarily be accompanied by an enlarged commerce with the eastern slope of the Andes. The people of the greater part of the plateau can produce only the food products of the Temperate Zone, and considerable quantities of tropic products are now brought up from the east slope at great expense. Any comprehensive industrial development of the plateau will make necessary the building of railroads to carry on this trade in food products needed on the plateau. There are many fertile valleys in the east slope having an elevation of over 5,000 feet, and resources and climate suitable to a great variety of tropical and semitropical products. Some of these products now cross the Andes and are exported. The eastern Andes are the source of the world's supply of coca leaves for the manufacture of cocaine, and there are many coca plantations scattered for hundreds of miles along the east slopes of Peru and Bolivia. This is also the region that furnished the world's supply of quinine, before its systematic cultivation in the British East Indies, and the Dutch colony of Java reduced the price of the article to one-thirtieth the former figure, and ruined the owners of the Peruvian and Bolivian plantations.

The province of Cuzco, in eastern Peru, is famous for its cacao, of which some 600 tons per annum are already sent over the Andes for export. These same valleys produce coffee, about 1,500 tons of which now cross the Peruvian Andes for shipment to the outside world. The most favored part of the east slope is in Bolivia, near La Paz, where, owing to a bend in the highlands, the slope is toward the north rather than toward the east, causing the trade winds to bring less mist and rain than they do to the eastern parts of Colombia and Ecuador. The rainfall of 40 to 75 inches is the same as that of the most favored parts of the United States, and the climate is said by American travelers to resemble that of California and to produce the same fruit products. The Yungas Valley in this section is noted for its coffee.

The eastern slopes of the Andes are so steep as to make an ordinary steam railroad expensive to build and operate. Coal would have to be brought from the Pacific coast, and the grades would make the hauling of heavy freight expensive. An electric railroad can be built here more cheaply, can ascend steeper grades, and can be operated by the unlimited supply of water power obtainable from the La Paz River. This stream, even in the dry season, is a rushing torrent 20 feet wide and 3 feet deep, falling 10,000 feet between La Paz and the head of navigation at Reyes, 200 miles below. In some places rapids have a fall of 200 feet in half a mile. The valley through which the electric line would run contains several towns, one with 6,000 and another with 10,000 people. Trade is carried on through this valley to La Paz and the treeless plateau. In the vicinity of La Paz alone there are 100,000, people who secure a part of their food supply and all of their wood from points down the river, by expensive pack-animal transportation. This electric railroad, however, can not be economically built or profitably operated until the city of La Paz itself is connected by rail with the Pacific. Such an extension (155 miles) is planned by the Antofagasta Company.

When a railroad has been built across the plateau and connected with an electric line coming up from the plains of Bolivia, there will probably be a considerable export by way of the Pacific of products from this source. The alternative route is by the Madeira River and the Lower Amazon, but the engineering difficulties at the Madeira Rapids are as great as those that lie in the way of the railroad to the Pacific. The heat and dampness of the Amazon route are deleterious to many products, such as hides, coffee, coca, and cacao. This region is now exporting these products by way of the Pacific ports, and their movement in that direction would be greatly increased by the opening of such a railroad.

On the edge of the Sandia and Carabaya region, on the east slope of the Peruvian Andes, near Bolivia, an American company not long since paid $285,000 cash for a mine, carried machinery to it at a cost of $250 per ton, and is now crushing quartz ores and paying dividends. In the past the Spaniards secured much gold from the eastern rivers of Ecuador, Peru, and Bolivia.

One of the easiest regions to reach east of the Andes is northern Peru, where it is planned to cross the narrowest part of the plateau and connect the Pacific ports with the headwaters of the Amazon. This road is partly surveyed and has been begun by a company having concessions to work a large coal field located near the summit of the Andes. The quality of this coal is reported to be good, and the deposits extensive and easily workable. The location of this field near the divide of the Andes will make it possible to send coal to the Pacific and to the navigable parts of the Amazon, thereby facilitating steam navigation in interior Brazil.

As the Upper Amazon is a swift river, and the head of navigation ten times as far from the Atlantic as it is from the Pacific, some of the trade of the Upper Amazon country will come and go by Pacific ports after the opening of the isthmian canal.

Industrial changes on the plateau and eastern slope can not be expected to make much progress until better connections with the Atlantic shall have been provided. After this event, the exploitation of the mineral wealth of the plateau may be expected to follow, and that will require the opening up of the eastern slope as a source of food supply for the laborers who work the mines.

INDUSTRIES OF PACIFIC SLOPE OF ECUADOR AND COLOMBIA.

At the western point of South America the climate of the coast changes, and to the northward the desert gradually gives way to regions of increasing rains. The transition is made gradually. The southern part of the Ecuadorian coast is a fertile region with a tropic climate more healthful than many tropical localities. It has a population of about a quarter of a million, and is practically the only part of Ecuador engaging in foreign trade, the interior being almost entirely cut off.

The greater part of the population of the coast plain of Ecuador lives in the valley of the Guayas River, on which is situated the city of Guayaquil. The only districts at present productive are those of the lowlands, served by water transportation on the rivers centering at Guayaquil. This river system is navigated by many native boats and a number of small American-built paddle-wheel steamers of the Mississippi River type. In the rainy season they can go 200 miles inland and bring to the coast the export produce. The soil of this valley produces tropical products in abundance, and the country is in a prosperous condition. The exports are cacao, ivory nuts, rubber, sugar, coffee, tobacco, and hides.

The cacao is of excellent quality and is the chief crop. It is exported to the amount of 20,000 to 30,000 tons per year, and constitutes one-third of the world's supply. At present more than half of the crop is produced in one small district, but it is estimated that 19,000 square miles in Ecuador are suitable for the production of cacao, an article of which the world's consumption is increasing about 5 or 6 per cent annually.

The ivory nut is the seed of a variety of palm that grows wild. Seventeen thousand tons were exported in 1898, chiefly to Europe, where it is used in the manufacture of buttons. In the same year about 2,500 tons of coffee were exported, $50,000 worth of tobacco, and considerable quantities of other tropical produce. The only manufactured export is the so-called Panama hat, and there are practically no manufactures of home products, all kinds of manufactured articles, as well as Temperate Zone food products, being imported from the United States and Europe.

Ecuador seems to have mineral wealth, but there are as yet no wagon roads and no railways, nor have the mineral regions been much explored. There are quartz gold mines in the south and placer mines in the north, both being operated by foreign companies, one of which is an American firm, said to be doing well. Petroleum, copper, silver, and coal are reported, but at present they are not being developed. The railroad now building between Guayaquil and the interior will bring about the exploration and possibly the working of the various mineral resources. This railroad will bring from the hills to the lowlands Temperate Zone products which must now be imported, and will stimulate the trade of the country by giving nearly a million people their first chance to trade with foreign countries. Any increase of Ecuadorian commerce means an increase in the traffic through the canal.

The rainfall increases from northern Ecuador to the Isthmus of Panama, the shore plain of Colombia being marshy and unhealthful. Its forests are uninhabited save by a few Indians and half-breeds, and the only export is a small amount of timber, although in some places vanilla and cacao are indigenous. The forbidding character of the coastal region has prevented the settlement of the higher lands on the foothills of the Andes, where in Ecuador and northward there are valleys above the malaria level with a salubrious climate and fertile soil.

THE CAUCA VALLEY, IN THE COLOMBIAN ANDES.

The Andean Mountains divide, near the Ecuadorean boundary, into three great ranges, the easterly one bending around into Venezuela, the western one trending toward the Isthmus of Panama, and the central one separating the valleys of the Magdalena and the Cauca rivers. The Magdalena Valley has its trade outlet by way of the Caribbean; but the mountains of Antioquia, in Central Colombia, cut off the valley of the Upper Cauca from the Atlantic and make it necessary for all commerce to come and go by way of the Pacific through the port of Buenaventura.

This Cauca Valley is in the Andean region, but, unlike the other parts of the Andes of which we have spoken, it is both tropical and subtropical, having an elevation of from 3,300 to 6,000 feet. The valley is larger than the State of New Jersey, and contains one of the densest populations in South America. There are half a million people, comprising negroes in the lower portion of the valley, and Indians and a considerable white population in the adjacent highlands. This section is truly Andean, however, inasmuch as it is cut off from the ocean by a range of mountains and has to depend upon pack-mule transportation for all of its commerce. The people do a little gold mining, but live chiefly by agriculture, importing nearly all of their merchandise, except some domestic manufactures of straw hats, coarse cloths, and utensils.

All the internal traffic of the valley, as well as its foreign trade, is carried over trails, the exports of agricultural products being limited to the most valuable articles, such as coffee and cacao of the best grades, although corn, sugar, tobacco, and fruits are cultivated and cattle are raised. Concessions have been given for a railroad to go through the valley from the port of Buenaventura, and 20 miles of the line have been built, but the enterprise has come to a standstill. The completion of this line and the opening of an isthmian canal would bring the producing districts of the valley into close connection with the commercial world.

At present Buenaventura is within the traffic territory of the Panama railroad and steamship lines, whose freight charges are high. During the year 1900 such typical articles as wire and nails were taken from New York to China for $8 a ton, but it cost $15 to land them at Buenaventura, 7,000 miles nearer. From there the costs were $8 per ton to the end of the railroad and $40 per ton additional by pack mule over the pass of the Andes, 6,000 feet in elevation, to Cali, 77 miles from the ocean. The mule transportation cost 70 cents per ton per mile. After reaching Cali some of the goods had to double the freight charges of $63 per ton by being carried many miles up and down the valley. At the same time the steel manufacturers of Pittsburg were paying an ususually high freight charge of $3.60 per ton to the seaboard.

The opening of the isthmian canal, the building of the railroad, and the introduction of foreign capital would be revolutionary in their effect upon the trade of the Cauca Valley. The first effect of the building of the railroad would be to increase the importation of machinery for agriculture and the smaller industries. The continuation of the railroad up and down the valley would make it the route of transportation to the promising gold mines in the adjacent provinces of Colimo and Antioquia. The valley would export coffee, cacao, animal products, and raw sugar.

SUMMARY OF THE EFFECT WHICH THE CANAL WILL HAVE ON WESTERN SOUTH AMERICA.

Each of the five industrial divisions, discussed above, of the tropic Pacific section of South America is rich in resources and backward in industrial development. Capital is only beginning to overcome the difficulties that political and geographical conditions have placed in the way of progress. Nearly all of this region is still in the pack-mule stage of its industrial life. The present trade conditions there are more backward than were those prevailing in the trans-Missouri territories of the United States fifty or sixty years ago. At that time Kansas City and Fort Leavenworth were the entrepôts of a brisk and thriving trade with the far western frontier. Every spring trains of covered wagons, "prairie schooners," went across the great plains to the Spanish settlements of New Mexico, distributing supplies en route at the distant settlements and isolated ranches and trading posts of the hardy pioneers and trappers who had pushed on toward the Rocky Mountains. Freight rates, ranging from $40 to $200 per ton, excluded from trade all articles except necessities and limited the return cargo to such valuable commodities as furs, skins, and bullion. If we substitute the pack mule for the more efficient prairie schooner, the above description applies to most of the tropic Pacific section of South America. Limited areas are served by the few lines of railroad and by some river steamboats.

The tropical Pacific section has twice the population and but little more than half the trade of the temperate Pacific section. The 3,000,000 people of the temperate region carry on a forign commerce amounting to $100,000,000, and the rest of the west coast commerce amounts to about $55,000,000. The exports exceed the imports by about $4,000,000. As in the case of Chile, the trade is nearly all with European countries.

Like the temperate section, the tropic region produces the raw materials we need and buys manufactures we might supply. The British cottons, for instance, purchased by Ecuador in 1898 were more valuable than all her imports from this country. After the isthmian canal is opened our cotton mills will share largely in that trade. The canal will facilitate the development of the resources of the tropic Pacific section, and thus enlarge the sale of American railway supplies and agricultural and mining machinery. The purchasing power of the South American people will increase, and trade with the United States will grow, not rapidly, but steadily, and to ultimately important dimensions.

EFFECT OF CANAL UPON ATLANTIC SOUTH AMERICA WILL NOT BE GREAT.

The isthmian canal will not greatly affect the Atlantic countries of South America. There is at present no direct trade between the two coasts of South America, except some little trade between Chile and the eastern countries of South America by way of the Straits of Magellan.

The exports of the South American and Central American countries are nearly all raw products, and there is no raw material produced on one coast that need be imported by the countries of the other coast. Rubber is the great staple of northern Brazil, but Ecuador and Central America are exporting some rubber across the Isthmus to the Atlantic. They also produce coffee, the great export of southern Brazil, and cacao, the staple of Ecuador, is also grown on the Atlantic coast. The temperate zone products needed by the tropic Atlantic countries of South America can be supplied by Argentina and the United States. The nitrate of Chile is not used on the east coast of South America, except in the form of manufactured articles made in the North Atlantic countries. The canal may have some slight influence in reducing the cost of these. Should Argentina and Uruguay need nitrate or other Chilean products, the natural route of the trade will be through the Straits of Magellan. There is but little commerce, present or prospective, that might advantageously go from the one coast of South America to the other by way of an isthmian canal.

The countries on the Pacific between the United States and South America have exports and imports that are almost identical with those of western South America, and the statements that apply to the trade between the two coasts of South America, will apply to any commerce between western Central America or Mexico and the Atlantic countries of South America.

The western United States and Canada export some products to Atlantic South America. There have been occasional shipments of wheat, but this trade has about disappeared because of the competition from Argentina. Our Pacific coast lumber is used in Atlantic South America, and this is probably the only trade that will require the passage of ships directly from the Pacific through the canal to these countries. The temperate part of the Atlantic coast of South America, however, will get its lumber via the Straits of Magellan or Cape Horn, because the eastern projection of Brazil makes those routes shorter. There is some demand on the Atlantic coast of South America for our canned goods and wine from the Pacific coast, but such imports will not be sufficient to require a direct trade. They will probably be distributed from New York, London, or some West Indian port. There is also a prospect that before the canal is opened this demand for wine and fruit products will be wholly or in part supplied by Argentina, which is similar in climate and products.

Australia will have little, if any, trade with the Atlantic countries of South America. In the oriental countries the conditions for trade are somewhat better, although they will not need to import from Atlantic South America, because Eastern tropical countries are much nearer. The people of Atlantic South America will import oriental articles—tea, mattings, silks, and curios—but these articles will hardly be desired in such quantities as to require the passage of vessels directly from the Orient through the canal to these countries. The countries of that part of South America below the mouth of the Amazon will draw their supplies from European ports or from New York.

The countries between the Amazon River and the American Isthmus will also trade with the Orient more or less indirectly, although they will not be so dependent, as countries farther south, upon London and New York for their supplies of Pacific products. Some West Indian city, such as St. Thomas or Kingston, will doubtless become a distributing point for goods that come through the canal and are destined for the ports of the West Indies and northern South America. The ports are now visited by vessels touching at various places in northern South America, Central America, the West Indies, and Mexico.

The isthmian canal will bestow but few benefits upon the Atlantic countries of South America, because nearly all of their trade is with the North Atlantic. The greater part of their small commerce with the Pacific will probably come by the new route, and there will be some direct cargoes of Pacific coast lumber. The cost of securing oriental products, Pacific coast canned goods, and wine will be somewhat reduced. These commodities, however, will probably be distributed in large part from such centers as New York, London, or Kingston, Jamaica.

Chapter XII.

JAPAN AND THE ISTHMIAN CANAL.

THE SALIENT CHARACTERISTICS OF JAPAN'S RESOURCES.

The 4,000 mountainous islands of Japan[a] stretch northeastwardly along the coast of Asia in the latitude comprised between South Carolina and Maine. The climate, like that of our own Atlantic coast, is changeable, because of the uncertain direction of the winds from the great land mass to the westward, although extremes are less in Japan than on the Asiatic mainland. The winter winds blow from Siberia across the Japan Sea and produce heavy snowfalls on the west side of the islands, but the high mountains shelter the more populous eastern slopes, which are warmed by the Kuro Siwo, or the tropic Japan current.

In the summer both coasts receive winds from the ocean, which bring abundant rain, amounting to 80 inches per annum in the south—nearly double the amount that falls at Philadelphia or New York. The humidity of the climate of Japan is nearly equal to that of England. The ocean currents along the Asiatic shore are similar to those of our Atlantic coast. The Japan current meets an Arctic stream along the northern islands of Japan and gives the shores and seas of that part of the Empire a foggy climate. The fishing banks, as well as the climate of that latitude, correspond with those of Newfoundland.

The agricultural resources of Japan are relatively meager, because of the infertility of the soil and the small amount of tillable ground. The cultivable ground—12 per cent of the total area of the country—is fully and carefully tilled, mainly by hand labor. The cultivation of tea occupies a prominent place in the agriculture of the country. The chief food crop is rice, although wheat, barley, potatoes, and tobacco are grown. Fertilizers have to be used abundantly, fish from the northern islands of the Empire and bean cake from Manchuria having long been employed. Latterly some South Carolina phosphates have been purchased, a few shiploads of which are now annually imported. The phosphate fertilizers seem well adapted to the Japanese needs, and the construction of an isthmian canal would doubtless largely increase their importation.

The moist climate gives Japan a varied flora, but good forage is everywhere scarce, owing to the preponderance of the bamboo type of vegetation. There are only a million and a half horses in the Empire, while the number of cattle is slightly less, and there are no sheep. Japan is consequently obliged to import all the wool and woolens used, and most of the hides, leather, dairy and meat products required.

Japan is becoming a food-importing country. The domestic supply of rice is now frequently insufficient. There is no sugar grown in the Empire. There is now some flour imported from the United States, and with the progress of the manufacturing industries of the Empire increasing quantities of American and Australasian breadstuffs and provisions will be required. The American breadstuffs will come from the Pacific slope; the provisions (meat and dairy products) will probably come, in part at least, from the central section of the United States.

Many of the raw materials required for the larger manufacturing industries are deficient or entirely lacking in Japan. Nevertheless, the country is certain to become an important manufacturing center. The materials of industry of which Japan possesses the most abundant supply are timber, raw silk, and the grasses used in making straw braid and mattings. Such forest products as camphor, vegetable wax, lacquer, and bamboo are the basis of a considerable share of Japan's industries and exports. The prevalence of the mulberry tree in many parts of the Empire makes possible the growth and favors the manufacture of silk.

The mineral resources of Japan are especially deficient. There is a small export of copper, but there is no prospect of its increasing. At present very little gold or silver mining is carried on, but the introduction of western machinery may result in some development of the mines. Japan has petroleum fields, but the exports are small and the imports are much larger and are increasing rapidly. New fields are being opened, but there is no indication that they will be able to supply the requirements of the country. The coal exports of Japan, as is shown in Chapter VI of this report, are increasing, but the fields are limited, and the demands of the manufactures of the country are rapidly growing. The price of coal in Japan is not cheap, it being too expensive to permit much development of iron and steel industries, although there are iron-ore deposits in the northern and southern parts of the Empire. The recent industrial progress of Japan has necessitated the importation of large quantities of iron and steel products, the home supply in 1898 being only one-ninth of the total consumption.

[a] Consult Plate 79 in connection with this chapter.

JAPAN AS A MANUFACTURING AND COMMERCIAL COUNTRY.

To become a manufacturing nation, in the modern sense of the term, required the Japanese to make great changes, but the people possess the faculty of adaptation to such a marked degree that it required only thirty years for them to adopt the ideals of western civilization and many modern processes, and to change from an isolated nation to one ambitious to participate largely in international trade. The limited area of Japan, its insular position, and the density of its population make its future progress conditional upon a large development of manufactures and commerce. The area of the Japanese Empire, exclusive of Formosa, is 147,655 square miles, or about 27,000 more than that of the British Isles; the population being 44,000,000, or 3,000,000 more than the inhabitants of the United Kingdom. The population averages 296 to the mile, being as dense as that of France and eleven times as dense as our population.

The people of the country constitute the nation's most valuable economic resource. They are skillful, artistic, and industrious artisans, and their high birth rate assures the country an abundant supply of labor. The chief obstacle to be overcome by Japan in the development of her industries is the insufficient supply of the raw materials required in the textile and iron and steel manufactures. She will need to import increasing quantities of materials, and for this reason, if for no other, the construction of the isthmian canal is a matter of much consequence to her.

The chief industrial activity of Japan centers about the inland sea, or Japanese Mediterranean, about which live nearly half of the people of the Empire. Surrounded by the three southern islands, it is a quiet, safe body of water, upon which commerce is active. There are three entrances from the ocean, many indentations into the land, and supplies of coal exist upon its southern shores. Where the most northerly arm of the inland sea reaches toward the center of the mainland of Hondo, stand the cities of Osaka and Hiogo, which were fishing villages when Japan was opened to foreign trade. Now they contain more than a million people and have secured the commercial supremacy of the Empire. They are growing in population at a rate equal to that of the manufacturing cities of the United States and Germany. Osaka is the manufacturing center of the country, and within a radius of 100 miles are to be found 16,000,000 people, and most of the large cities of Japan. It manufactures large quantities of mattings and rugs, and is the chief exporting point for tea. In 1895 it received more than half of the total imports of foreign commodities, besides having a heavy local traffic in rice, fish, timber, and edible seaweed.

Thirty miles inland from Osaka is Kioto, the old capital city of Japan, now connected with the seaboard by railroad, telegraph, and canals. The city is located in the center of a fertile and densely populated plain and is an important center of manufactures. There are three other Japanese cities of importance not located on the inland sea—Tokyo, Nagasaki, and Hakodate. Hakodate is the fishing, lumber, and mining port of the north, and is located near the northern coal fields. Nagasaki is at the southwestern corner of the Empire, near the southern coal fields. It exports nearly 2,000,000 tons of coal per year, has a good landlocked harbor, capacious docks, and, being located on the commonly used trade route between America and Asia, is a port of call for nearly all merchant ships and transports connected with our commercial and military relations with the East. Midway along the eastern coast is Tokyo, the capital of the Empire, which had about 700,000 people in 1872 and now has nearly 1,500,000, its area and population being about the same as Philadelphia's. Besides being the capital of the Empire, it is the main center of distribution for the eastern part of the country and has many native manufactures. On account of the shallow harbor of Tokyo, most of its foreign trade is handled at Yokohama, the the chief exporting city of the Empire, with a population of 100,000. The foreign trade of Tokyo consists of silks, tea, camphor, lacquer ware, and other Japanese goods.

The growing foreign trade of Japan will make her a competitor with America and Europe in oriental markets, but in all probability the seriousness of this competition has been greatly exaggerated. This, however, need hardly be considered in this discussion of the relation of the isthmian canal to our trade with Japan, because the expansion of Japanese industry must inevitably be accompanied by large purchases and sales in the Central, Southern, and Eastern sections of the United States. The most serious rivalry between the Japanese and American manufactures will probably be in cotton textiles, but that can hardly be felt for some time to come, because Japan is still a large importer of cotton goods, and her numerous population is rapidly enlarging its purchases.

The industrial progress of the Japanese is widening their range of imports very greatly. Wages are rising and enabling the people to satisfy new wants, and compelling capitalists to introduce labor-saving machinery. Although much has been said of the economic changes going on in Japan, her industrial revolution is only begun. The complete modernization of the industrial and social life of Japan will yet require several decades, and its accomplishment will necessitate a large trade with the United States and Europe.

ANALYSIS OF JAPANESE TRADE WITH REFERENCE TO EFFECTS OF THE CANAL.

The combined imports and exports of Japan were $13,000,000 in 1868, $28,000,000 in 1878, $65,000,000 in 1888, and about $275,000,000 in 1901. She exports silk, straw braid, mattings, cotton yarns, cotton cloth, coal, tea, camphor, rice, mushrooms, and miscellaneous manufactures, and imports raw cotton and cotton manufactures, woolens, sugar, rice, beans, peas, oil cake, steamships, locomotives, steel rails, iron manufactures, and machinery. The chief countries with which she trades are China, Cochin China, and India, the United Kingdom, the United States, and Germany. From Asiatic countries she obtains rice, cotton, beans, and peas. From Europe and the United States come mainly metal manufactures, dry goods, raw cotton, and food stuffs. The percentage of the total exports consisting of manufactures is increasing, and the imports are made up of a decreasing percentage of manufactures, as would naturally be expected from what has been said concerning the diversification of industries in progress.

While the development of Japan's foreign trade has been very rapid, the growth of our share in that enlarging trade has been still more rapid. In 1881 we sold Japan less than 6 per cent of her importations, but in 1900 and 1901 our sales averaged 18 per cent, while during the same period the part furnished by England declined from 52 per cent to 21 per cent of the total. In 1896 our exports to Japan increased 84 per cent; in 1897, 57 per cent; in 1898, 45 per cent, and since 1898 the United States has been second only to Great Britain among the nations supplying Japan with imports. There has also been a steady growth in our importations from Japan, and while they have not grown as rapidly as our sales to that country, they have a higher total. Her raw silk is the chief supply for our mills, and her tea, mattings, and bric-a-brac are important items. The growth of Japan's trade with the United States since 1892 has been remarkable. The exports to the United States gained more rapidly than those to Europe, and we have become Japan's best market.

The growth that has taken place in Japan's imports has been most rapid in the case of raw cotton, woolen goods, flour, railway materials, fertilizers, tobacco, leather and leather manufactures, cotton-spinning machinery, and paper, and it is especially interesting to note that many of these commodities of increased import are furnished by the United States, and are the articles in which we have decided advantages of production or manufacture, to wit: Leather goods, flour, railroad supplies and machinery among the manufactures, and meat, cotton, tobacco, and phosphate rock among the raw materials. A brief reference to iron goods, cotton, and phosphates will illustrate our interest in the Japanese import trade.

In 1896 we furnished one-sixth of the rails imported into Japan; in 1898 our share was two-thirds. We already have a large part of the trade in electrical supplies, and also furnish a growing proportion of nails and bridge materials. European countries lead in other classes of iron manufactures. The growth of our iron trade with Japan is mainly a question of home demand and cheap transportation abroad. As freight costs are reduced the Japanese will draw upon us in larger measure for railway materials, and for the steel needed in rebuilding their cities and in equipping their factories with machinery.

The importations of raw cotton into Japan increased very largely until the recent period of abnormally high prices set in. The cotton ports of New Orleans and Galveston are the most distant of our seaboard cities from the Pacific by existing water routes. At the present time our cotton sales in Japan consist almost entirely of the raw staple, but this should not always continue. In 1898 Japan imported 60,000,000 yards of unbleached muslin, worth $2,100,000, and less than one-thousandth of it came from this country. Direct communication between our Southern mills and Japan would doubtless enable us to furnish a large share of this grade of cottons.

The soil of Japan is not rich, and the number of farm animals is very small. The increasing population and rising standard of consumption will necessitate the highest attainable degree of intensive cultivation, and this will require larger supplies of fertilizers. We have begun exporting to Japan oil cake and phosphate, of which articles we have most of the world's supply, but they are commodities of such low value that the trade can not increase greatly until the canal has lowered the costs of transportation. Phosphate rock, worth one-fourth of a cent a pound at the seaboard, is a good illustration of the class of cheap goods necessary to industrial progress, which can be carried long distances only by water transportation of the most economical character.

With the exception of the Pacific coast flour and canned goods, the trade of this country with Japan originates in the manufacturing East and in the Southern States. By present routes Europe has the advantage. The canal will enable us to supply Japan with larger amounts of bulky articles, in whose cost to the consumer the charges for freight are an important item. We are now supplying a limited quantity of such articles, but under better freight conditions there is no reason why that trade may not greatly increase. Examples of this class are cement, alcohol, condensed milk, glassware, small agricultural implements, iron manufactures, mining machinery, locomotives and other engines, wire, paint, and paper. Cheaper transportation would, moreover, enable the United States to sell some of the lighter as well as the heavier commodities to Japan, and increase both the variety and quantity of our exports to that country.

Chapter XIII.

CHINA AND THE ISTHMIAN CANAL.

An analysis of the resources and industrial conditions of China presents many difficulties. The Chinese Empire is a large region, with a great diversity of resources, concerning which present information is partial and indefinite. During the last few years a large amount of descriptive literature has been written regarding China, but definite statistical information, whether of a private or an official nature, is very scanty. The assertions of all well-informed people agree in representing China as a country with a great variety of valuable natural resources. The population, moreover, is usually represented as being industrially efficient.

Speaking generally, China[a] is to be thought of as a densely populated and industrially undeveloped country, possessing varied and abundant resources, which, under the supervision of capable captains of industry, can be made the basis of a wide range of economic activities. The questions uppermost in this discussion are whether these resources and activities are such as will be affected by the American isthmian canal, and whether the economic progress of China will be accompanied by a larger trade between that country and the Atlantic section of the United States—that section whose trade with trans-Pacific countries will come most directly under the influences of the canal.

GEOGRAPHICAL DIVISIONS OF CHINA.

China proper, or, as it is sometimes called, the Kingdom of China, and the dependency of Manchuria consist of a coastal plain and a plateau of mountainous upland region, which increases in elevation toward the west and finally merges into the lofty arid plateaus of central Asia. The coastal plain is mainly of alluvial origin and is 200 miles in length and about 400 miles in breadth near the Yangtse, below which region it rapidly narrows until in southern China it extends inland but a short distance. This coastal plain is extremely fertile, is well watered and highly cultivated. Probably half the people of the entire Chinese Empire dwell in this section, the density of whose population may be illustrated by reference to the province of Kiangsu, which is reputed to have 40,000,000 inhabitants within an area of 40,000 square miles.

The broad mountainous upland region lying between the coastal plain and the arid plateaus of Tibet and Mongolia are supposed to be relatively fertile and are known to possess abundant stores of coal, iron, copper, and other valuable mineral resources. This part of China has as yet been brought but little under the influences of international trade and western civilization.

China[b] occupies the eastern part of Asia between the parallels of 20° and 50° north latitude. It is the geographical counterpart of that portion of the eastern part of North America lying between Cuba and Labrador. Manchuria is in the latitude of northern Quebec, and Canton, situated just within the Tropics, has the latitude of Habana. Northern China has the severe winter climate of Canada, while Hongkong and Canton have the climate of southern Florida and Cuba. China, consequently, like the United States, has a great variety of agricultural products and can, within its own borders, produce nearly all the articles required by its people. This fact explains why it has been possible for China to remain for four thousand years practically without intercourse with outside nations.

For the purposes of this discussion of the industries and trade of China, and the effect which a canal will have upon them, it will be helpful to divide China into three geographic zones. The basis of division is a dual one, resting partly upon differences in climate and partly upon the physiography of the country. These three divisions are (1) northern China, including Manchuria,[b] the Peiho and Hoangho valleys, and the peninsula of Shantung; (2) central China, comprising the valley of the Yangtse River, and (3) southern China, comprised mainly within the valley of the Siho, or West River. The northern district has its commercial outlets on the Gulf of Pechili and corresponds in latitude and industrial products to our North Atlantic States and Canada.

[a] Consult Plate 80 in connection with this chapter.

[b] In this discussion China will be considered to include Manchuria, although, strictly speaking, that is a dependency of the Kingdom of China. Whether some other nation than China will make Manchuria a dependency is a question over which Russia and Japan are now at war.

Pekin is on the fortieth parallel, the one that passes through Philadelphia. Central China corresponds more nearly to the South Atlantic and Gulf States of our country. Shanghai, its metropolis, is in the latitude of Savannah, Ga. Southern China corresponds in latitude and production with the extreme southern portions of the United States and with the West Indies.

The boundaries of these divisions are not everywhere clearly defined physiographically, because they merge into each other in the coastal plain. They are, however, sufficiently distinct for the purposes in hand.

RESOURCES AND TRADE OF NORTH CHINA—MANCHURIA, HOANGHO VALLEY, AND SHANTUNG.

Manchuria lies to the north and east of the Great Wall, mainly between the fortieth and fiftieth parallels of north latitude. It extends from the Gulf of Pechili to the Amur River. The population of this district is said to be 22,000,000.

It is in the wheat belt of China, adapted by climate and fertility of soil to general agriculture, and is reputed to be a region of a fair degree of fertility. It possesses extensive forests, some of which contain valuable hard woods.

Eighty miles north of Niuchwang, in Manchuria, are coal deposits, presumably rich and extensive. These coal fields are crossed by the railroad from Siberia to Port Arthur. Mining operations will doubtless follow the restoration of peace, and will include not only the development of the coal mines, but also the mining of gold, lead, and copper. Gold is now exported from Manchuria.

The agricultural, and particularly the mineral, resources of Manchuria, like those of China generally, have received but little development, because of the lack of means of communication and transportation and because modern methods of production have not yet been introduced. The people of Manchuria seem less adverse to change than do those of other parts of China, and it is probable that the control of Manchuria by Russia or Japan will result, not only in the establishment of railway transportation, but also in the introduction, to some extent at least, of modern methods of production.

Niuchwang is the distributing point for Manchuria, the imports consisting chiefly of cotton and woolen goods, kerosene, iron and steel, and general manufactures. Its exports comprise agricultural and mineral products. Niuchwang and Dalny are the ports of China nearest to the United States, and our export trade to China is mainly with Manchuria, about half of the imports of that district being from our country. The things we sell in Manchuria consist chiefly of cotton goods, petroleum, and iron and steel products, commodities produced in the eastern part of the United States.

Niuchwang and Dalny will become exporting points and distributing centers for an extensive district reaching as far inland as Lake Baikal in southern Siberia. The trade of eastern Siberia and of Manchuria will always be handled through the Pacific rather than Baltic ports. Lake Baikal is farther from St. Petersburg than San Francisco is from New York, and the railway from St. Petersburg has the Ural Mountains and heavy grades to overcome. This fact makes it certain that the heavy commodities imported into the region east and southeast of Lake Baikal will be handled through Niuchwang, Dalny, Vladivostok, and other Pacific Asiatic ports. The imports of this region will come largely from the United States.[a]

The Peiho and Hoangho valleys, the second subdivision of the northern section of China, are supposed to contain between 80,000,000 and 100,000,000 people. The region consists of a coastal plain, most of which is included in the province of Pechili, the mountainous district comprised within the province of Shansi, and the pastoral and agricultural upland provinces of Shansi and Kansu lying to the west of the mountains of Shansi.

The coastal province of Pechili is drained by the river Peiho, upon which the cities of Tientsin and Pekin are situated. This region and the lower basin of the Hoangho are made up largely of fertile alluvial soil, from the products of which a dense population supports itself. In the mountainous province of Shansi are located the richest coal fields of China, concerning which much has been said by Richtofen and all travelers who have explored this region. It is probable that one of the earliest resources of China to be developed in the future will be the coal fields of Shansi. In order to accomplish this it will be necessary to extend the railroad which now runs from Tientsin to Pekin into the mountains lying west of those cities.

In the westerly part of the Hoangho Valley is the province of Kansu, which extends far into the arid Mongolian plateau. The province is well adapted to grazing, and large sections of it can be cultivated. There are, moreover, numerous deposits of coal, and better means of communication and production would enable the province to develop a domestic and foreign trade of considerable proportions. This province is the present gateway to Mongolia and is crossed by

[a] And from Japan should the control of Manchuria pass to Japan.

the caravan route from Pekin to Turkestan. The exports and imports of the region west of the Shansi Mountains are handled over this caravan route.

The city of Tientsin is in the commercial center for the Peiho and Hoangho valleys. The railroad connecting Tientsin with Pekin, and by means of a line extending northeast with the coal fields of the Gulf of Pechili, was causing the population and commerce of Tientsin to increase rapidly before the outbreak of the Boxer rebellion. The city of Tientsin has a population said to number 1,000,000. Its commerce doubled between 1887 and 1897, when it amounted to 55,059,017 taels, or $44,000,000. In 1899 the value was 77,604,562 taels, or $61,000,000. Probably the most important imports of this city will always be cotton goods and iron and steel manufactures. Our ability to supply those goods and the effect which the canal will have upon that trade have been sufficiently emphasized in another place in this report.

The province of Shantung comprises that part of the coastal plain crossed by the lower course of the Hoangho and the mountainous peninsula having the same name as the province. One-half of this district is tillable and the other half contains a variety of minerals, the most valuable of which is coal. There are four coal fields now being worked in a feeble way by the natives, but which the Germans, who now control the larger part of Shantung, expect to make highly productive.

The Germans have taken hold of the development of the peninsula of Shantung in a vigorous way, extensive improvements having been made at the harbor of Kiaochau, and a railroad 280 miles in length having been planned and partly constructed. It is expected that German capitalists will develop the mineral and other resources of Shantung at an early date.

Shantung has two ports, Chifu and Kiaochau, the latter of which will in all probability become the more important one. The exports will consist mainly of minerals, silk, and tobacco, and the imports will comprise flour and provisions, cotton goods, iron and steel, and other manufactures. The Germans will doubtless endeavor to control the major share of the trade, and during the early years of their occupation they will in all probability supply most of the iron and steel and other commodities imported. It seems probable, however, that the cotton goods will, after a few years at least, be supplied largely by the United States, and also that the iron and steel manufactures will come in part from this country. If the Germans succeed in organizing efficiently the 30,000,000 people said to dwell in Shantung, they will give rise to a large foreign trade in which the United States will unquestionably have a share.

RESOURCES AND TRADE OF CENTRAL CHINA—THE YANGTSE VALLEY.

The great central portion of China is included within the Yangtse Valley, which in general occupies a strip of country extending 250 miles on each side of the thirtieth parallel of latitude. It is the largest of the three sections in which China has been divided in this chapter, and possesses the greatest variety and abundance of natural resources. The Yangtse Valley is divided into two rather distinct parts by the gorges in the river just above the city of Ichang, about 1,100 miles from the ocean.

Probably one-half of the valley below the gorges consists of the coastal plain, the other half being upland country. The great silk and tea districts of China are crossed by the lower course of the Yangtse River. Rice and cotton constitute other productions of great value. The population of certain sections of the lower course of the Yangtse is probably more dense than that of any other section of the Kingdom.

Although the most valuable resources of the lower valley are agricultural, there are large stores of minerals, particularly coal, which is known to exist in large quantities in the province of Hunan south of the river. In the mountainous regions, where the tributaries of the Yangtse originate, are reported to exist deposits of copper, gold, silver, and lead.

The Yangtse Valley above the gorges is an extensive rolling country, most of which is included within the province of Szechuan, north of the river, and Kweichau, on the south side of the stream. Both provinces have abundant stores of coal, copper, iron, tin, lead, and the precious metals. Kweichau is a more distinctively mineral region than Szechuan is. In the latter province the rice crop is the most important one, but wheat, sugar, opium, and fruits can be, and are, produced to some extent. The climate is very much like that of France. Cotton, the chief material from which clothing is made, can not be produced in the province. The exports from the Upper Yangtse Valley consist of hemp, opium, hides, bristles, wool, wax, and some silk. At the present time the chief imports into the region consist of cotton goods.

Very little credence is to be given to the statistics of Chinese population, which must always be regarded as estimates. There are, however, said to be 70,000,000 people in the Yangtse Valley above the gorges, and whether this figure be right or not, it can not be doubted that this interior portion of China must in time become the center of a large domestic and foreign trade. At the present time the only commercial highway is the Yangtse River, which is obstructed not only by the gorges above Ichang, but also, and more seriously, by the tax officials of the various local governments along the river.[a]

The city of Shanghai, at the mouth of the Yangtse, is the port of entry for the whole valley and the most important commercial center of all China. Fifty-nine per cent of all the Chinese imports and 48 per cent of the exports are handled in this city. There is, moreover, some prospect that manufacturing industries will be successfully developed at this point; some beginnings have already been made. It is an interesting fact that most of the trade of the United States with China, although our chief markets are in Manchuria and the northern part of the Kingdom, is handled through Shanghai, that city being the distributing point not only for the Yangtse Valley, but for North China as well.

About seven hundred miles up the Yangtse River is the city of Hankau, the most important interior distributing point in the Kingdom. By means of the Yangtse and its branches from the north and south it has water connection extending in all directions, and from it nine provinces of China can be reached. The city is accessible to seagoing vessels and, consequently, has a large trade directly with foreign countries. It is the market place for traders from various parts of China, and its central location in the fertile section of the Kingdom makes it the point of shipment for a large part of the export trade of central China.

The evidence is conclusive that the great Yangtse Valley of central China, comparable as regards area and wealth of agricultural and mineral resources with our Mississippi Valley, is destined to become industrially and commercially important when its resources and great supply of labor can be organized. The time can not be far distant when capital will provide means of transportation and develop the natural resources of the country. When this is done the region will surely have a large import trade in the class of manufactures produced in the Eastern and Southern sections of the United States. Those parts of the United States, moreover, will require the silk, wool, and other raw materials of industry from the Yangtse Valley, the present exportations of which are but a fraction of what they might be made.

RESOURCES AND TRADE OF SOUTHERN CHINA.

The southern district of China is situated on both sides of the Tropic of Cancer, and includes the coastal region of the province of Fukien and the territory drained by the Siho or West River and its tributaries.

The products are almost entirely agricultural, and are those of the tropical and subtropical regions. Silk, tea, rice, sugar, opium, camphor, and various medicinal plants are grown and exported in greater or less quantity. The manufactures of the region are all handmade, and consist of mattings, silks, lacquer ware, embroideries, and the sails required for the domestic shipping.

The upper valleys of the West River and its tributaries contain mineral resources, and these might, without great expense, be made accessible by improvements in the river navigation. Southern China, like the rest of the country, however, is still industrially undeveloped, and must remain so until a government can have been established that will be strong enough to protect personal and property rights.

The city of Hongkong, on an island at the mouth of the West River, is the main port of southern China, and next to Shanghai the most important one on the Pacific coast of Asia. Besides Hongkong, the cities of Amoy and Fuchau, on the coast to the east and north of Hongkong, are growing centers of commerce.

It is said that Hongkong is the distributing point for 80,000,000 people, and its position is such that its trade must grow pari passu with the development of southern China. The city is about equally distant from New York by the Suez and American isthmian routes. At the present time its trade with the Atlantic part of the United States as well as with Europe is handled by way of the Suez. After the American canal has been opened the trade of Hongkong and all southern China generally, will probably be divided between the easterly and westerly canal routes. One reason why the westerly route will obtain a share of the trade is that Hongkong is the terminal port for vessels outbound across the Pacific from the United States. At present nearly all the lines from British Columbia and our west coast ports call at Japanese ports, Shanghai, and Hongkong. After the canal has been opened vessels crossing the North Pacific from America to Asia will naturally call at Japanese and Central Chinese ports and proceed to Hongkong or Manila. Southern China and the Philippines are in the region whose commerce will be competed for by both routes. When the American canal has been opened the traffic will be divided between the two canals, and the exporters of that region will profit by the competition of the two routes.

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[a] Possibly the treaty of 1904 between China and the United States together with treaties between China and other nations may result in the abolition of the likin taxes, but this is at least doubtful.

THE FOREIGN TRADE OF CHINA.

The aggregate foreign trade of China in 1901 was valued at 438,000,000 taels ($350,000,000), of which 268,000,000 taels were imports and 170,000,000 were exports. In 1897 the total foreign trade amounted to 367,000,000 taels ($294,000,000). While this total seems fairly large, the amount of trade per capita is extremely small, barely one dollar per person. There are some countries with natural resources inferior to those of China whose foreign trade is from twenty-five to one hundred times as much per person. The foregoing analysis is sufficient to show that the resources and labor supply of China are ample to support extensive industries capable of giving rise to a large foreign trade, were the political and social conditions favorable to economic progress.

Whether and to what extent the present untoward political and social conditions of China can be improved constitutes the Chinese question. If the powers succeed in securing for China a stable and fairly progressive government under which the individual and society may develop industrially, there can be no question but that the foreign commerce of China will reach large proportions.

The truth of this statement is clearly shown by what occurred during the five years preceding the outbreak of the Boxer revolution. During those years comparatively rapid progress was being made in the work preparatory to rendering the natural resources of the country available. Mining concessions were obtained by various capitalists, railroads were under construction, and there was every indication that the natural wealth of China was to be made to contribute largely to international trade. In 1899 the total trade was 24 per cent more than that of the preceding year and double that of the year 1890.

The most important imports into China are cotton goods, which comprise over a third of the total inbound trade. The commodity next in rank is opium, which is followed by kerosene, metals, coal, woolen goods, and a variety of other commodities. Silk, raw and manufactured, ranks first among the exports, tea being next in importance. Among the other exports of consequence are straw braid, sugar, hides, clothing, paper, and pottery. At the present time Great Britain controls more of this trade than any other country, but her share of the total is decreasing. An analysis of our trade with China will show that the opposite is the case with our commercial relations.

TRADE OF UNITED STATES WITH CHINA AND EFFECTS OF CANAL.

The trade of the United States with China included about $27,000,000 worth of imports into this country and nearly $19,000,000 worth of exports to China during the year ending June 30, 1903. This total of $46,000,000 indicates an increase of 100 per cent within a decade. The most rapid growth has taken place in our exports of cotton goods. The value of cotton sheetings sent to China in 1899 exceeded the value of our total annual exports to that country for the years preceding 1896. Next to cotton goods, our leading article of exportation is kerosene oil, but in addition we are selling increasing quantities of iron and steel, breadstuffs, lumber, and general manufactures. Among the articles which we import from China, silk, raw and manufactured, holds first place, and tea occupies the second position. These two articles comprise over half the total value of the imports. Raw wool, hides, skins, and furs, straw braid, and a variety of curios make up the larger share of the other articles imported.

The rapidity with which our trade in China is growing may be shown by a few comparisons. During the three years ending in 1899 the total imports of Shanghai increased 50 per cent and those from the United States were doubled. Our imports of Chinese goods direct from China (i. e., exclusive of the Hongkong trade) are now nearly double what those of the United Kingdom are. Moreover, the Chinese statistics do not give us credit for all the trade we have with the country. Some of our trade is handled by way of Europe and credited to European countries, while another large share goes from New York by way of the Suez Canal to Hongkong, whence it is distributed in China. It appears as imports into Hongkong and as exports from that city to China. All nations, both oriental and western, handle more or less of their trade with China through Hongkong. Apparently the trade of the United States with Hongkong direct is two-thirds as large as Great Britain's is. A French commission sent out to China in 1895 to study the trade situation added 63 per cent to the figures of American trade to cover the amount that entered China by indirect routes, and there is no indication that any important change has taken place since then in the routing of trade such as would have changed the percentage of our indirect as compared with our direct shipments.

The general relation of an isthmian canal to our trade with China may be easily and briefly stated. The breadstuffs and lumber which we export across the Pacific will unquestionably be sent from the Pacific coast. The same will be true of the lighter manufactures of high value per bulk. Should we develop any considerable trade in provisions, the main source will be east of the Rocky Mountains. The iron and steel, general manufactures, kerosene, and cotton goods will be exported from the eastern and southern sections of our country. They will unquestionably constitute canal traffic, and their sale will be largely facilitated by that waterway.

Our kerosene trade in China is already feeling very keenly the competition of Java and Russia, and our exporters are able to hold their trade only because they have developed unusually economical means of transportation.

Probably our exportation of cotton goods will be affected more favorably by the canal than will any other class of goods sent to China, with the possible exception of heavy manufactures of iron and steel. It is estimated that 70 per cent of the cottons exported from this country to China are manufactured in the Southern States, the section nearest to the canal. At the present time four-fifths of these exports go by way of the Suez Canal, the other fifth being sent across the continent, largely by way of the Canadian Pacific Railway. Moreover, the foreign destination of these goods is nearly all in northern China, that part of the country nearest to the United States by way of the isthmian canal and most remote from us by way of the Suez. Even under the present unfavorable conditions of competition we are securing control of the larger part of the cotton-goods trade of northern China. During the past decade the imports of cotton goods into that section from England and Dutch countries declined over 50 per cent, whereas ours increased 400 per cent during the same period. With the canal to assist us in the development of this trade, it seems certain that we can not only control the business, but can do it with a large margin of profit.

Should the anticipated industrial development of China occur, will the country become independent of foreign trade? Will it supply its own needs? Not a little has been heard regarding the danger of Chinese development to American labor and American industries. The fear has no basis in experience. In general it may be said that our trade is greatest with those countries whose industrial development has reached the highest stage of evolution, and that our commerce increases in proportion to the economic progress of the country traded with. Japan is a case in point. The large development now in progress in that Empire is being accompanied by a very rapid growth in her trade with the United States. The same is true in a less degree of Chile, and would be true in a much greater degree if we were able to trade with Chile under favorable conditions of transportation.

Industrial development and economic progress are always accompanied by an increase in wages and a rise in the standard of life. If foreign nations succeed in organizing the industrial forces of China, they will also succeed in greatly multiplying the wants of the people and laying the foundation for a much larger trade between that country and all parts of the world.

Chapter XIV.

THE CANAL AND THE INDUSTRIES AND TRADE OF AUSTRALASIA.

There is possibly no part of the world outside of Europe and the United States that has a more promising commercial future than Australia. The area of the island continent of Australia is about equal to that of the United States, exclusive of Alaska and the colonies, each having somewhat less than 3,000,000 square miles of territory. The density of the population of the two countries is, however, very different, for in 1901 there were but 3,771,715 people in all Australia, a smaller number than there are in Illinois or Ohio, not to mention the still more populous States of Pennsylvania and New York. In spite of its small population, Australia is a region having an enormous commerce, the average trade per capita being one hundred times that of the Chinese people. This enormous trade results partly from the nature of the industries of the country, and partly from the character of the population, which is nearly all British. The people have a very large average per capita wealth, and their standard of living is high. They import large quantities of manufactures, which they are able to purchase because of the vigor and energy employed in the development of the abundant natural resources of the virgin continent.

AUSTRALIAN INDUSTRIES REQUIRE A LARGE FOREIGN TRADE.

The rapid development of the natural resources of Australia could not take place without an immense foreign trade. The chief industries[a] are pastoral, agricultural, and mineral, all of which can be carried on with a comparatively limited supply of labor. The vast area of the country and the fact that but a small portion of the territory has yet been occupied make certain the continuance, without very great change, of the present industrial conditions of the country for several decades. Although the country possesses liberal stores of minerals other than the precious metals, there is little prospect of the early development of industries upon which highly developed manufactures must rest. The three most essential requisites to diversified manufactures are cheap labor, cheap and abundant coal and iron, and surplus capital seeking investment. Although Australia has coal and iron, labor and capital are so scarce that fuel and steel must necessarily be more expensive than they are in Europe and the United States, where most of the world's manufacturing is done at the present time. For some time to come the profits in the pastoral and agricultural industries, and in the mining of precious metals, will continue to offer greater inducement than can the manufacturing industries. This is equivalent to saying that Australia will, for several decades at least, continue to export great quantities of food supplies and raw materials in exchange for manufactures.

In Australia's total foreign commerce of over $350,000,000 worth of goods annually, the United States has a large and rapidly increasing share. The development of our manufactures will require constantly larger quantities of the exports of Australia, and our export trade to that country is certain to be of constantly increasing importance to us.

THE CANAL AND DISTANCES TO AUSTRALIA.

The distances from New York and our North Atlantic ports to Australia by way of the Suez Canal and by way of the Cape of Good Hope are practically the same; consequently all our direct commerce with Australia moves around the Cape. In the tables included in Chapter XVII, the distances from our Atlantic and Gulf ports to Australian cities by way of the Cape of Good Hope route, and the proposed American Canal are compared. By referring to the table it will be seen that New York is 3,806 miles nearer Sydney by way of the Panama Canal than by way of the route followed by vessels going to Sydney by way of the Cape of Good Hope. Adelaide, the most westerly port of the industrially important part of Australia, will be 1,640 miles nearer New York and 3,209 miles nearer New Orleans by way of the Nicaragua Canal than by Good Hope.

A map[b] accompanying Chapter XVII shows the line connecting the points equidistant from

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[a] See Plate 81.

[b] See Plate 86.

New York by way of the Nicaragua and Suez routes, and it will be seen that the line crosses the western part of Australia and touches the continent of Asia west of Hongkong.[a] These references to distances are sufficient to show that the industrially and commercially important half of Australia will be brought from eight to fifteen days nearer our eastern seaboard by the construction of an isthmian canal.

The tables of Chapter XVII show that the entire continent of Australia is nearer Liverpool by way of the Suez Canal than it will be by way of the American isthmian route. Attention may be called to the fact, however, that Sydney will be only 357 miles farther from Liverpool by the Panama route than by the Suez. The line connecting points equidistant from Liverpool by way of the two routes passes between New Zealand and Australia and east of the main island of Japan.

The Suez route to Australia is shorter for European commerce than is the Good Hope route, but the difference is not enough to induce slow freight steamers to use the canal, the tolls of which amount to about $2 per net ton, British measurement.[b] Letters received from European steamship companies show that about the only steamers between Europe and Australia using the canal are those which carry passengers and mails. The slow-going freighters practically all go around the Cape. As compared with the Good Hope route between Europe and Australia, the American canal line would be shorter. The east coast of Australia will be almost equidistant from Liverpool by the easterly and westerly canal routes. The significance of this is enhanced by the fact that over half the commerce of Australia is handled at Sydney, which port is made by all vessels, whether from Europe or from the United States. These references to distances, however, are not intended to imply that distance is the only fact determining the routes taken by vessels.

GENERAL GEOGRAPHY OF AUSTRALIA.

The continent of Australia is situated between 10° and 40° south latitude, somewhat over half of the continent being south of the Tropic of Capricorn. The island is regular in shape, has a coast line but little broken, and consists of a comparatively narrow rim of well-watered and fertile country, within which is a vast stretch of semiarid and arid country, much of which has an annual rainfall of 10 inches or less. Almost all the mountains are situated near the coast, the highest ones being the Australian Alps, which run parallel to the eastern and southeastern shore about 50 to 75 miles from the ocean. The average height of this range is 1,500 feet, the peaks rising to 5,000 and 6,500 feet. The eastern slopes are everywhere well watered, and this portion of Australia is the most fertile and thickly settled part of the continent.

The western slopes of these mountains are very gradual, and are drained by the Murray and Darling rivers and their tributaries, which together have a basin as large as that of the St. Lawrence or the Danube. This is the great grazing section of Australia. The eastern and southern sections of the basin, however, have a rainfall of 25 to 40 inches, and are adapted to cereal agriculture.

The eastern third of Australia is divided into three political divisions, Queensland occupying the northern half of this eastern section. South of Queensland is New South Wales, below which is Victoria. The most populous and productive parts of Australia are New South Wales and Victoria. These colonies occupy a region corresponding in latitude to that of the United States between New York City and Jacksonville. South Australia consists of the central third of Australia, west of which is the great tract of western Australia. Both of these divisions are arid except within the narrow rim near the ocean, and in the tropical northern sections where the trade winds, unobstructed by any coastal mountains, give the country abundant rainfull. But little of the tropical section of Australia has as yet been occupied because the British colonists have not found the region healthful.

PASTORAL AND AGRICULTURAL RESOURCES.[c]

From the first years of its settlement Australia has been celebrated as a grazing region. Everywhere, with the exception of the tropical lowlands and the interior desert sections, the climate is favorable to sheep and cattle, and the forage is abundant.

The most important grazing district of Australia is the large interior basin of the Murray River and its tributaries, where a large part of the country is taken up with the cattle and sheep

[a] Had the lines on the map been drawn with reference to the Panama and Suez routes the location of the lines would have been somewhat but not greatly different. On plate 74 the differences between the distances by the Nicaragua and Panama routes are stated.

[b] The Suez toll is now 8.50 francs a ton, net register, Danube measurement. As is explained in Chapter XXII, that is equal to about $2 a ton, net register, British or American measurement.

[c] See Plate 81.

ranches. The more populous sections of the country between the Australian Alps and the eastern and southern coasts are changing from grazing to dairying, Australia having become an exporter of large quantities of dairy products.

A few statistics regarding the number and value of the cattle and sheep of Australia will serve to illustrate the importance of the grazing and dairying industries of the country. Despite several years of drought, during the period since 1896, there were 72,000,000 sheep in Australia in 1901. The figures for the United States for that year were 59,756,000; but for the beginning of 1904 only 51,630,000. New South Wales alone frequently has as many sheep as the whole of the United States. The Australian wool furnishes one-fourth of the world's supply, and is of the finest quality. During the past decade it has been worth $120,000,000 per annum on an average, and in addition to this, $80,000,000 have been annually derived from the meat and other animal products. This total of $200,000,000 per year amounts to over $50 for each person in Australia.

The agricultural industries of Australia include the raising of grain, the growing of fruits, and the production of sugar. The grain-producing districts lie on both sides of the Cordilleran Alps in New South Wales and in Victoria and on the shores of Spencer Gulf, in South Australia.

The colony of Victoria, whose area and population are about the same as those of Nebraska, has grown a maximum wheat crop of 20,000,000 bushels in one year. This was in 1898, when half as many bushels were raised in the neighborhood of Spencer Gulf, South Australia. Australia can not, however, be regarded as a very favorable wheat-growing country, because of the uncertainty of the rainfall in many parts of the wheat-growing sections. Irrigation is being extensively resorted to, and it will doubtless enable the country to support a great many more cattle and sheep, to increase the annual grain production, and to enlarge the acreage of its fruit orchards.

Horticulture is rapidly developing in Australia. The lower regions of the subtropical and tropical districts produce the fruits usually grown in the climate of those regions, and the upland districts of the more southerly and temperate colonies are adapted to the production of grapes, apples, pears, plums, and similar fruits. In the Victorian part of the Murray River Valley there are said to be forty corporations holding concessions aggregating 2,000,000 acres, under which they are developing irrigation projects, mainly for the purpose of growing fruits. In the neighborhood of Wallaroo, north of Adelaide, there is an irrigation system using 670 miles of iron and steel pipe, by which water is distributed to places 25 to 75 miles distant. This region produced 1,080,000 gallons of wine in 1898. The exports of fruit from the region are growing and promise to constitute an important industry.

The tropical portion of Queensland has the beginnings of what will doubtless become a large sugar industry. The yearly crop amounts to 160,000 or 180,000 tons, a total of more than half the average annual product of Louisiana.

The agricultural resources of Australia are such that the country must continue to be an important exporter of food products for many decades. There is, and will long continue to be, a surplus of breadstuffs. Wool, meat, hides, and dairy products will long be produced in such abundance as to necessitate a large sale of them abroad. Other promising future agricultural exports are wine, tobacco, and sugar. One-fourth of the world's wool is now grown in Australia. In the future we shall want increasing quantities of this article and of hides and skins.

MINERAL RESOURCES.

The mineral industries[a] of Australia rank high in the statistics, both of production and of foreign commerce. Gold, silver, copper, and coal are the most extensively mined, although by no means the only minerals existing in the country.

The annual export of gold from Australia is, in round numbers, $60,000,000. The industry has passed the uncertain stage of placer mining and now consists mainly of the reduction of quartz ore. Most of the gold fields are in the mountains of eastern Australia, but quartz reefs, situated in the arid plains of the western part of the continent, are now yielding a large percentage of the total output. These mines in western Australia have added much to the annual production of the country.

Australia ranks third among the silver-producing countries of the world, being outclassed only by the United States and Mexico. Her product is about one-tenth that of the entire world. The mines are located mainly in the eastern part of the country.

The copper mines of Australia yielded 18,000 tons of the metal in 1898, the product having doubled in four years. Lead and tin are both exported, and various other metals are produced in small quantities.

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[a] See Plate 81.

In Chapter VI, dealing with the coal supply for the commerce of the Pacific, the coal trade of Australia was discussed at some length. The field from which the present supplies are mainly drawn is a comparatively small one of 3,000 square miles in area, situated close by the city of Newcastle, 62 miles north of Sydney, the most important port of Australia. There are other larger fields in the mountainous sections of the country, of which use will be made as the demand for fuel increases. The present exportation of coal from Australia, as has already been explained, is facilitated by the large tonnage of vessels leaving the country in ballast. This explains why the western part of the United States, South America, Hawaii, and the Philippines, as well as the East Indies, use more or less Australian coal.

The value of the minerals exported from Australia averages $100,000,000 per year, more than $25 for each person. This is a very large amount of trade for any one class of industries to give rise to, and it shows the great productive capabilities of the Australians. The chief significance to the United States of this great Australian mineral industry is that it necessitates a large foreign trade in mining machinery and general manufactures. As was stated at the beginning of this chapter, the industrial conditions of Australia are not such as to make profitable the development of the iron industries, and of the manufactures based upon crude iron and steel. Consequently, the expensive machinery for the development of the mines, the railway material, and the manufactures required by the mining population must be imported. American manufacturers have been especially successful in making mining machinery, and their products have gone all over the world. In Chapter IV, on the Central West, the experience of a Chicago manufacturer was cited. This, and numerous other firms in different parts of the United States, now have a large foreign trade in mining machinery in many sections of the world.

THE CANAL AND THE COMMERCE OF AUSTRALIA WITH THE UNITED STATES.

In considering the foreign trade of Australia, the fact must be kept in mind that the statistics of the commerce of the various Australian States include, not only the trade which they have with countries outside of Australia, but with the various parts of Australia. The statement made at the beginning of this chapter that the foreign trade of Australia amounted to $350,000,000 per annum—a sum equal to $100 per capita—referred only to the trade of the various Australian States with countries outside of Australia. This total of the foreign commerce of Australia equals half that of all South America, and is as large as our foreign trade was fifty years ago. The per capita average is nearly four times that of the United States at the present time. There is, moreover, no doubt of the continuance of this large foreign commerce. The nature of the industries being such that a heavy foreign trade is requisite to their development, the fact that the various Australian Commonwealths have constructed efficient railway systems, which are being extended as necessity requires, the industrial aptitude of the people—all these factors combine to assure the future commercial importance of Australia.

Although the Australian imports are increasing rapidly, our share in those imports is growing more rapidly than their total. In fact, our export trade into Australia is increasing faster than that to any other country except those of eastern Asia. Between 1890 and 1900 our exports to Europe increased 52 per cent, those to South America one-half of 1 per cent, while our exports to Oceania increased 157 per cent. The greater part of this commerce with Oceania was with the continent of Australia, in every State of which the use of our manufactures is increasing. New South Wales, for instance, during the last decade increased its total trade 40 per cent, but the imports from the United States rose 184 per cent during the ten years. In 1900 our total exports to Australia were valued at $26,725,702; in 1903 at $32,510,118, whereas in 1889 their value was $12,252,147. Our direct imports from that country have not increased since 1896. It is probable, nevertheless, that we are using a larger quantity of Australian wool than we did ten years ago. Most of this wool, however, comes to us by way of London, and appears in the statistics of our trade with the United Kingdom. We are now sending to Australia a large variety of commodities.

The preeminent rank of the city of Sydney in the foreign trade of Australia is a fact of much significance in this discussion. Ninety-seven per cent of the trade of New South Wales is handled through that port, and nearly one-half of the total commerce of the Australian States with nations outside of the continent of Australia is carried on at the port of Sydney. This city is the commercial metropolis of Australia, and is the point from which a large share of the imports from Atlantic countries is distributed throughout Australia and the adjacent islands. The city of Melbourne is another distributing point, but its importance has declined as compared with Sydney, because of the greater facilities possessed by the latter port for the transshipment of commodities.

The fact that the coasting trade of Australia centers so largely in Sydney and Melbourne is interesting in this connection, because those ports are so situated that they will be brought many days nearer to the eastern half of the United States by the construction of the isthmian canal.

The influences of the isthmian canal upon our Australian commerce will affect our trade in a large variety of commodities. Our growing exports of iron and steel manufactures and other heavy articles are being supplemented by an increasing exportation of lighter commodities, and when the canal has removed our present handicap, arising from the disadvantages regarding distances which we at present have in competing with Europe, our commerce with Australia will be carried on under much more favorable conditions. The traffic between Australia and the eastern and southern sections of the United States by way of the canal will be large, unless the tolls of that waterway should be placed so high as to be prohibitory. In Chapter XXII the question of tolls is considered at length, and it is there shown that a toll of $1 per vessel ton net register would not restrict the use of the canal by our Australian commerce. The maintenance of the present Suez Canal tolls, which are equivalent to $2 per net register ton, British measurement, and the imposition of the toll of $1 per ton or less for the use of the American canal would be of much assistance to the American waterway. In the chapter on tolls emphasis is laid upon the necessity of adopting a schedule of tolls for the American canal that will not prevent its being used by the traffic of Australia and western South America.

NEW ZEALAND AND THE CANAL.

New Zealand is almost exactly antipodal to the United Kingdom. The construction of a Panama Canal will bring Wellington 1,313 miles nearer Europe by that route than by the Suez. That city will be 2,522 miles nearer New York by a Panama Canal than by way of the Straits of Magellan.

The islands of New Zealand[a] bear some resemblance to the United Kingdom in shape, area, and climate. Within their area of 104,500 square miles there are at present less than 800,000 people. The climate is admirably adapted to raising grain, cattle, and sheep.

The chief industry of the islands is the raising of sheep and the exportation of mutton and wool. The islands now have 20,000,000 sheep and the annual exports of mutton to the United Kingdom exceed $10,000,000 in value.

The mountains of New Zealand, like those of Australia, are well stocked with minerals. The output of the gold mines amounted to $8,600,000 in 1901. Most of this, however, was secured from placer mines, although the working of the quartz deposits has been begun. The mountain streams of the country furnish an abundant supply of water power for mining and other industrial purposes.

Over a million and a quarter tons of coal are annually mined, the output of which can and will be increased in proportion to the demand for fuel. It hardly need be said that the iron deposits of New Zealand have not yet been worked. A country that is still mainly in the grazing stage of industry is several decades ahead of the exploitation of its iron mines.

The mineral resource of New Zealand which is of interest to the people of the United States is the kauri gum, from which varnish is made. This gum is a fossil resin dug up from the sites of old forests, and the supply, it is said, is sufficient to last for several decades. On an average nearly 10,000 tons of this gum, valued at $3,000,000, are exported, and a large part of it comes to the United States.

The commerce of New Zealand is larger per capita than that of Australia, being over $120 per person. The total commerce, with a value of over $100,000,000 per year, is mainly controlled by Great Britain, but the United States has a respectable and increasing share of the trade. During the nine years ending in 1898 our trade with New Zealand increased 108 per cent, our total trade in 1898 amounting to about $7,000,000. In 1901 the value was $9,500,000, a gain of 36 per cent over 1898.

New Zealand has good shipping facilities for foreign trade, the Government is developing the railway system rapidly, and the natural resources of the country may be expected to contribute increasing quantities to international trade. There is no more probability of the development of manufactures in New Zealand than in Australia. The islands will continue to export food products and raw materials in exchange for manufactures.

The opening of the Panama Canal will bring the city of New York 5,541 miles nearer to New Zealand than it is by the Good Hope and Australia route, and the distances between the Eastern cities of the United States and that country will be from 2,500 to 3,500 miles shorter than by way of the Straits of Magellan. Seven-eighths of our exports to New Zealand are sent from the Atlantic coast. These exports include mineral oils, tobacco, machinery, hardware, wire and wire nails, carriages, carriage materials, patent medicines, and boots and shoes. The volume and variety of our present commerce carried on by the circuitous route around Africa is evidence that the opening of the American canal will have important effects upon our New Zealand trade.

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[a] See Plate 82.

Chapter XV.

THE CANAL AND THE PHILIPPINES AND HAWAII.

I. THE PHILIPPINES.[a]

Our present commerce with the Philippines is carried on mainly by the Suez Canal route and frequently by way of some European port. A minor but increasing share of the trade is shipped through our west-coast ports and across the Pacific Ocean to Hongkong. A glance at Plate 86, accompanying Chapter XVII, will show that the line connecting points equally distant from New York City by way of the Suez Canal, and the route by the American isthmus, runs somewhat to the west of the Philippine Islands, indicating that they are slightly nearer New York by way of the Panama Canal than the Suez route. The difference in distance by the easterly and westerly canal lines will, however, be slight, and the Philippine Islands, as well as Malaysia generally, will constitute a section whose commerce with North Atlantic countries will be divided between the American and Suez canals.

THE GEOGRAPHY AND INDUSTRIES OF THE PHILIPPINES.

The information concerning the geography of the Philippines is scanty and must necessarily be very incomplete until the islands can be surveyed. The location of the Philippines is between 5° and 20° north latitude, their latitude being that of the Guianas and Haiti. Their climate is tropical and humid, and, being situated with a general north-and-south trend in the latitude of the trade winds and monsoons, both the eastern and western slopes of the islands have alternate rainy and dry seasons.

The area of the islands is estimated to be about 115,000 square miles and the population to be 7,635,426. Over one-half of the people live on the island of Luzon.

The resources of the Philippines are agricultural, forest, and mineral. Concerning the agricultural conditions of the islands, information is fairly satisfactory. The forest resources are known to be varied and abundant, and it is supposed that the mineral deposits are important. There is, however, very little authentic information at hand regarding the mineral wealth of the country. The industrial conditions of the Philippines are in an extremely backward and undeveloped condition, the islands being at the time of the American occupation practically without highways. Only one short railroad has yet been built, and the industries are still in an unorganized state.

At the present time the agricultural product of most commercial importance is hemp, the exports of which in 1902 were valued at $19,290,610. The production and exportation of this article are rapidly increasing with the growth in the demand for it in the United States and other agricultural countries. Some of it is used for cordage, but much more is used as binder twine. The principal competitor of Manila hemp is that from Yucatan, sisal hemp, the quality of which is much inferior. The plant from which the fiber is taken is grown in the shade of half-cleared woods, and its cultivation requires very little intelligence and only a moderate amount of diligence and thrift on the part of the producer.

Before the insurrection the most valuable export from the Philippines was sugar, of which $10,368,000 worth was exported in 1893. The exports in 1900 amounted to about $3,022,000. Sugar can be produced in large quantity in the Philippine Islands, and with the investment of capital, in the exploitation of the resources of the islands, will probably rise in the list of Philippine industries.

Like the islands of the West Indies, the Philippines produce tobacco abundantly, the soil and climate of the northern provinces of Luzon being adapted to its culture. The quality is said to be fairly good. The home consumption of tobacco is large, and considerable quantities both

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[a] Consult Plate 83 in connection with this chapter.

of manufactured and leaf tobacco are exported. Most of the unmanufactured article is sent to Spain. The other important article of export from the Philippines at the present time is copra, the dried meat of the cocoanut. The cocoanut palm grows in many parts of the island, and might be made to contribute much more largely to the wealth of the islands than it does at the present time.

Next to the cotton manufactures the most important article of importation into the Philippine Islands is rice. This important article of food might all be grown in the islands, and a surplus might be exported if the industry were properly organized. The indifferent agriculture of the Philippines was largely devoted to the growing of rice, until the production and exportation of sugar became more profitable. Whether it is possible to apply capitalistic organization to the production of rice is not altogether certain. In all probability the organizers of the industry would be obliged to use coolies for a part of their labor force.

One of the early natural resources of the islands to be drawn upon will be the forests. Nearly all of the forest lands belong to the Government, and concessions for the cutting of timber are now being granted. The variety of hard woods is large; seventeen valuable dyewoods are known to exist, and gutta-percha, camphor, and other gum trees may be included among the important timbers.

While but little can be confidently asserted regarding the mineral resources of the Philippines, it is supposed that there are large deposits of gold, copper, and iron. The mining of gold is now being carried on to a slight extent. The development of both gold and copper resources, however, must be delayed until machinery can be introduced and the enterprise organized in an efficient manner. The working of iron mines must necessarily be deferred until there is a good supply of cheap fuel. Lignite has been found upon several of the islands, and the quality is such that it can be used for locomotives and on steamers. Some of these lignite deposits are near the seashore and can be readily worked. At the present time, however, the entire coal supply is imported.

In considering the industrial resources of the Philippines and their probable future development, one of the most important considerations is the labor supply. Whether the present inhabitants of the Philippine Islands can be successfully organized in industrial undertakings is uncertain. It is probable, however, that education and training in industry may make of them a valuable and reliable labor supply. It is possible that more or less use must be made of coolie labor. The near-by continent of Asia can furnish an unlimited supply of efficient labor, but whether the Asiatic labor supply should be drawn upon or not raises a social as well as an industrial question.

THE COMMERCE OF THE PHILIPPINES.

Having acquired political control of the Philippine Islands, their foreign trade becomes of additional importance to the United States. In order to present the information regarding the Philippine trade completely and definitely, the following tables have been prepared. The imports and exports of the islands are shown by countries and by articles for the years 1893 and 1900. The imports and exports for the year ending June 30, 1900, are shown in a separate table. The figures for 1900 are taken from the Monthly Summary of Commerce of Philippine Islands, United States War Department, Division of Insular Affairs. The figures for previous years are from Bulletin No. 14, United States Department of Agriculture, Section of Foreign Markets.[a]

TABLE NO. I.—*Imports of Philippine Islands by articles, calendar year 1893 and fiscal year 1900.*

Articles.	Calendar year 1893.	Fiscal year 1900.	Articles.	Calendar year 1893.	Fiscal year 1900.
Cotton manufactures	$5,866,000	$6,019,000	Vegetables	$189,000	$243,000
Rice	628,000	3,113,000	Wood, and manufactures		225,000
Iron and steel manufactures	672,000	715,000	Flax, hemp, and jute manufactures	494,000	209,000
Malt liquors and cider	105,000	638,000	Pork, bacon, lard	175,000	195,000
Chemicals		605,000	Mineral oils	1,084,000	161,000
Glass and glassware	174,000	525,000	Boots and shoes	120,000	149,000
Opium		476,000	Woolens	215,000	139,000
Coal		468,000	Earthenware and china	212,000	132,000
Paper, and manufactures	376,000	462,000	Olive oil	114,000	47,000
Silk manufactures	367,000	462,000	All other articles	3,338,000	4,840,000
Flour	526,000	399,000			
Wines	1,060,000	320,000	Total	15,891,000	20,597,000
Distilled liquors	176,000	303,000			

[a] A revision of these tables to date by substituting 1903 for 1900 would be made if the author had the time at his command. It is believed that the value of the tables and the discussion of them warrants their retention in the report.

TABLE No. II.—*Imports of Philippine Islands by leading countries, 1893 and 1900.*

Countries.	Calendar year 1893.	Fiscal year 1900.
China, including Hongkong and Indo-China	$2,754,000	$8,210,000
United Kingdom	4,247,000	3,941,000
Spain	5,104,000	2,093,000
United States	956,000	1,656,000
Germany	1,246,000	1,210,000
France	477,000	485,000
Japan	183,000	259,000
All other countries	923,000	2,743,000
Total	15,890,000	20,597,000

TABLE No. III.—*Exports of Philippine Islands by leading articles, calendar year 1893 and fiscal year 1900.*

Articles.	1893.		1900.	
	Quantity.	Dollars.	Quantity.	Dollars.
	Pounds.		*Pounds.*	
Hemp	a 92,262	7,697,000	a 75,476	11,399,000
Sugar	576,557,000	10,368,000	173,630,000	3,022,000
Copra and cocoanuts	26,223,000	414,000	81,799,655	1,693,000
Cigars and cigarettes		969,000		1,362,000
Leaf tobacco	23,687,000	1,463,000	14,010,356	818,000

a Tons.

TABLE No. IV.—*Exports of Philippine Islands by leading countries.*

Countries.	Average for 1892–1896 (calendar years).	Fiscal year 1900.
United Kingdom	$8,844,000	$6,227,000
China, including French Indo-China and Hongkong	31,000	4,415,000
United States	6,053,000	3,522,000
France	986,000	1,392,000
Spain	3,855,000	1,226,000
Japan	616,000	1,032,000
Germany	201,000	97,000
Other countries	1,896,000	2,110,000
Total	22,482,000	19,751,000

TABLE No. V.—*Imports and exports of merchandise, Philippine Islands, year ended June 30, 1900.*

Countries.	Imports.	Exports.
United States	$1,656,469	$3,522,160
United Kingdom	3,941,422	6,227,259
Spain	2,092,530	1,226,475
France	485,299	1,392,439
Germany	1,209,953	1,397,548
Japan	259,461	1,032,462
China	5,570,683	1,458,729
Hongkong	2,639,620	2,686,168
British East Indies	2,216,914	938,470
Other countries	1,524,816	1,169,558
Total	20,597,167	19,751,068

One-half of the imports into the Philippine Islands, as is shown by Table No. I, consists of cotton manufactures and rice. Among other important articles are iron and steel manufactures, liquors, and chemicals. By comparing the trade of the year 1893 with that of 1900 several important changes will be seen to have taken place in the Philippine trade. During both years cotton manufactures held first place, but the importation of rice is shown to have increased nearly fivefold. The importation of mineral oils has fallen off very greatly, and the same is true of wines. The decreased purchases of wines, however, are largely offset by the increased importation of distilled and malt liquors. On the whole, the trade shows a rather large growth in view of the insurrection. There is a general tendency toward a larger purchase of manufactured commodities.

An examination of Table No. II shows that important changes are taking place in the distribution of the Philippine purchases among foreign countries. As might be expected, the transfer of the islands from Spain to the United States, and the abolition of the preferential tariffs maintained by Spain, have resulted in a great decrease in her trade with the Philippines. Our exports to those islands are shown to be increasing.[a] The exports from the United Kingdom to the Philippines appear to be declining, while those from China and Hongkong appear to be increasing. The trade of Hongkong, however, is only that of a distributing center, and the increase in its exports to the Philippines means only that the United Kingdom, the United States, and other countries are sending greater quantities of commodities to Hongkong for distribution in the Philippines and elsewhere.

In the exports of the Philippine Islands the hemp now has first place, although in 1893 the value of the sugar exports was 50 per cent more than that of hemp. The war with Spain and the subsequent insurrection have greatly interfered with the sugar production. The exportation of hemp, cocoanut products, and tobacco seems to have been less interfered with.[b] The consumption of hemp is increasing so fast that the exportation of this commodity from the Philippines must unquestionably increase rapidly in the future. It is probable also that improved machinery will be introduced for the manufacture of sugar and that some of the plantations, at least, will be organized in accordance with efficient modern methods. At the present time the sugar exports consist of a very crude, unrefined product, most of which is sold in Asiatic countries. Table No. IV, giving the destination of the foreign exports, shows that Great Britain and the continent of Asia received over half of the total in 1900. Here again the trade of Great Britain and the United States seems to have fallen off, and that of Hongkong and China to have greatly increased. This is obviously due to the fact that Hongkong is credited with trade that is merely transshipped at that port. The exports from Spain to the Philippines have fallen off, as might have been expected. The influence of the Philippine insurrection upon the total exports of the islands and upon their export trade to the United States in 1900 is clearly indicated by Table No. IV.

The imports into the Philippine Islands from the United States in 1900 constituted but a small portion of the purchases by the people of those islands. The total value of our exports to those islands were, however, increasing, the goods exported directly from the United States amounting to $1,655.469 during the year ended June 30, 1900. During the five years 1892–1896, when our trade relations were normal, our exports to the islands averaged only $135,228 per annum.

What are the chances for our developing a large export trade to the Philippine Islands? Is it probable that the Filipinos will largely increase their total imports, and if they do, will a larger share of the total be supplied by the United States? What has happened since 1900 is certainly encouraging. What the future growth of our Philippine trade shall be will depend more upon the facilities for shipment than the cost of production in this country as compared with cost of production in Europe. At the present time Great Britain and Germany control the larger share of the Philippine trade, but it would seem that in the future the heavier iron and steel manufactures, as well as the electrical machinery, tools, bicycles, sewing machines, and similar articles, will be purchased in considerable and in increasing quantities from this country. Our ability to sell cotton goods extensively in Manchuria would indicate that we can compete with Europe in supplying the Filipinos with those goods. The growing demand for flour, provisions, and dairy products will be supplied by the United States if shipping facilities are favorable. At the present time the petroleum used by the Filipinos is supplied mainly by Russia, but the opening of the canal and the establishment of better shipping facilities, between the eastern part of the United States and the Orient, will enable the American exporters of oil to control at least a part of this trade.

The opening of the canal will not greatly reduce the distances from our Atlantic seaboard to the Philippine Islands, but it will give us another route to the East, and one that will probably be more economical. One of the consequences of the canal will be a larger commercial intercourse between the United States and oriental countries generally, and this will be accompanied by better facilities for trading with all oriental countries, the Philippines included. At the present time the European exporters have more favorable facilities for shipping to the Philippines and other points in the East than Americans have.

LOCATION OF THE PHILIPPINES WITH REFERENCE TO TRADE ROUTES FROM THE UNITED STATES.

Present conditions make Hongkong the point from which the imports into the Philippine Islands are distributed, and is the point from which a large part of the exports is despatched to North Atlantic countries. At the present time the trade of the Philippines is not large enough to cause many vessels outbound from Europe for Hongkong, Shanghai, and Japanese ports to make

[a] Our exports to the Philippines in 1901 amounted to $4,014,180, in 1902 to $5,251,867, and in 1903 to $4,028,677. During these years our imports were for 1901, $4,420,912; 1902, $6,612,700, and 1903, $11,372,584.

[b] In 1902 the total exports of the Philippines amounted to $28,671,904, of which hemp comprised $19,290,610, or 67 per cent. Sugar constituted 12 per cent, cigars 7 per cent, copra 9 per cent, and miscellaneous articles 5 per cent.

the detour required in order to call at Manila. Moreover, the wharves will not now accommodate large ships, and nearly all the traffic has to be handled by lighters. The improvements in progress in the harbor will remove this obstacle, and it is probable that as the total trade of Manila increases, the inducements for making the city a port of call will become sufficient to cause a large share of the Manila trade to be handled at that port, instead of being transshipped at Hongkong.

The location of Manila and the Philippines with reference to trade routes from New York by way of the Panama Canal is shown by the following table. In Chapter XVII the length of routes from Europe and the United States to the Philippines is discussed more in detail.

	Miles.
1. New York to Manila via Panama, San Francisco, Great Circle, and Yokohama	11,585
2. New York to Manila via Panama, Honolulu, and Guam	11,729
3. New York to Manila via Panama, San Francisco, Yokohama, Shanghai, and Hongkong	12,372
4. New York to Manila via Panama, Honolulu, Yokohama, Shanghai, and Hongkong	12,823
5. New York to Hongkong via Panama, Honolulu, Guam, and Manila	12,357
6. New York to Hongkong via Panama, San Francisco, Yokohama, and Shanghai	11,744
7. New York to Shanghai via Panama, San Francisco, and Yokohama	10,883
8. New York to Shanghai via Panama, Honolulu, Guam, and Manila	12,964

The distance from New York to Hongkong and Shanghai (compare routes 5, 6. 7, and 8) are respectively 613 and 2,081 miles shorter by way of the northerly route and Japan than by the southerly route and the Philippines. The distance from New York to Manila is shorter by way of San Francisco and Japan (routes 1 and 2) than by Honolulu and Guam. In Honolulu, moreover, the price of coal is higher than in San Francisco. Coal is also dearer in Guam than in Yokohama. San Francisco and Yokohama also have more freight to offer than Honolulu and Guam have The price of coal will always be high at Guam, because the island will not be an exporting point. Vessels engaged in the commerce between America, Asia, and the Philippines will tend to take the northern route to get Japanese coal and freight.

II. THE HAWAIIAN ISLANDS.

SOIL AND CLIMATE OF THE HAWAIIAN ISLANDS.

The Hawaiian Islands have a fertile soil in the limited areas where cultivation is possible. The islands being situated in midocean between 19° and 23° north latitude, the northeast trade winds blow over them during the greater part of the year, and the eastern side of the islands is copiously watered, but on the opposite slopes the rainfall is much less and irrigation is necessary to agriculture. The leeward side of the islands, moreover, is calmer and warmer than the windward side. The islands are volcanic, hilly, and well drained, and hence not malarial. In most parts of the islands the climate is not especially enervating, and Europeans, as well as Japanese and Chinese, find sustained effort to be possible. The islands are of small area and very mountainous, and the foreign immigrant has a large range of choice as regards climate.

The Hawaiian group consists principally of seven islands, having a total area of 6,449 square miles. The largest island of the group is Hawaii, although Oahu, upon which the city of Honolulu is located, is the most populous one. Although the Hawaiian Islands have nearly twice the area of Porto Rico, their population is only one-sixth as great. According to the census taken by the United States Government in 1900 the inhabitants of the islands number 154,000, the increase from 1896 having been 44,981, which was over 41 per cent. This very rapid growth in population was due to the sudden expansion of business resulting from the annexation of the islands to the United States.

By the census of 1896 the population numbered 109,020, and of this total 31,019 were natives, 8,485 half-castes, 21,616 Chinese, 24,407 Japanese, 15,191 Portuguese, 3,086 Americans, 2,250 British, the rest of the population being made up of Germans, Norwegians, French, and Polynesians. The immigrants into the islands from the United States comprise a comparatively small share of the total population. They have, however, the industrial and political control of the islands. The laboring classes consist largely of Japanese and Chinese. In 1900 there were 25,742 Chinese in the islands, and about 6,000 of them were employed on the sugar plantations. The Japanese numbered 58,000, and about 26,100 of them were employed on the sugar plantations. Nearly five-sevenths of the plantation laborers consist of Japanese. By 1900 the native Hawaiians had decreased to 29,834 and the half-castes to 7,835. The white population is increasing, its total number in 1900 being 28,553, but the most rapid gains have been made by the Japanese, who numbered 58,500 in 1900.

THE RESOURCES OF THE HAWAIIAN ISLANDS.

The resources of Hawaii are almost exclusively agricultural. There are no minerals of consequence and manufactures are and will always be insignificant.

The sugar industry is of overshadowing importance. The decomposed lava soils of the islands, when properly irrigated and treated with a small quantity of fertilizers, are exceedingly productive, the yield of sugar per acre being especially high, ranging from 3 to 5 tons per acre on the average. The total crop of 1891 amounted to 137,000 tons, while that of 1901 was about 345,000 tons, and additions have been made to the acreage of the plantations since that date. The plantations are organized on a large scale and in accordance with most economical methods. The rainfall on the leeward side of the island being light, irrigation is necessary, and extensive irrigation works have been constructed.

While the large development of the sugar industry in Hawaii has added to the wealth of the islands, it has not been altogether fortunate for their economic progress. The climate and soil of the islands are such that the industries might be diversified, and it is probable that a population consisting to a large extent of small, independent farmers might be developed if the sugar plantations did not include such a large share of the islands. In the early eighties the best sugar lands were leased for thirty and forty year periods to a small number of planters, and the American capital invested in Hawaii has gone almost entirely into the sugar industry. The population connected with the sugar plantations consists of Japanese, Chinese, and Portuguese laborers, who probably will always constitute a dependent population.

Rice is the second crop in value, and in former years it has been an important article of export. The rapid growth in the population, particularly in the number of Japanese, has so increased the home demand as nearly to put an end to the exportation of rice. The industry is carried on by the Chinese according to very primitive methods.

Large quantities of tropical fruits, oranges, pineapples, bananas, etc., could be successfully grown in Hawaii. The exportation of bananas to California began in 1899.

At one time it seemed probable that the production of coffee would constitute the most important industy of the Hawaiian Islands, but the reciprocity treaty between Hawaii and the United States made the cultivation of sugar so profitable that capital went more and more into sugar plantations. Some of the coffee estates have been converted into sugar plantations, and at the present time it is estimated that there are less than 20,000 acres of coffee under cultivation. The annual production is larger than the home demand and a limited quantity is exported. The exports in 1897 amounted to 337 pounds, and those of 1899 were 779,796 pounds.[a] It seems probable that the annual production will grow less rather than increase, unless the coffee and sugar industries should be developed together on the same plantations. Those who have studied the question have suggested that the two crops might advantageously be produced on the same plantation, because coffee grows at a greater elevation than the sugar does, and the season when coffee requires the largest labor force comes at a time when the sugar plantation has a surplus of workmen. Anything that can bring about the diversification of industries in Hawaii will be of advantage to the islands.

Whether the industries of Hawaii can be diversified and the social conditions accompanying large plantation life can be changed is a matter of great importance to the economic future of Hawaii. There seems to be a tendency in all tropical countries toward the organization of industries upon a large scale. The corporation with abundant capital at its command seems in a measure to be taking the place formerly occupied by the slave owner. In the time of slavery the planters organized and directed the labor force of the natives, and under the present capitalistic régime the corporations, in a different manner, are performing a similar task. Whether or not the capitalistic organization of labor will result in a social betterment of the laboring classes and in the development of intelligent, self-supporting artisans remains to be seen. If it is possible to develop desirable social conditions anywhere in the Tropics, Hawaii would seem to offer more opportunities than most of the island countries. The United States Government has established an agricultural experiment station in Hawaii that will doubtless be of assistance in varying the productions of the islands. General education will in time assist in the same work.

THE CANAL AND THE TRADE OF HAWAII.

The Hawaiian Islands have a large and rapidly increasing foreign trade. The annexation of the islands to the United States was followed by a great expansion in business. The imports of 1897 were valued at $8,838,000, those of 1899 amounted to $19,058,000, which, however, was much larger than our present export trade to the islands. The exports of the islands increased from $16,029,000 in 1897 to $22,628,000 in 1899, and to $26,228,204 in 1903 and all but $27,029 worth were sent to the United States.

The share of the Hawaiian trade controlled by the United States is especially large. In 1898, 99.62 per cent of the exports of the islands came to the United States, and we furnished them 76.94 per cent of their imports. In 1899 the United States purchased 99.52 per cent of the Hawaiian exports, and supplied the islands 78.81 per cent of their imports. The percentages for

[a] Later figures are not available because our commerce with Hawaii is now coasting trade, concerning which statistics are not kept.

1903 are nearly the same. Our most important rival in the import trade of Hawaii is Japan, which supplies the islands with about 7 per cent of their purchases.

Practically all of the iron and steel products imported by Hawaii come from the Eastern States. The owner of one of the largest Hawaiian sugar plantations states that its water supply is handled through pumps and pipes purchased in Birmingham, Ala., and that its sugar machinery was manufactured in St. Louis. A single firm near New York already sends $500,000 worth of machinery annually to Hawaii. Of the fertilizers, a part comes Germany, but the larger share is from the phosphate beds of our Southern States, and the canal will aid Hawaiian agriculture by cheapening the cost of these commodities as well as by furnishing a shorter route by which to market the exported produce. Our Atlantic States have been importing 40,000 to 80,000 tons of Hawaiian sugar per year, by way of Magellan and Cape Horn. This will be cheapened by the shorter route, and as the price of sugar on the Pacific coast is determined by its price in New York and Hamburg, the canal will enable the sugar grower to obtain a higher price for the bulk of the crop marketed in our Pacific States.

In their trade relations the Hawaiian Islands may be considered as a part of our Pacific coast, They belong to the United States, the dominant race is American, English is the common language. our capital controls the industry of the islands, and their commerce is almost all with this country. An isthmian canal must have a great effect on Hawaii. The one-sidedness of her resources makes Hawaii especially dependent upon commerce. Sugar is the only product extensively exported; agriculture the only industry, and that is in an undiversified state. All manufactures and many of the food products needed by her increasing population must be imported. The complex demands of the islands can be supplied only in part by the industries of our Pacific coast States, and everything not originating there must be brought from our Eastern States or Europe. Some of the Hawaiian imports from the eastern part of the United States now move by the transcontinental railroads and thence by water, but the heavier articles usually go by Cape Horn or the Straits of Magellan. Some goods are sent by the Panama lines and transshipped at San Francisco. After the canal has been constructed, the traffic, both import and export, will be divided between the transcontinental railroads and the all-water canal route.

Chapter XVI.

THE CANAL AND CENTRAL AMERICA AND WESTERN MEXICO.

I. CENTRAL AMERICA.

POPULATION AND GENERAL GEOGRAPHY.

The population of Central American countries has not been accurately determined by careful censuses, but the following table, compiled from the Statesman's Yearbook, doubtless gives approximately accurate figures regarding both the area and population of each of the Central American countries:

Area and population of Central American countries.

Country.	Area.	Population.	Capital city.	Population of Capital city.
	Sq. miles.			
Costa Rica	23,000	300,000	San José	25,000
Guatemala	63,400	1,532,000	Guatemala City	75,000
Honduras	46,250	407,000	Tegucigalpa	12,600
Nicaragua	49,200	420,000	Managua	20,000
Salvador	7,225	[a] 915,000	San Salvador	50,000
Total	189,075	3,574,000		

[a] Bulletin Bureau of American Republics, March, 1901.

The population of the Central American countries[a] is nearly all upon the plateaus adjacent to the Pacific. The climate of the Caribbean coastal regions of Central America is humid, and the tropical vegetation grows so rank as to add much to the difficulty of occupying and cultivating the country.

The plateau on which the Central American population and industries are centered extends with varying width and elevation from Mexico to southern Costa Rica. West of the continental divide and parallel to it is a succession of volcanoes extending through all the region to the north of Costa Rica. In Guatemala they raise a barrier that walls in a series of upland lakes, in Salvador they inclose a high valley where most of the people of the country reside, and in Honduras and Nicaragua they are near the Pacific between the lakes and the ocean. This double mountain range widens the plateau and increases the habitable area. The plateau from Costa Rica northward is made up in large part of decomposed lava, which has formed a fertile soil. Like the lava soils of Hawaii, those of Central America are well adapted to sugar, coffee, and other crops of tropic agriculture.

The Central American plateau is most closely connected commercially with the Pacific Ocean. The Caribbean outlets are the Costa Rica Railroad, from San José to Port Limon, and the San Juan River. To the Pacific, however, four railroads have been constructed, not including the short line terminating at Punta Arenas, Costa Rica. Two of these four railroads are in Guatemala, one in Salvador, and one in Nicaragua. Numerous wagon roads have been constructed, and an English company is constructing a railroad in Costa Rica between San José and Tivives.

THE CENTRAL AMERICAN INDUSTRIES.

The industries[a] of Central America are mainly agricultural. Forest products are exported to some extent. The mineral resources of the country are beginning to be developed, but as yet on a comparatively small scale.

Throughout Central America coffee is the staple product, the leading State in its production being Guatemala. In that State the coffee belt is in the plateau, the western edge of the belt being some 10 or 15 miles from the Pacific Ocean. It is 50 to 80 miles wide. This is the part of the country where most of the population is to be found. The coffee in this region is carefully

[a] See Plate 84.

cultivated and extensively exported, two railroads to the Pacific having already been built, and a third line near the Mexican boundary will probably be constructed in the near future. The western plateau of Salvador, Honduras, Nicaragua, and Costa Rica has numerous valleys where coffee culture is extensively carried on. The main coffee belt of Nicaragua is situated in the neighborhood of Jinotepe, northwest of Lake Nicaragua. In Costa Rica the valley in which the city of San José is located constitutes the most important coffee-growing region.

The lowlands of the eastern coast, particularly of Nicaragua and Costa Rica, are well adapted to banana culture, and the United Fruit Company has extensive banana plantations in the neighborhood of Port Limon, Costa Rica, and Bluefields, Nicaragua. The San Juan River Valley is another region in which banana culture could be extensively carried on.

In the western part of Central America, where the soil is largely of volcanic origin, sugar can be very successfully grown. Several sugar plantations are now in successful operation, but their output is practically all consumed within the country. In the future development of Central America the production of sugar will in all probability have a prominent place.

There is at the present time a limited amount of cocoa produced in various sections, and this is a product which could readily be increased. It is also probable that rubber trees can be and will be profitably cultivated in the future. At the present time the world's rubber supply is mainly secured from the natural forest trees, but the growing demand for rubber and the increasing difficulty of securing adequate supplies from the present uncertain sources make it probable that rubber will in the future be a cultivated product. When that time comes the lowlands will offer a favorable region.

Throughout the uplands of Central America cattle are raised in large numbers, and one of the important exports at the present time is hides. Indeed, coffee, bananas, and hides are the leading articles of export. At the present time, with the exception of bananas and timber, the leading exported commodities leave the country mainly by the Pacific ports.

The lumbering industries are mainly located on the eastern shore, and the same is true of dyewoods and other forest products.

The mining of gold, silver, and copper has made some headway in Central America, and with the establishment of stronger governments and the development of additional facilities for transportation these mineral industries will doubtless develop. When it is possible to reach the mines in the western part of Costa Rica, Nicaragua, Salvador, and Guatemala by improved means of transportation, and when it is possible to secure supplies and dispose of the product with moderate transportation costs, there is reason to believe that the Central American countries will regain some of the prominence which they once held as a source of precious metals. Possibly the most valuable mineral resource of the region will prove to be copper, the world's demand for which seems to increase more rapidly than does the supply of the metal.

As to the productive capabilities of Central America, there is no doubt that when foreign capital can be invested freely and safely in industrial enterprises the progress of that region will be steady and eventually reach large proportions. The construction of the canal will increase the shipping facilities of the eastern part of the country and will bring the western half of the region into close commercial relations with its chief markets, the countries of the North Atlantic.

THE CANAL AND THE FOREIGN TRADE OF CENTRAL AMERICA.

The opening of a canal across the American Isthmus, either at Panama or at Nicaragua, would enlarge the foreign commerce of Central America and increase the share of the trade controlled by the United States. A waterway across Nicaragua[a] would, however, have a greater effect upon the industries and commerce of Central America than would one at Panama, because of the great assistance the Nicaragua Canal would give to economic and political progress in the States adjacent. Nicaragua and Costa Rica would contribute tropical products to the traffic of a canal passing through their territory and to the commerce of Europe and the United States. Fruits and forest products would be shipped from the San Juan Valley and the northern part of Costa Rica. In the uplands of Costa Rica and on the plateau of Nicaragua the exportation of cattle, coffee, fruits and vegetables, sugar, and probably tobacco would be stimulated by the canal and the facilities for shipping at all times to all important commercial countries. Nicaragua would be especially favored by the canal because of the facilities which Lake Nicaragua would afford for collecting and distributing commodities. The interoceanic waterway would bring the interior basin of the country, where most of the industrial activity is centered, into close connection with the world's commerce.

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[a] It has seemed best not to revise this paragraph, because it indicates the ways in which a canal by the Nicaragua route would have benefited Nicaragua and Costa Rica. The Panama Canal will, however, assist in the economic development of those countries, especially when they have built the railways required for inland transportation.

The commerce of the eastern ports of Central America is largely controlled by the United States, while most of that of the western slope is with Europe. We supply 55 to 60 per cent of the imports of British Honduras or Belize on the Atlantic coast. To Guatemala as a whole we furnish only 39 per cent, including our direct shipments to the east coast, and the flour, lumber, and provisions from San Francisco to the west coast. Great Britain supplies most of the $558,000 worth of cottons purchased by Guatemala, and nearly all of the manufactures imported by that country come from Europe by the Straits of Magellan. The same conditions prevail in western Honduras, although we have most of the trade of the eastern ports, where there are good steamer connections with New Orleans. Salvador has a foreign trade of $20 per capita, divided between San Francisco and Europe. In 1895 the United States supplied Nicaragua with but 23 per cent of the imports of the Pacific side, and the goods sold by us consisted largely of California lumber, wines, and flour. In 1897 we furnished the following percentage of the imports of eastern ports of Nicaragua: Cape Gracias a Dios, 85 per cent; Bluefields, 83.6 per cent; Greytown, 53 per cent. Fifty-eight per cent of the goods forwarded from Greytown to the interior were from the United States. We are now furnishing 45 to 50 per cent of the imports of Costa Rica, and the share has increased considerably since the railroad to Port Limon changed the commercial outlet from Punta Arenas on the Pacific to Port Limon on the Atlantic.

The total imports of Central America and the shares of the United States, the United Kingdom, and Germany are shown by the following table taken from the publications of the United States Bureau of Statistics:

Imports of Central America.

From—	1887.	1897.
Total	$15,800,285	$23,999,561
United States	2,935,447	7,739,907
United Kingdom	4,941,464	5,266,444
Germany	[a] 1,739,304	1,781,666

[a] 1889.

The Central American trade has not reached large proportions, but it is growing. Our share has more than doubled in the decade 1887–1897, while that of the United Kingdom and Germany remained nearly stationary. In 1903 we exported to Central America $5,785,000 worth of commodities, and imported articles to the value of $10,294,000, a trade more than double the figures of 1897. Under present conditions, the Pacific coast of the United States trades with the Pacific coast of Central America, and our Atlantic coast ports with the Caribbean section. The canal will enable each of our coasts to find a market on the opposite seaboard of Central America. This and the industrial development of the American Isthmus resulting from the canal will largely promote the commerce of the United States with Central America.

II. WESTERN MEXICO.[a]

The area of that part of Mexico draining directly into the Pacific Ocean comprises over 300,000 square miles, and is equal in size to California, Oregon, and Washington. The northern half of this Pacific slope of Mexico resembles the southern part of California and Arizona in climate and general physical conditions. The southern half of the region is tropical in character, the section beyond Tehuantepec being physiographically a continuation of Guatemala.

According to the census of 1895 the section under consideration contained approximately 4,000,000 people, and until the construction of the railways about the City of Mexico and on the Mexican Plateau stimulated the growth of population in that part of the Republic, the rate of increase was greater on the Pacific slope than in the country as a whole.

The Pacific slope of Mexico is more geographically isolated than are the west coast States of our own country. Seven transcontinental railway lines connect our Western States with the Mississippi Valley and the eastern section of our country, but as yet there is only one railway, a spur of the Southern Pacific, joining the western part of Mexico with the region east of the Cordilleras. While the railway system of Mexico has been rapidly extended, the construction of lines connecting the plateau with the Pacific coast has made slow progress, because the western slope of the great Mexican Plateau is so steep as to make railroad building extremely difficult. The result of this lack of railway lines, connecting western Mexico with the United States and with Mexico east of the mountains, has been that the region is in the main commercially tributary to Europe.

[a] See Plate 85.

AGRICULTURAL RESOURCES OF WESTERN MEXICO.

The western slope of Mexico, being situated in temperate and tropical latitudes, and having a variation of several thousand feet in altitude, is capable of producing a great variety of agricultural products. The Tropic of Cancer divides the region under discussion into two nearly equal sections, the most important port of the region in the temperate latitude being Mazatlan, situated just north of the Tropics. In the irrigated portion of the temperate section wheat can be grown to advantage, and also subtropical fruits. In the tropical latitudes sugar, coffee, and other tropical products are grown.

North of the twentieth parallel irrigation is everywhere necessary for agriculture, but south of that line the natural rainfall is usually sufficient. In this temperate region the amount of cultivable land is limited to the portions for which water can be secured, but those sections, as is usual in irrigated regions, are highly productive. Several valleys of western Mexico have already been irrigated, and a reference to two of them will illustrate the results that are being accomplished.

In the valley of the Yaqui River, which flows into the Gulf of California a few miles south of Guaymas, an American corporation has constructed an irrigation ditch 40 miles in length, by which 400,000 acres of land can be watered. In this irrigated valley corn, cotton, tobacco, wheat, and subtropical fruits can be and are raised. The wheat produced is usually sold in Mexico, although in 1892 some of it was exported by way of New Orleans to Europe. Oranges are exported from the Yaqui Valley and other sections of the State of Sonora to the United States.

Somewhat farther south, in the State of Sinaloa, a short railway has been built from the port of Altata to Culiacan, and along the line of this railroad irrigation works have been constructed, and a sugar estate established upon which 900 people are employed. A few years ago this region was an uninhabited waste. The valley in which this sugar estate is located is said to be capable of producing 40,000 to 50,000 tons of sugar annually.

A reference to Lower California will afford another illustration of the agricultural resources of the temperate latitude of western Mexico. This peninsula has an extremely arid climate and is everywhere infertile except in the limited sections where irrigation is possible. The food supply for the inhabitants has to be imported to a large extent, although some sugar is exported to the mainland from the irrigated district in the southern part of the peninsula. The most important vegetable product of Lower California is the agave, a plant that grows in many parts of Mexico. There are several species of the plant, one producing the soft pita fiber and another the hemp of commerce. Henequin, or sisal, the species of agave that grows in Yucatan, and from which the so-called hemp is obtained, also grows in Lower California, although it has not yet been cultivated for exportation. It seems, however, that the production of hemp in Yucatan is nearing its possible maximum, and that the hemp of Lower California will soon become commercially important. In view of the fact that the largest market for sisal is in that part of the United States east of the Rocky Mountains, and that the article is a bulky one, whose costs for transportation are comparatively large, it would seem that the opening of the isthmian canal would have a very favorable effect upon the development of the hemp industry of Lower California.

In the tropical part of western Mexico the most important agricultural product is coffee. In the neighborhood of Mazatlan and Manzanillo there are some estates from which coffee is now exported. The industry seems, however, to be in a backward state of development.

The resources of tropical Mexico from Manzanillo east are now of but small importance to international trade. The economic and social conditions of Chiapas, the State next to Guatemala, will illustrate this fact. This State of Chiapas is the continuation of the coffee belt that crosses Guatemala, but of the 20,000,000 acres of land comprised within the State only 6,000,000 acres have as yet become private property, and it is said that only 70,000 acres are under cultivation. The population of the State, including foreigners, comprises only 320,000 people. A beginning has been made in the cultivation of rubber trees, but, unless some change may have occurred since 1900, there is neither railroad, bank, nor electric light in the State, nor are there any modern agricultural implements used. The construction of an isthmian canal would bring this part of Mexico into close commercial connection with the countries of the North Atlantic.

MINERAL RESOURCES.

The Republic of Mexico is a very mountainous country, possessing extensive deposits of gold, silver, copper, lead, and other metals. Up to the present time foreign capital has gone more largely into mining than into any other enterprises. As the transportation system of the country is developed, and the population becomes denser, a larger diversification of industries may be expected, but for some time to come the mineral industries will be of chief consequence. They will always rank high.

The western Cordilleras of Mexico contain the richest mineral deposits of the country, and it is the northern half of these western Cordilleras that possesses the greatest mineral wealth. Thus far the mining operations of this section have been confined mainly to the eastern slope. Some mining operations are being carried on near the Pacific coast, but the larger part of the mountainous region has yet to be developed by mining operations.

The location of these western Cordilleras is such that they are naturally tributary to the Pacific rather than to the Gulf of Mexico. Some of the mountains are within 50 miles of the Pacific, and practically all of these western ranges are within 300 miles of that ocean. They average from two to three times the latter distance from the Gulf. At the present time four railroads are being constructed from the plateau westward across these ranges to the Pacific, but it will probably be some time before any of them can be completed. One of the great drawbacks to the mineral development of western Mexico at the present time is the high cost of fuel on the Pacific. Coke is now brought from Europe by way of Cape Horn to western Mexico. It is possible that by the time the canal has been opened good coal will be found in sufficient quantity in the mountains of western Mexico. Should this not happen, it will be possible to export coal from our Southern cities, by way of the canal, to western Mexico, for sale at about half the price at present prevailing in that locality.

Without attempting to speak in detail of the mining operations now being conducted in the western part of Mexico, reference may be made to the fact that there is a large number of gold and silver mines in operation in the neighborhood of Mazatlan. The output from this region, both of gold and silver, is rapidly increasing. Old mines are being reopened, the cyanide process is being introduced, and the construction of the railroad from Durango through to the coast is being pushed. Ninety miles east of Culiacan an American company has erected a water-power plant that furnishes 500 horsepower throughout the year. The power is converted into electricity for use in the mines. In the northwestern part of the State of Durango, in the Topia district, there is a region possessing silver ores, lead, iron, and limestone in abundance. In southwestern Chihuahua are valuable deposits of gold and silver. This district is at present 300 miles from a railroad, and the Topia district, just mentioned, is now 106 miles distant from the railway. The consequence is that in both sections mining operations can now be carried on only on a small scale. Mention is made of these districts to call attention to the fact, that the construction of railways and better facilities for shipment from Pacific ports, can add very much to the already important mining industries of western Mexico. Mention might be made of numerous other mining industries; those spoken of are merely illustrative.

The peninsula of Lower California has valuable resources of gold, silver, copper, and salt. Some American companies are now mining gold and silver, and a French corporation, the Baleo Copper Company, at Santa Rosalia, is annually shipping 18,000 tons of copper and copper matte to Europe. Some of this product goes across the Gulf of California to Guaymas and is sent in bond to New Orleans and thence to Europe. More of it, however, is sent around the Horn. The company imports about 60,000 tons of coke by way of the cape, and its mining supplies come from the same source by the same route.

THE CANAL AND THE COMMERCE OF WESTERN MEXICO.

The character of the trade of western Mexico and the effects which the canal will have upon that trade can best be illustrated by reference to the trade of Mazatlan, the most important port of the region. The information herein given in regard to the industries and trade of Mazatlan is taken from an excellent special report prepared in 1900 for the Isthmian Canal Commission by the United States consul located in that city.

The commercial connections of Mazatlan with the United States are by steamers running to San Francisco and to Panama. A minor share of this trade is handled by the Southern Pacific Railway. The facilities for shipping between Mazatlan and Europe are much better. The Chilean line carries some of Mazatlan's exports to Valparaiso where they are transferred to vessels bound for Europe. A French line and a German line of steamers make regular calls at Mazatlan. There are also two sailing vessels carrying coal from England to Mazatlan, and from time to time other sailing vessels, as occasion requires, are operated under charters from England, France, and Germany. Having better and cheaper connections with Europe, the trade of Mazatlan is mainly with that Continent.

A New York exporter of machinery says:

> At present a planter in the Pacific countries of Central America and Mexico can ship coffee and rice machinery from any European port, and secure freight rates which would involve a saving of from 5 to 10 per cent on the value of his purchase, provided the cost price was equal to that quoted here.

The total foreign trade of Mazatlan in 1899 amounted to $42,000,000 Mexican silver, and at the present time this trade is mainly controlled by the merchants of Hamburg, Liverpool, and Bordeaux. The vessels that take out coal and other commodities from Europe load back with ore, tropical woods, and the other exports of Mazatlan. In 1899 Mazatlan sent to Europe $500,000 worth of logwood and mahogany, whereas our imports of those woods amount to $16,000. An interesting contrast to this is offered by the trade of Tampico, on the opposite side of Mexico. The commerce of that city is larger with the United States than with any other country, three-eighths of the city's imports being from our country.

Although the present trade of Mazatlan is comparatively large, it is much less than it will be when the means of communication with the tributary country have been improved. At the present time there are no railway connections with the interior, all the trade being handled by coasting vessels or by wagons and pack mules. The completion of a railroad, now being built westward from Durango, will greatly enhance the commercial importance of Mazatlan.

Our manufacturing cities in the eastern part of the United States will be between 1,000 and 2,000 miles nearer to western Mexico, by way of the canal, than to San Francisco and Seattle. This region, moreover, is so situated that the vessels engaged in our interoceanic coasting trade can conveniently engage in its commerce. The isthmian canal will cheapen the cost of constructing railroads in western Mexico, and will lower the cost of machinery needed in the development of the mines and plantations. It is quite probable also that the coal from the southern part of the United States will be taken to western Mexico through the canal, and it is possible that the canal will make profitable the development of the great iron deposits of Durango. This vast deposit of iron ore in Durango is situated within 125 miles of the Pacific, with which it might readily be connected by rail.

At the present time the commerce of western Mexico is mainly with Europe, and the most important commercial route is that around South America. The opening of the isthmian canal will give it closer connections with the United States than with Europe, and it seems probable that its trade will eventually be handled largely by our merchants.

Chapter XVII.

COMPARISON OF DISTANCES BY THE ISTHMIAN CANAL AND OTHER ROUTES.

In determining what commerce would use an isthmian canal; the fact of most fundamental importance is the effect which the new waterway will have on the ocean distances between the trade centers adjacent to the Atlantic and those in and about the Pacific. The length of the route determines the time of the voyage, and in general the commerce of the world is so conducted as to minimize distances as much as the conditions of ocean navigation and international exchanges permit. It is accordingly desirable to preface the discussion of the traffic of an isthmian canal with a comparison of the distances between the Atlantic and Pacific by way of the American isthmus with those by way of the various routes now followed. This comparison can best be made by means of a series of tables giving the distances by alternative routes[a] between the most important commercial centers. In most respects the tables are self-interpretative. The distances are expressed in nautical miles, and the figures used in compiling the tables were furnished by the United States Hydrographic Office. The length of each canal is reckoned in nautical miles, the Nicaragua Canal being 161 nautical miles long, the Panama 41, and the Suez 88.

In the first table a comparison is made between the distances by the Nicaragua Canal with those by the Straits of Magellan and the west coast of North, Central, and South America.[b]

Table I.—*Distances via the Nicaragua and Magellan routes between the eastern ports of the United States and the ports of the west coast of North, Central, and South America.*

From—	Via—	To Sitka.	To Port Townsend.	To Portland.	To San Francisco.	To San Diego.	To Acapulco.	To San José de Guatemala.
Portland, Me	Nicaragua	6,418	5,891	5,766	5,116	4,668	3,291	2,736
	Magellan[c]	15,021	14,491	14,369	13,719	13,342	11,896	11,466
Boston	Nicaragua	6,373	5,856	5,731	5,081	4,633	3,256	2,701
	Magellan[c]	14,986	14,459	14,334	13,684	13,307	11,861	11,431
New York	Nicaragua	6,223	5,696	5,571	4,921	4,473	3,096	2,541
	Magellan[c]	15,016	14,489	14,364	13,714	13,337	11,891	11,461
Philadelphia	Nicaragua	6,171	5,636	5,511	4,861	4,413	3,036	2,481
	Magellan[c]	15,066	14,539	14,414	13,764	13,387	11,941	11,511
Baltimore	Nicaragua	6,143	5,616	5,491	4,841	4,393	3,016	2,461
	Magellan[c]	15,078	14,551	14,426	13,776	13,399	11,953	11,523
Norfolk	Nicaragua	6,013	5,486	5,361	4,711	4,263	2,886	2,331
	Magellan[c]	14,942	14,415	14,290	13,640	13,263	11,817	11,387
Charleston	Nicaragua[d]	5,803	5,276	5,151	4,501	4,053	2,676	2,121
	Magellan[c]	14,951	14,424	14,299	13,649	13,272	11,826	11,396
Savannah	Nicaragua[e]	5,809	5,282	5,157	5,704	4,059	2,682	2,127
	Magellan[c]	14,980	14,453	14,328	13,678	13,301	11,855	11,425
Jacksonville	Nicaragua[f]	5,767	5,240	5,115	4,465	4,017	2,640	2,085
	Magellan[c]	14,955	14,428	14,303	13,653	13,276	11,830	11,400
Port Tampa	Nicaragua	5,280	4,753	4,628	3,978	3,530	2,153	1,598
	Magellan[c]	15,116	14,589	14,464	13,814	13,437	11,991	11,561
Pensacola	Nicaragua	5,386	4,859	4,734	4,084	3,636	2,259	1,704
	Magellan[c]	15,320	14,793	14,668	14,018	13,641	12,195	11,765
Mobile	Nicaragua	5,314	4,886	4,761	4,111	3,663	2,286	1,731
	Magellan[c]	15,362	14,835	14,710	14,060	13,683	12,237	11,807
New Orleans	Nicaragua	5,420	4,893	4,768	4,118	3,670	2,293	1,738
	Magellan[c]	15,416	14,889	14,764	14,114	13,737	12,291	11,861
Galveston	Nicaragua	5,603	5,076	4,951	4,301	3,853	2,476	1,921
	Magellan[c]	15,598	15,071	14,946	14,296	13,919	12,473	11,043

[a] Consult Plate 74 for a chart of ocean routes by way of existing trade lines and by way of the Nicaragua and Panama canals.

[b] These tables were prepared in 1901 before the decision had been reached as to whether the Nicaragua or Panama route should be adopted. However, the tables and the chart are so worked out as to show the distances both by the Panama route and the Nicaragua route.

[c] Via Pernambuco, Callao, and San Francisco for points beyond these ports.

[d] Vessels going by west end of Cuba will shorten voyage 69 miles for Charleston.

[e] 104 for Savannah.

[f] 136 for Jacksonville.

TABLE I.—*Distances via the Nicaragua and Magellan routes between the eastern ports of the United States and the ports of the west coast of North, Central, and South America*—Continued.

From—	Via—	To Honolulu.	To Guayaquil.	To Callao.	To Iquique.	To Valparaiso.	To Coronel.
Portland, Me	Nicaragua	6,626	3,441	3,946	4,588	5,173	5,356
	Magellan [a]	14,854	10,428	9,707	9,226	8,866	8,235
Boston	Nicaragua	6,591	3,403	3,911	4,553	5,133	5,321
	Magellan [a]	14,819	10,393	9,672	9,199	8,431	8,200
New York	Nicaragua	6,431	3,246	3,751	4,393	4,978	5,161
	Magellan [a]	11,489	10,423	9,702	9,221	8,461	8,230
Philadelphia	Nicaragua	6,371	3,186	3,691	4,333	4,918	5,101
	Magellan [a]	14,899	10,473	9,752	9,271	8,511	8,280
Baltimore	Nicaragua	6,351	3,166	3,671	4,313	4,898	4,581
	Magellan [a]	14,911	10,485	9,764	9,283	8,523	8,292
Norfolk	Nicaragua	6,221	3,036	3,541	4,191	4,768	4,951
	Magellan [a]	14,775	10,349	9,628	9,147	8,387	8,156
Charleston	Nicaragua [b]	6,011	2,826	3,331	3,973	4,558	4,741
	Magellan [a]	14,784	10,358	9,637	9,156	8,396	8,165
Savannah	Nicaragua [c]	6,017	2,832	3,337	3,979	4,564	4,747
	Magellan [a]	14,813	10,387	9,666	9,185	8,425	8,194
Jacksonville	Nicaragua [d]	5,975	2,790	3,295	3,937	4,522	4,705
	Magellan [a]	14,788	10,362	9,641	9,160	8,400	8,169
Port Tampa	Nicaragua	5,488	2,303	2,808	3,450	4,035	4,218
	Magellan [a]	14,949	10,523	9,802	9,321	8,561	8,339
Pensacola	Nicaragua	5,594	2,409	2,914	3,556	4,144	4,324
	Magellan [a]	15,153	10,727	10,006	9,525	8,765	8,534
Mobile	Nicaragua	5,621	2,436	2,941	3,583	4,168	4,351
	Magellan [a]	15,195	10,769	10,048	9,567	8,807	8,576
New Orleans	Nicaragua	5,628	2,443	2,948	3,590	4,175	4,358
	Magellan [a]	15,249	10,823	10,102	9,621	8,861	8,630
Galveston	Nicaragua	5,811	2,626	3,131	3,773	4,358	4,541
	Magellan [a]	15,431	11,005	10,284	9,803	9,043	8,812

[a] Via Pernambuco, Callao, and San Francisco for points beyond these ports.
[b] Vessels going by west end of Cuba will shorten voyage 69 miles for Charleston.
[c] 104 for Savannah.
[d] 136 for Jacksonville.

The above table compares the distances by way of the Nicaragua Canal with those through the Straits of Magellan from the chief ports of our Atlantic and Gulf seaboard extending, from Portland to Galveston, to thirteen representative ports on the west coast of the American continents. Coronel, the most southerly of the west coast ports mentioned in the table, is situated within two or three hundred miles of the southern limits of the industrial section of Chile. It is also an important coaling port at the present time. It will be observed that the distance from New York to Coronel by way of the Nicaragua Canal is 3,059 miles less than the present route through the Straits of Magellan.

The effect of an isthmian canal upon the length of ocean routes connecting our eastern seaboard with the west coast of the three Americas is well shown by comparing the distances by way of a Nicaragua Canal and the Straits of Magellan from New York, the largest Atlantic port, and from New Orleans, the largest Gulf port, to San Francisco, the representative west coast city of the United States, to Iquique, the center of the nitrate of soda section, and to Coronel, in southern Chile. This comparison is shown in the following table:

To—	From New York via—		From New Orleans via—	
	Nicaragua.	Magellan.	Nicaragua.	Magellan.
San Francisco	4,921	13,714	4,118	14,114
Iquique	4,393	9,221	3,590	9,621
Coronel	5,161	8,230	4,358	8,630

In the following table (II) the distances from representative European ports to the west coast of the American continents by the Nicaragua and Magellan routes are given:

TABLE II.—*Distances from Europe to Pacific ports via the Nicaragua Canal and the Straits of Magellan.*

To—	From Liverpool via—		From Hamburg via—		From Antwerp via—		From Bordeaux via—		From Gibraltar via—	
	Nicaragua.	Magellan. [a]	Nicaragua.	Magellan. [a]	Nicaragua.	Magellan. [a]	Nicaragua.	Magellan. [a]	Nicaragua.	Magellan. [a]
Sitka	8,953	15,386	9,470	15,836	9,191	15,557	8,941	15,073	8,675	14,455
Port Townsend	8,426	14,859	8,943	15,309	8,664	15,030	8,414	14,546	8,148	13,928
Portland	8,301	14,734	8,818	15,184	8,539	14,905	8,289	14,421	8,023	13,803
San Francisco	7,651	14,084	8,168	14,534	7,889	14,255	7,639	13,771	7,373	13,153
San Diego	7,214	13,707	7,718	14,157	7,439	13,878	7,189	13,394	6,923	12,776
Acapulco	5,840	12,261	6,343	12,711	6,064	12,432	5,814	11,948	5,548	11,330
San José de Guatemala	5,285	11,831	5,788	12,281	5,509	12,002	5,259	11,518	4,993	10,900
Honolulu	9,175	15,219	9,678	15,669	9,399	15,390	9,149	14,906	8,883	14,288
Guayaquil	5,975	10,722	6,493	11,172	6,214	10,893	5,964	10,409	5,698	9,791
Callao	6,481	10,072	6,998	10,522	6,719	10,243	6,469	9,259	6,203	9,141
Iquique	7,123	9,591	7,640	10,041	7,361	9,762	7,111	9,278	6,845	8,660
Valparaiso	7,708	8,831	8,225	9,281	7,946	9,002	7,696	8,518	7,430	7,900
Coronel	7,891	8,600	8,408	9,050	8,129	8,771	7,879	8,287	7,613	7,669

[a] Via Pernambuco. Callao, and San Francisco for ports north of those cities.

The European ports included in the above table are so situated that the distances from them to Pacific ports typify the distances from the leading industrial and commercial centers of Europe. It will be observed that the distance from Liverpool to Coronel by way of the Nicaragua Canal will be 709 miles less than by the route through the Strait of Magellan. The route to the nitrate port of Iquique will be shortened 2,468 miles. San Francisco will be brought 6,433 miles nearer to Liverpool and 5,780 miles nearer to Gibraltar.

In Tables III, IV, and V the distances from the Atlantic American ports to Pacific countries, by way of the Nicaragua Canal, and by way of existing routes are compared.

TABLE III.—*Distances, in nautical miles, from Atlantic American ports to Yokohama, Shanghai, and Hongkong via the Nicaragua and Suez routes.*

From—	To Yokohama via—			To Shanghai via—			To Hongkong via—			
	San Francisco and Great Circle.	Honolulu.	Suez,[a] Colombo, Singapore, Hongkong, and Shanghai.	San Francisco, Great Circle, and Yokohama.	Honolulu and Yokohama.	Suez,[b] Colombo, Singapore, and Hongkong.	San Francisco, Great Circle, Yokohama and Shanghai.	Honolulu, Yokohama, and Shanghai.	Honolulu, Guam, and Manila.	Suez, Colombo, and Singapore.
Portland	9,652	10,026	13,330	10,702	11,076	12,280	11,561	11,935	12,097	11,421
Boston	9,617	9,991	13,370	10,667	11,041	12,320	11,526	11,900	12,062	11,461
New York	9,457	9,831	13,564	10,507	10,881	12,514	11,366	11,740	11,902	11,655
Philadelphia	9,397	9,771	13,707	10,447	10,821	12,657	11,306	11,680	11,842	11,798
Baltimore	9,377	9,751	13,852	10,427	10,801	12,802	11,286	11,660	11,822	11,943
Norfolk	9,247	9,621	13,727	10,297	10,671	12,677	11,156	11,530	11,692	11,818
Charleston	[c] 9,037	[c] 9,411	13,982	[c] 10,087	[c] 10,461	12,932	[c] 10,946	[c] 11,320	[c] 11,482	12,073
Savannah	[d] 9,043	[d] 9,417	14,057	[d] 10,093	[d] 10,467	13,007	[d] 10,952	[d] 11,326	[d] 11,488	12,148
Jacksonville	[e] 9,001	[e] 9,375	14,137	[e] 10,051	[e] 10,425	13,087	[e] 10,910	[e] 11,284	[e] 11,446	12,228
Port Tampa	8,514	8,888	14,629	9,564	9,938	13,579	10,423	10,797	10,959	12,720
Pensacola	8,620	8,994	14,833	9,670	10,044	13,783	10,529	10,903	11,065	12,924
Mobile	8,647	9,021	14,875	9,697	10,071	13,825	10 556	10,930	11,092	12,966
New Orleans	8,654	9,028	14,929	9,704	10,078	13,879	10,563	10,937	11,099	13,020
Galveston	8,837	9,131	15,111	9,807	10,181	14,061	10,666	11,040	11,202	13,202

[a] Direct voyage from Singapore to Yokohama reduces this distance by 393 miles.
[b] Direct voyage from Singapore to Shanghai reduces this distance by 66 miles.
[c] Vessels going by west end of Cuba will shorten voyage 69 miles for Charleston.
[d] 104 miles for Savannah. [e] 136 miles for Jacksonville.

In Table III the distances from representative ports of the Atlantic and Gulf to Yokohama, Shanghai, and Hongkong by way of the various alternative routes are given. The distances given in the table are those which a vessel would take in going by actual commercial routes. It has been deemed more important to deal with distances by commercial routes rather than by the shortest possible course. The shortest route from the American Isthmus to Japan or China is by way of the Great Circle. The distance from Brito to Yokohama direct is 7,122; via Magdalena Bay, Lower California, 7,144; via San Francisco, 7,236; and via Honolulu, 7,610 miles. By the Great Circle route a vessel can call at San Francisco by adding only 114 miles to its voyage; and with this call at San Francisco included, the distance from New York to Shanghai by the Great Circle and Yokohama is 374 miles less than via Honolulu and Yokohama. The Nicaragua route is shorter than the Suez route for all Asiatic points mentioned in the table, the advantages of the Nicaragua route being greater for our Gulf ports than for those on the Atlantic. Especial note may be made of the fact that the distance to Hongkong by way of Honolulu, Guam, and Manila is considerably greater than by a route which enables a vessel to call en route at San Francisco, Yokohama, and Shanghai. The latter route is 536 miles less for a vessel starting from New York.

In order to compare the distances by various routes connecting our eastern seaboard with Manila, Table IV has been prepared.

TABLE IV.—*Distances, in nautical miles, from American Atlantic ports to Manila via Nicaragua and Suez routes.*

From—	Via San Francisco, Great Circle, and Yokohama.	Via Honolulu and Yokohama.	Via Honolulu Yokohama, Shanghai, and Hongkong.	Via Honolulu, and Guam.	Via Suez, Colombo, Singapore.
Portland	11,402	11,776	12,563	11,469	11,367
Boston	11,367	11,741	12,528	11,434	11,407
New York	11,207	11,581	12,368	11,274	11,601
Philadelphia	11,147	11,521	12,308	11,214	11,744
Baltimore	11,127	11,501	12,288	11,194	11,889
Norfolk	10,997	11,371	12,158	11,064	11,764
Charleston [a]	10,711	11,085	11,872	10,778	12,019
Savannah [b]	10,717	11,091	11,878	10,784	12,094
Jacksonville [c]	10,667	11,041	11,828	10,734	12,174
Port Tampa	10,264	10,638	11,425	10,331	12,266
Pensacola	10,370	10,744	11,531	10,437	12,870
Mobile	10,397	10,771	11,558	10,464	12,912
New Orleans	10,404	10,778	11,565	10,471	12,966
Galveston	10,587	10,961	11,748	10,674	13,148

[a] The route to Greytown via west end of Cuba is 69 miles less.
[b] The route to Greytown via west end of Cuba is 104 miles less.
[c] The route to Greytown via west end of Cuba is 136 miles less.

It will be seen in the table that the distance from New York to Manila by way of San Francisco, the Great Circle, and Yokohama, is 11,207 miles, and that the distance by way of Honolulu and Guam is 11,274 miles. The Suez route is longer than either of these routes, being 11,601 miles. A vessel bound from New York or New Orleans, or any other eastern seaport to Manila can call at San Francisco, Yokohama, and Hongkong en route by adding 720 miles to the length of a voyage by way of Honolulu and Guam. Manila, it will also be noticed, is somewhat nearer the eastern part of the United States by way of the Nicaragua Canal than by way of Suez.

The manner in which the Nicaragua Canal would affect the distances between our eastern seaboard and Australia is shown by Table V.

TABLE V.—*Distances, in nautical miles, between the eastern seaboard of the United States and Australia via the Nicaragua and Suez routes.*

From—	To Adelaide via—		To Melbourne via—		To Sydney via—		To Wellington via—		
	Brito, Tahiti, Sydney, and Melbourne.	St. Vincent and Cape of Good Hope.	Brito, Tahiti, and Sydney.	St. Vincent, Cape of Good Hope, and Adelaide.	Brito and Tahiti.[a]	St. Vincent, Good Hope, Adelaide, and Melbourne.	Brito and Tahiti.[a]	St. Vincent, Good Hope, and Melbourne.	Straits of Magellan.
Portland	10,954	12,446	10,446	12,954	9,871	13,529	8,911	14,204	11,419
Boston	10,919	12,459	10,411	12,967	9,836	13,542	8,876	14,217	11,384
New York	10,759	12,575	10,251	13,083	9,676	13,658	8,716	14,333	11,414
Philadelphia	11,699	12,641	10,191	13,149	9,616	13,724	8,656	14,399	11,464
Baltimore	10,679	12,736	10,171	13,244	9,596	13,819	8,632	14,494	11,476
Norfolk	10,549	12,614	10,041	13,122	9,466	13,697	8,510	14,372	11,140
Charleston	10,265	12,761	9,155	13,269	9,180	13,844	8,220	14,519	11,349
Savannah	10,269	12,821	9,671	13,329	9,186	13,904	8,226	14,579	11,378
Jacksonville	10,219	12,846	9,711	13,354	9,136	13,929	8,196	14,604	11,353
Port Tampa	9,816	12,243	9,308	13,751	8,733	14,326	7,773	15,001	11,514
Pensacola	9,922	13,447	9,414	13,955	8,839	14,530	7,879	15,205	11,718
Mobile	9,949	13,489	9,441	13,997	8,866	14,572	7,906	15,247	11,760
New Orleans	9,956	13,543	9,448	14,051	8,873	14,626	7,913	15,301	11,814
Galveston	10,139	13,725	9,631	14,233	9,056	14,808	8,096	15,483	11,996

[a] The course from Brito to Sydney direct, omitting call at Tahiti, would be 52 miles less.

The distance from New York to Australia by the Cape of Good Hope is practically the same as by the Suez Canal, and the Cape route has the advantage of more favorable winds and currents and of a cooler temperature. Vessels going from our eastern coast to Australia always round the Cape; accordingly, the comparisons of Table V are between the Nicaragua and Good Hope routes. Steamers bound for Australia via the Cape usually call at St. Vincent for coal; hence the distances given in the table include a call at that island. The route between the American isthmus and Australia and New Zealand is by way of the centrally located island of Tahiti, which will doubtless become an important coaling station upon the opening of the isthmian canal.

New York is 3,982 miles nearer Sydney by way of Brito and Tahiti and 3,796 miles nearer via Panama and Tahiti than via St. Vincent, Good Hope, Adelaide, and Melbourne. Adelaide is 1,816[a] miles nearer New York and 3,587 miles nearer New Orleans by Brito and Tahiti than by Good Hope. For the Panama route the figures are 1,640 for Adelaide-New York, and 3,209 for Adelaide-New Orleans. Wellington would be brought 5,617[b] miles nearer New York by a Nicaragua canal and 5,441 miles by the Panama Canal.

The places in Australia, the East Indies, and southern China, equally distant from New York by the Nicaragua and Suez routes, are shown on Plate 86. It will be observed that the line passing through points equidistant from New York via the two canals crosses the western part of Australia, runs west of the Philippines, and touches the continent of Asia in the neighborhood of the island of Hainan considerably to the west of Hongkong.

In Table VI the distances from Liverpool to Australasia and the Orient by way of the Nicaragua and Suez routes are contrasted.

[a] Omitting stop at Tahiti would add 52 miles to this figure, and if Melbourne were reached by Wellington rather than by Sydney, it should be increased by 232 miles.

[b] Omitting stop at Tahiti would add 185 miles to this figure.

TABLE VI.—*Distances from Liverpool to the East by the Suez and Nicaragua routes.*

To—	Suez route.		Nicaragua route.		Difference—Suez, −; Nicaragua +.
	Ports of call.	Nautical miles.	Ports of call.	Nautical miles.	
Adelaide	Aden,[a] Colombo, King George Sound	11,151	Brito, Tahiti, Sydney, Melbourne[b]	13,489	−2,338
Melbourne	Aden,[a] Colombo, King George Sound, Adelaide	11,659	Brito, Tahiti, Sydney[b]	12,981	−1,322
Sydney	Aden,[a] Colombo, King George Sound, Adelaide, Melbourne.	12,234	Brito, Tahiti[b]	12,406	− 172
Wellington	Aden,[a] Colombo, King George Sound, Melbourne.	12,949	....do.[c]	11,446	+1,503
Manila	Aden,[a] Colombo, Singapore	9,677	Brito, San Francisco, Yokohama[d]	13,937	−4,260
Hongkong	....do	9,731	....do.[e]	13,777	−4,046
Tientsin	Aden, Colombo, Singapore, Hongkong, Shanghai.	11,362	Brito, San Francisco, Yokohama	13,554	−2,192
Yokohama	....do	11,640	Brito, San Francisco	12,187	− 547

[a] Direct voyage from Aden to King George Sound would shorten these routes 540 miles.
[b] Direct voyage from Brito to Sydney would shorten these routes 52 miles.
[c] Direct voyage from Brito to Wellington would shorten this distance by 185 miles and make the difference 1,688 miles.
[d] A stop at Shanghai would add to this route 535 miles.
[e] A stop at Shanghai would add to this route 319 miles.

With the exception of Wellington, the Pacific ports named in Table VI are nearer Liverpool via the Suez Canal than by way of Nicaragua. From Liverpool to Sydney, however, the distance via Brito and Tahiti is only 172 miles and via Panama 357 miles more than via Suez, Colombo, Adelaide, and Melbourne. Yokohama is but 547 miles farther from Liverpool via Brito and San Francisco, and 934 miles farther via Panama and San Francisco than via the easterly route.

The route from Liverpool to Japan and China, by way of the American Isthmus, passes close to both the Atlantic and Pacific seaboards of the United States. A vessel would add but 314 miles to the length of the voyage from Liverpool to Colon by calling at New York City, the port having the largest foreign commerce of any city in the world (London excepted) and an export traffic going in all directions. By calling at the south Atlantic or Gulf ports of the United States, the raw and manufactured cotton, which is exported in large quantities from the United States across the Pacific, could be added to the vessel's cargo. A call at San Francisco, or some other west coast port of the United States, would enable the vessel to participate in the grain and lumber trade from the United States to Oriental countries. If the vessel making the trip from Liverpool to Asia is sailed under the American flag, it can participate in the coasting trade between the two seaboards of the United States.

By consulting Plate 86, on which the points in Australasia and the East Indies equally distant from Liverpool are located, it will be seen that the line connecting the places equidistant from Liverpool, by way of the Nicaragua and Suez routes, passes between New Zealand and Australia, runs east of the main island of Japan, and touches the continent of Asia on the Manchurian coast some distance north of Vladivostok. As far as distance alone is determinative, the commerce of Liverpool with Australia and the Far East is tributary to the Suez route; but the commercial factors other than distance will, in all probability, so affect the routes of trade as to cause some of the outbound and inbound trade of Liverpool with the East to make use of the westerly route.

For the purpose of showing the relative advantages, as far as distance is concerned, which New York and Liverpool will possess for the Eastern trade after the isthmian canal has been completed, Table VII has been prepared:[a]

TABLE VII.—*Comparisons of distances, in nautical miles, from New York and Liverpool to Australasian and Asiatic ports via the Nicaragua and Suez routes.*

To—	From New York (via Nicaragua).		From Liverpool (via Suez).		Difference—(Suez, −; Nicaragua, +).
	Route.	Miles.	Route.	Miles.	
Wellington	Brito, Tahiti	8,716	Aden,[b] Colombo, King George Sound, Melbourne.	12,949	+4,233
Sydney	....do.[c]	9,676	Aden,[b] Colombo, King George Sound, Adelaide, Melbourne.	12,234	+2,558
Adelaide	Brito, Tahiti,[c] Sydney,[d] Melbourne	10,759	Aden,[b] Colombo, King George Sound	11,151	+ 392
Manila	Brito, San Francisco, Great Circle, Yokohama.	11,207	Aden, Colombo, Singapore	9,677	−1,530
Hongkong	....do	11,047	....do	9,731	−1,316
Shanghai	....do	10,507	Aden, Colombo, Singapore, Hongkong	10,590	+ 83
Tientsin	....do	10,824	Aden, Colombo, Singapore, Hongkong, Shanghai.	11,362	+ 538
Yokohama	Brito, San Francisco, Great Circle	9,457	....do	11,640	+2,183

[a] From Plate 74 the figures may be obtained for comparing the Panama and Suez routes.
[b] Omitting stop at Colombo will shorten voyage 540 miles.
[c] Omitting stop at Tahiti will shorten voyage 52 miles.
[d] If vessel goes by Wellington and Melbourne voyage will be shortened 232 miles.

New York will be nearer than Liverpool to New Zealand and the commercially important half of Australia. Liverpool by way of the Suez route will be nearer than New York by way of the Nicaragua or Panama route to the Philippines, Hongkong, and southern Asia. Shanghai will be somewhat farther from New York than from Liverpool, the handicap of New York by way of Panama, San Francisco, the Great Circle, and Yokohama being 295 miles—the route from Liverpool by way of the Suez including a call at Colombo, Singapore and Hongkong. If the call at San Francisco be omitted the New York-Panama distance is shorter than the Liverpool-Suez route. Northern China, Manchuria, and Japan will be considerably nearer New York than to Liverpool.

Plate 86 shows that the line connecting the points equally distant from Liverpool and New York by the Suez and Nicaragua routes, respectively, runs through the central part of Australia, through the western part of New Guinea, east of the Philippine Islands, and touches the mainland of Asia a little north of Shanghai.

The foregoing seven tables have shown the effect which a Nicaragua canal would have upon the ocean distances from our eastern seaboard to the Pacific countries of America, Australia, and Asia. These tables have also shown the manner in which the comparative distances from our eastern seaboard and from Europe would be modified by a Nicaragua canal. In Table VIII the Nicaragua and Panama Canal routes are contrasted, and the distances from typical Atlantic and Gulf ports of the United States, and from representative European cities to the western coast of the American continents and to trans-Pacific countries, by way of each canal route, are given:

TABLE VIII.—*Comparison of distances, in nautical miles, from American and European Atlantic ports to Pacific ports via the Nicaragua and Panama canals.*

From—	Via—	To Port Townsend via San Francisco.	To San Francisco.	To Guayaquil.	To Callao.	To Iquique.	To Valparaiso.	To Coronel.
New York	Nicaragua	5,696	4,921	3,246	3,751	4,393	4,928	5,161
	Panama	6,074	5,299	2,864	3,359	4,021	4,630	4,838
Norfolk	Nicaragua	5,485	4,710	3,035	3,540	4,182	4,767	4,950
	Panama	5,872	5,097	2,662	3,157	3,819	4,428	4,636
Charteston	Nicaragua	5,276	4,501	2,826	3,331	3,973	4,558	4,741
	Panama	5,673	4,898	2,463	2,958	3,638	4,229	4,437
Port Tampa	Nicaragua	4,753	3,978	2,303	2,808	3,450	4,035	4,218
	Panama	5,328	4,533	2,098	2,593	3,255	3,864	4,072
New Orleans	Nicaragua	4,893	4,118	2,443	2,948	3,590	4,175	4,358
	Panama	5,477	4,698	2,263	2,758	3,420	4,029	4,237
Galveston	Nicaragua	4,996	4,221	2,546	3,051	3,693	4,278	4,461
	Panama	5,574	4,799	2,364	2,858	3,520	4,129	4,338
Liverpool	Nicaragua	8,426	7,651	5,975	6,481	7,123	7,708	7,891
	Panama	8,813	8,038	5,603	6,098	6,760	7,369	7,577
Hamburg	Nicaragua	8,943	8,168	6,493	6,998	7,640	8,225	8,408
	Panama	9,242	8,467	6,032	6,527	7,189	7,798	8,006
Antwerp	Nicaragua	8,664	7,889	6,214	6,719	7,361	7,946	8,129
	Panama	8,963	8,188	5,753	6,248	6,910	7,519	7,727
Bordeaux	Nicaragua	8,414	7,639	5,964	6,469	7,111	7,696	7,879
	Panama	8,713	7,938	5,503	5,998	6,660	7,269	7,477
Gibraltar	Nicaragua	8,148	7,373	5,698	6,203	6,845	7,430	7,613
	Panama	8,447	7,672	5,237	5,723	6,394	7,003	7,211

TABLE VIII.—*Comparison of distances, in nautical miles, from American and European Atlantic ports to Pacific ports via the Nicaragua and Panama canals.*

From—	Via—	To Yokohama via San Francisco.[a]	To Shanghai via San Francisco[a] and Yokahama.	To Manila via San Francisco[a] and Yokohama.	To Sydney via Tahita.[b]	To Melbourne[b] via Tahita[c] and Sydney.	To Wellington via Tahita.[d]
New York	Nicaragua	9,457	10,507	11,207	9,676	10,251	8,716
	Panama	9,835	10,885	11,585	9,852	10,427	8,892
Norfolk	Nicaragua	9,246	10,296	10,997	9,466	10,041	8,505
	Panama	9,623	10,684	11,384	9,650	9,858	8,690
Charleston	Nicaragua	9,037	9,957	10,505	9,250	9,831	8,296
	Panama	9,344	10,367	10,809	9,451	10,006	8,491
Port Tampa	Nicaragua	8,514	9,564	10,264	8,733	9,308	7,773
	Panama	9,069	10,119	10,819	9,086	9,661	8,126
New Orleans	Nicaragua	8,654	9,704	10,404	8,873	9,448	7,913
	Panama	9,234	10,284	10,984	9,251	9,826	8,291
Galveston	Nicaragua	8,757	9,887	10,587	9,056	9,631	8,016
	Panama	9,335	10,385	11,085	9,352	9,927	8,392
Liverpool	Nicaragua	12,187	13,237	13,937	12,406	12,981	11,446
	Panama	12,574	13,624	14,324	12,591	13,166	11,631
Hamburg	Nicaragua	12,704	13,754	14,454	12,923	13,498	11,963
	Panama	13,003	14,053	14,753	13,020	13,595	12,060
Antwerp	Nicaragua	12,425	13,475	14,175	12,644	13,219	11,684
	Panama	12,724	13,774	14,474	12,741	13,316	11,781
Bordeaux	Nicaragua	12,175	13,225	13,925	12,394	12,969	11,434
	Panama	12,474	13,524	14,224	12,491	13,066	11,471
Gibraltar	Nicaragua	11,909	12,959	13,659	12,128	12,703	11,168
	Panama	12,208	13,258	13,958	12,225	12,800	11,265

[a] Via Honolulu add 374 miles for Nicaragua and 252 for Panama.
[b] Omitting Tahiti reduces voyage from Brito by 52 miles.
[c] Voyage from Brito to Sydney by way of Wellington is 232 miles less than by way of Tahiti; from Panama it is 405 miles less.
[d] Voyage from Brito to Wellington direct is 185 miles shorter than via Tahiti, and from Panama it is 358 miles shorter.

Table VIII shows very clearly that the Panama route is the more advantageous for the west South American trade, both with Europe and the United States. For the commerce of Europe and the United States with every other Pacific country, with the exception of New Zealand, to which the distances are practically equal, the Nicaragua is shorter than the Panama route. If the call be made at Tahiti on the voyage between Wellington and the American Isthmus, the Nicaragua route is somewhat shorter than the one across Panama for the trade of North Atlantic countries with New Zealand. If this voyage be made without the call at Tahiti, distance by way of the two canal routes is practically the same.

For convenience of comparison, the following brief table is serviceable. The distances from New York, New Orleans, and Liverpool by way of the Nicaragua and Panama Canal routes to San Francisco, Yokohama, Hongkong, Sydney, Wellington, and Iquique are shown:

	New York.		New Orleans.		Liverpool.	
	Nicaragua.	Panama.	Nicaragua.	Panama.	Nicaragua.	Panama.
San Francisco	4,921	5,299	4,118	4,698	7,651	8,038
Yokohama	9,457	9,835	8,654	9,234	12,187	12,574
Hongkong	11,366	11,744	10,563	11,143	14,096	14,483
Sydney via Tahiti	9,676	9,852	8,873	9,251	12,406	12,591
Wellington via Tahiti	8,716	8,892	7,913	8,291	11,446	11,631
Iquique	4,393	4,021	3,590	3,420	7,123	6,670

Chapter XVIII.

CARGO TONNAGE OF THE EXISTING MARITIME COMMERCE THAT MIGHT USE AN ISTHMIAN CANAL, 1898-99.

The attempt is made in the following chapters to measure, with all possible accuracy, the amount of the ocean shipping and commerce which would use the isthmian waterway at the present time, if the route were in existence. The latest statistics[a] of ocean shipping, and of the commodity traffic of which maritime commerce is composed, have been carefully examined and are analytically set forth in these chapters, for the purpose of determining the volume of the traffic reservoir from which the commerce of the canal would be drawn.

The results of three distinct statistical investigations are here presented, two of which were made by the Isthmian Canal Commission and one by the New Panama Canal Company. The investigations having been made without reference to each other, afford an exceptional opportunity for a comparison of results obtained by different methods, and for testing the accuracy of the conclusions reached by the several inquiries.

One of the two studies made by the Isthmian Canal Commission examined the statistics of the imports and exports of our own country, and those of several European countries, for the purpose of determining how many tons of cargo or how much freight the trade of those countries might have contributed to the traffic through an American interoceanic canal in 1899. The investigation, the results of which are presented in this chapter, has gone fully into every essential detail concerning which information was obtainable; and in the comparatively limited field where estimates were unavoidable, because of insufficient official data, the figures have been subjected to such critical tests as were applicable.

The other statistical investigation, conducted by the Isthmian Canal Commission, was made for the purpose of finding out the tonnage of the vessels which would pass through the canal if it were now in existence. This inquiry involved a study of the statistics kept by the leading commercial nations, of the entrances and clearances of the vessels now engaged in the commerce, between the ports so situated that their maritime trade might have made use of an interoceanic canal. The third investigation, described in the following chapters, is the one made by the New Panama Canal Company to ascertain the tonnage of the vessels, that during recent years have been engaged in commerce, that might have passed through a canal across the Isthmus of Panama; the New Panama Canal Company having courteously permitted the Isthmian Canal Commission to present in this report the results of an elaborate study.

NATURE AND LIMITATIONS OF THE INFORMATION AVAILABLE FROM OFFICIAL STATISTICS.

The statistics of the internal commerce of the United States and of other countries give the volume of business in tons. The traffic of the railways, rivers, and canals, and the productions of our mines and furnaces are measured by the ton unit, and the same is true of the products of our farms and forests when in the possession of the transportation agent. The statistical units of weight most familiar to the people of the United States are the short ton of 2,000 pounds and the "long" ton of 2,240. The long ton is not employed so much in this country as it formerly was, but in the United Kingdom the ton of 2,240 pounds is still more generally used than the short ton. In countries that have adopted the metric system of weights and measures the ton weighs 2,204 pounds.

In the Government statistics of ocean commerce no record is made of the cargo or weight tonnage of the commodities carried, and the volume of business done is expressed in terms of vessel tonnage. The "gross register tonnage" of a ship is its capacity in cubic feet divided by 100, and its "net register tonnage" is determined by dividing by 100 the cubic feet of space available in the vessel for cargo. Maritime commercial statistics are usually given in net register tonnage. To those who are directly concerned with maritime commerce the statistics of vessel tonnage are a readily understood index of the volume of commodity traffic; but to many

[a] The latest statistics available at the time the investigation was made.

if not most men engaged in industrial pursuits the cargo ton of 2,000 or 2,240 pounds is the customary unit employed in measuring the volume of trade, and figures of net tonnage have little significance until they have been converted into tons of weight.

It was believed that a statement of the cargo tonnage or the amount of freight that would make use of an isthmian canal, if it were now in existence, would be of value for several reasons. The business world being accustomed to consider the amount of traffic in terms of the cargo ton, a statement in that unit of the volume of available canal traffic would, it was thought, convey definite information that would be readily comprehended without being translated. The statistics of the cargo tonnage of ocean commerce permit comparisons to be made with the statistics of internal traffic, while statements of vessel tonnage do not. The saving in freight rates, furthermore, that the opening of an isthmian canal would make possible can be more intelligently considered by knowing the volume of cargo freight that would now use the waterway. Ocean rates, like railway freight charges, are levied on the cargo ton of weight or measurement, but unlike the statistics of railway traffic, those of maritime commerce give no data regarding freight tonnage.

The United States Bureau of Statistics, now in the Department of Commerce and Labor, collects the statistics of our foreign trade, and in its monthly and annual publications gives the value of imports and exports by classes of commodities and by ports. Tables are also published giving the values and, in many cases, the quantities of the commodities exported from each port to foreign countries as a whole; similarly, the values and usually the quantities of the imports entering our several ports from foreign countries, taken collectively, are given. Though these tables are elaborate and of great value, they do not give the amount of trade by articles and quantities carried on between our several ports and the countries with which we exchange commodities.

It is not possible to obtain the actual cargo tonnage of the total foreign trade of the United States directly from our official statistics, because the published tables seldom give the weights of the commodities, frequently do not state the quantities, and in no instance is the ocean freight tonnage stated. This is equally true of the commercial statistics compiled by foreign countries.

It is likewise impossible to ascertain from the published tables the kinds and quantities of commodities that constitute the trade carried on through and by our several ports with different countries. Our published statistics indicate the foreign trade carried on at each port of the United States; and the distribution of our entire trade among the several countries is shown, but it is in the form of total values. The Bureau of Statistics possesses the data necessary for this analytical presentation, by articles, of the trade of our respective ports with each foreign country, but the tables which such a presentation would require would be so voluminous as to make their publication for all ports impracticable. A table would need to be constructed for each port or customs district, showing its trade with each foreign country in each article or class of articles imported and exported. There are at the present time more than 50 maritime customs districts, trading more or less with 92 foreign countries, by exchanging some or all of the 661 articles in the classified list of the commodities.

Not being able to obtain from the published tables the data necessary for the calculation of the cargo tonnage of our ocean commerce that would now make use of an isthmian waterway, the resort was had to the unpublished folios, access to which was courteously given by the United States Bureau of Statistics. The facts concerning the trade of each port were copied from these folios, and two sets of tables were constructed, one for the Pacific ports of the United States and one for the Atlantic. The tables constructed for the Pacific ports showed for each port the values and, when obtainable, the quantities of each class of articles imported and exported in the trade carried on with each foreign country on the Atlantic. Similar tables were made, giving the trade of each Atlantic port with each Pacific country.

Having secured the mass of data contained in these compilations, the work of converting quantities and values of commodities into their cargo tonnage equivalents was begun, and the results of the calculations were four comparatively small tables giving the values and the cargo tonnage of the imports and exports composing the trade which our Pacific ports had with the Atlantic countries in 1898–99, and which our Atlantic ports had with Pacific countries the same year. These four tables give the value and the cargo tonnage of the maritime foreign commerce of the United States, which might have used the isthmian canal had it been in existence during the year ending June 30, 1899.

The discussion of methods as well as results can be given more advantageously with the tables in hand. The four tables present (1) the value and cargo tonnage of the imports into each of our Atlantic ports from the Pacific foreign countries traded with; (2) the exports from each Atlantic port to those countries; (3) the value and cargo tonnage of the imports into each Pacific port from each Atlantic foreign country dealt with, and (4) the value and cargo tonnage of the exports from each of our Pacific ports to each Atlantic country to which commodities were sent. Table V is inserted in a later connection, where the totals of the first four tables are discussed.

I.—*Atlantic coast imports from foreign Pacific countries, values and cargo tons, year ending June 30, 1899.*

Customs districts.		Chile.	Ecuador and Peru.	Salvador and British Columbia.	Hawaii.
Baltimore	value	$76,393			
	tons	4,204.1			
Beaufort, S. C	value				
	tons				
Boston and Charlestown	value	$61,640	a $70,307		$5
	tons	14,520	a 3,140		0.1
Bridgeton	value	$61,340			
	tons	3,921.9			
Charleston, S. C	value	$93,308			
	tons	3,413.9			
Delaware	value	$101,701			
	tons	8,479.2			
Georgetown, D. C	value				$25,000
	tons				564.3
Hartford	value				
	tons				
Newark	value				
	tons				
New York	value	$2,245,533	$2,301,984	b $296,693	$7,954,770
	tons	103,490.3	29,140.3	2,107.2	95,866.4
Norfolk and Portsmouth	value	$11,723			
	tons	879.4			
Perth Amboy	value				
	tons				
Philadelphia	value	$109,542			$463,672
	tons	15,547.6			5,486.6
Portsmouth and Falmouth	value				$300
	tons				5
Providence	value				
	tons				
Richmond	value				
	tons				
Savannah	value	$35,295			
	tons	1,364.7			
Wilmington, N. C	value				
	tons				
Galveston	value				
	tons				
Key West	value				
	tons				
Mobile	value				
	tons				
New Orleans	value				$43,240
	tons				488.1
Pearl River	value				
	tons				
Pensacola	value				
	tons				
Tampa	value				
	tons				
Saluria	value				
	tons				
Total	value	$2,796,475	$2,372,291	$296,693	$8,486,987
	tons	155,821.1	32,280.3	2,107.2	102,410.5

Customs districts.		British Australia and Auckland.	China.	Japan.	Hongkong.
Baltimore	value		$7,999	$125,680	$190,215
	tons		89.8	2,501.8	13,602.9
Beaufort, S. C	value				
	tons				
Boston and Charlestown	value	$464,011	$145,232	$94,265	$242,292
	tons	1,607.2	784.5	2,567.5	7,118.3
Bridgeton	value				
	tons				
Charleston, S. C	value			$13,628	
	tons			350.9	
Delaware	value				
	tons				
Georgetown, D. C	value	$20	$4,305		
	tons	.5	41.3		
Hartford	value		$462	$5,921	$328
	tons		8.5	77.8	2.5
Newark	value	$133,828		$234	$1,424
	tons	116.5		4.7	20.2
New York	value	$3,072,191	$8,510,473	$7,079,664	$1,437,966
	tons	29,469.1	95,802.2	109,557.4	15,070.4
Norfolk and Portsmouth	value				
	tons				
Perth Amboy	value				
	tons				
Philadelphia	value	$163,011	$68,212	$110,189	$9,279
	tons	576.8	1,935	2,306	524.4
Portsmouth and Falmouth	value				
	tons				

a Peru. b British Columbia, $14,168.

I.—*Atlantic coast imports from foreign Pacific countries, values and cargo tons, year ending June 30, 1899.*

Customs districts.		British Australia and Auckland.	China.	Japan.	Hongkong.
Providence	value			$270	
	tons			3	
Richmond	value	$582		$313	
	tons	7.6		3.4	
Savannah	value				
	tons				
Wilmington, N. C	value			$200	
	tons			3	
Galveston	value				
	tons				
Key West	value			$472	
	tons			6.2	
Mobile	value				
	tons				
New Orleans	value	$76	$44,982	$49,186	$5,292
	tons	1	2,717.2	1,510.6	30.3
Pearl River	value				
	tons				
Pensacola	value				
	tons				
Tampa	value				
	tons				
Saluria	value				
	tons				
Total	value	$3,833,719	$8,781,665	$7,480,024	$1,886,796
	tons	21,778.7	101,381.5	118,892.3	36,369

Customs districts.		Philippine Islands.	Total Hongkong and Philippines.	Total all others.	Grand total.
Baltimore	value		$190,215	$210,072	$400,287
	tons		13,602.9	6,795.7	20,398.6
Beaufort, S. C	value				
	tons				
Boston and Charlestown	value	$850,578	$1,092,870	$835,460	$1,928,330
	tons	18,216.7	25,335	22,619.3	47,954.3
Bridgeton	value			$61,340	$61,340
	tons			3,921.9	3,921.9
Charleston, S. C	value			$106,936	$106,936
	tons			3,764.8	3,764.8
Delaware	value			$101,701	$101,701
	tons			8,479.2	8,479.2
Georgetown, D. C	value			$29,325	$29,325
	tons			609.1	609.1
Hartford	value		$328	$6,383	$6,711
	tons		2.5	86.3	88.8
Newark	value		$1,424	$134,062	$135,486
	tons		20.2	121.2	141.4
New York	value	$3,100,485	$4,538,451	$31,461,308	$35,999,789
	tons	41,468.5	56,538.9	455,437.9	511,971.8
Norfolk and Portsmouth	value			$11,723	$11,723
	tons			879.4	879.4
Perth Amboy	value				
	tons				
Philadelphia	value	$221,819	$231,098	$914,626	$1,145,724
	tons	3,142.2	3,670.6	25,852	29,522.6
Portsmouth and Falmouth	value			$300	$300
	tons			5	5
Providence	value			$270	$270
	tons			3	3
Richmond	value			$895	$895
	tons			11	11
Savannah	value			$35,295	$35,295
	tons			1,364.7	1,364.7
Wilmington, N. C	value			$200	$200
	tons			3	3
Galveston	value				
	tons				
Key West	value			$472	$472
	tons			6.2	6.2
Mobile	value				
	tons				
New Orleans	value		$5,292	$137,484	$142,776
	tons		30.3	4,716.9	4,747.2
Pearl River	value				
	tons				
Pensacola	value				
	tons				
Tampa	value				
	tons				
Saluria	value	$44	$44		$44
	tons	.5	.5		.5
Total	value	$4,172,926	$6,059,722	$34,047,852	$40,107,604
	tons	62,831.9	99,200.9	534,371.6	633,572.5

II.—*Atlantic coast exports to foreign Pacific countries, values and cargo tons, year ending June 30, 1899.*

Customs districts.		Chile.	Bolivia, Ecuador, and Peru.	Salvador and British Columbia.	Hawaii.	British Australia and Auckland.
Baltimore	value	$6,000			$33,248	$524,099
	tons	3,000			12,335	20,691
Beaufort, S. C.	value					
	tons					
Boston and Charlestown	value					$89,408
	tons					835.2
Bridgeton	value					
	tons					
Charleston	value					
	tons					
Delaware	value					
	tons					
Georgetown, D. C	value					
	tons					
Hartford	value					
	tons					
Newark	value					
	tons					
New York	value	$1,984,661	a $1,936,464	b $282,072	$659,387	$15,865,902
	tons	44,480.7	a 27,802.4	b 6,339.3	12,359.5	337,017.1
Norfolk and Portsmouth	value	$6,638	c $7,700		$16,813	
	tons	3,250	c 4,400		8,407	
Perth Amboy	value				$24,420	
	tons				2,267.5	
Philadelphia	value	$3,888			$5,400	
	tons	2,350			452.7	
Portland and Falmouth	value					
	tons					
Providence	value					
	tons					
Richmond	value					
	tons					
Savannah	value					$68,242
	tons					11,214
Wilmington	value					
	tons					
Galveston	value					
	tons					
Key West	value					
	tons					
Mobile	value					
	tons					
New Orleans	value					
	tons					
Pearl River	value		d $22,631			
	tons		d 3,485.4			
Pensacola	value		c $5,525			$11,150
	tons		c 997.5			1,122.4
Tampa	value					$23,304
	tons					3,884
Total	value	$2,001,187	$1,972,250	$282,072	$739,268	$16,582,105
	tons	53,080.7	36,685.3	6,339.3	35,821.7	374,763.7

Customs districts.		China and Hongkong.	Japan.	Asiatic Russia and Korea.	French and German Oceania.
Baltimore	value				
	tons				
Beaufort, S. C	value		$30,416		
	tons		11,739		
Boston and Charlestown	value				
	tons				
Bridgeton	value				
	tons				
Charleston	value				
	tons				
Delaware	value				
	tons				
Georgetown, D. C	value				
	tons				
Hartford	value				
	tons				
Newark	value		$185		
	tons		2.5		
New York	value	e $12,073,176	$4,841,684	$807,935	$17,763
	tons	e 301,835.5	170,856.7	8,954.3	993.3
Norfolk and Portsmouth	value		$10,000		
	tons		1,000		
Perth Amboy	value		$348		
	tons		8		
Philadelphia	value	$628,048	$970,369		
	tons	4,220.8	80,650.3		
Portland and Falmouth	value				
	tons				

a Bolivia and Ecuador, value, $806,592; tons, 12,051.8.
b New York to British Columbia, value, $4,144; tons, 65.8.
c Norfolk and Portsmouth to Peru, value, $7,700; tons, 4,400. Pensacola to Peru, value, $5,525; tons, 997.5.
d Pearl River to Bolivia and Ecuador, value, $22,631; tons, 3,485.4.
e Of this total, Hongkong's share was $1,775,634 and 105,704.7 tons of cargo. New York was the only customs districts of the Eastern seaboard that exported to Hongkong in 1899.

II.—*Atlantic coast exports to foreign Pacific countries, values and cargo tons, year ending June 30, 1899*—Continued.

Customs districts.		China and Hongkong.	Japan.	Asiatic Russia and Korea.	French and German Oceania.
Providence	value				
	tons				
Richmond	value				
	tons				
Savannah	value		$10,000		
	tons		1,000		
Wilmington	value				
	tons				
Galveston	value		$440,971		
	tons		11,902		
Key West	value		$73,860		
	tons		7,386		
Mobile	value	$13,898	$14,289		
	tons	421.2	433.1		
New Orleans	value		$444,696		
	tons		12,097.2		
Pearl River	value				
	tons				
Pensacola	value		$8,400		
	tons		2,100		
Tampa	value		$23,574		
	tons		3,929		
Total	value	$12,715,122	$6,868,792	$807,935	$17,763
	tons	306,477.5	303,103.8	8,954.3	993.3

Customs districts.		Philippine Islands.	Total Hongkong and Philippines.	Total, all other.	Grand total.
Baltimore	value	$29,690	$29,690	$563,347	$593,037
	tons	13,151.6	13,151.6	36,026	49,177.6
Beaufort, S. C	value			$30,416	$30,416
	tons			11,739	11,739
Boston and Charlestown	value			$89,408	$89,408
	tons			835.2	835.2
Bridgeton	value				
	tons				
Charleston	value				
	tons				
Delaware	value				
	tons				
Georgetown, D. C	value				
	tons				
Hartford	value				
	tons				
Newark	value			$185	$185
	tons			2.5	2.5
New York	value	$84,315	$1,859,949	$36,693,340	$38,553,289
	tons	1,988.9	107,693.6	804,934.1	912,627.7
Norfolk and Portsmouth	value	$70,336	$70,336	$41,151	$111,487
	tons	30,695	30,695	17,057	47,752
Perth Amboy	value			$24,768	$24,768
	tons			2,275.5	2,275.5
Philadelphia	value			$1,607,705	$1,607,705
	tons			87,673.8	87,673.8
Portland and Falmouth	value				
	tons				
Providence	value				
	tons				
Richmond	value				
	tons				
Savannah	value			$78,242	$78,242
	tons			12,214	12,214
Wilmington	value				
	tons				
Galveston	value			$440,971	$440,971
	tons			11,902	11,902
Key West	value			$73,860	$73,860
	tons			7,386	7,386
Mobile	value			$28,187	$28,187
	tons			854.3	854.3
New Orleans	value			$444,696	$444,696
	tons			12,097.2	12,097.2
Pearl river	value			$22,631	$22,631
	tons			3,485.4	3,485.4
Pensacola	value			$25,075	$25,075
	tons			4,219.9	4,219.9
Tampa	value			$46,878	$46,878
	tons			7,813	7,813
Total	value	$184,341	$1,959,975	$40,210,860	$42,170,835
	tons	45,835.5	151,540.2	1,020,514.9	1,172,055.1

Total, plus 873 tons of miscellaneous *foreign exports* not included in the table, 1,172,928.1 tons.

III.—*Pacific coast imports from foreign Atlantic countries, values and cargo tons, year ending June 30, 1899.*

Customs districts.		Austria-Hungary.	Belgium.	Denmark.	France.	Germany.	Italy.	Netherlands.
Los Angeles	value	$1,742	$28,559	....	$10,580	$76,348	$574	$2,193
	tons	65.8	2,908.1	....	112.4	3,910.1	1	21.3
Oregon, Oreg	value	....	$12,352	....	....	....	....	....
	tons	....	1,678.1	....	....	....	....	....
Puget Sound	value	$2	$41,917	$81	$1,444	$10,331	$19	$92
	tons	0.1	5,542.4	1.6	7.3	148.2	0.8	1
San Diego	value	....	....	....	$69	$42,929	....	....
	tons	....	....	....	3	2,852.3	....	....
San Francisco	value	....	$885,502	....	$678,731	$880,382	$188,650	....
	tons	....	45,946.9	....	7,815	41,988.9	3,646.4	....
Willamette	value	....	$124,960	....	$2,555	$47,604	$39,503	....
	tons	....	11,583.8	....	19.5	5,085.6	2,107.2	....
Total	value	$1,744	$1,093,290	$81	$693,379	$1,057,594	$228,746	$2,385
	tons	65.9	67,659.3	1.6	7,957.2	53,985.1	5,755.4	22.3

Customs districts.		Sweden and Norway.	Switzerland.	United Kingdom.	East Canada.	West Indies.	Brazil.	Total.
Los Angeles	value	$1,377	$1,080	$74,322	$100	$30	....	$197,015
	tons	7.5	3	6,838.6	3	....	....	13,870.8
Oregon, Oreg	value	....	....	$716	....	....	....	$13,068
	tons	....	....	79.3	....	....	....	1,757.4
Puget Sound	value	....	$16	$26,860	$68	....	....	$80,860
	tons	....	2	1,891.1	2.6	....	....	7,597.1
San Diego	value	....	....	$89,588	....	....	....	$132,586
	tons	....	....	12,293.5	....	....	....	15,148.8
San Francisco	value	....	....	$1,806,509	....	$213,604	$3,650	$4,657,028
	tons	....	....	137,236.3	....	310.5	12.1	236,456.1
Willamette	value	$6,994	$176	$131,697	$957	....	....	$354,446
	tons	179.5	7	6,482.1	34.9	....	....	25,499.6
Total	value	$8,371	$1,302	$2,129,702	$1,125	$213,634	$3,650	$5,435,003
	tons	187	12	164,820.9	40.5	310.5	12.1	300,829.2

IV.—*Pacific coast exports to foreign Atlantic countries, values and cargo tons, year ending June 30, 1899.*

Customs districts.		United Kingdom.	Germany.	Belgium.	Italy, Switzerland.
Oregon, Oreg	value	$92,324	[a]$10,200	....	....
	tons	1,612	95.6	....	....
Puget Sound	value	$2,815,647	$28,000	$311,500	....
	tons	124,183.8	....	[b]15,483.6	....
San Francisco	value	$6,918,817	$650	....	[c]$37,340
	tons	173,084.2	11	....	[c]5,184.8
Willamette	value	$6,249,843	$17,931	$60,000	[d]$176
	tons	274,689.9	....	[b]5,572.7	[d]6
Total	value	$16,076,631	$56,781	$371,500	$37,516
	tons	573,569.1	106.6	21,056.3	5,190.8

Customs districts.		South Africa.	East Canada.	Argentina.	Total.
Oregon, Oreg	value	....	....	....	$102,524
	tons	....	....	....	1,707.6
Puget Sound	value	$648,723	$3,252	$37,693	$3,539,679
	tons	56,519.2	594.8	12,497.6	191,312.3
San Francisco	value	$346,839	....	....	$7,605,530
	tons	13,032.3	....	....	209,279
Willamette	value	$776,767	....	....	$7,104,717
	tons	32,048.4	....	....	312,317
Total	value	$1,772,329	$3,252	$37,693	$18,352,450
	tons	101,599.9	594.8	12,497.6	714,615.9

[a] Including Denmark.
[b] Including Germany.
[c] All trade with Italy.
[d] All trade with Switzerland.

Estimates of total scattering foreign exports, value, $1,078; tonnage, 715,693.

In constructing these tables the trans-Atlantic trade of our Gulf and Atlantic ports was omitted because it would not be tributary to the canal, and the figures include only the ocean foreign commerce now carried on by our Atlantic and Gulf ports with Pacific countries, and between our Pacific ports and countries on the Atlantic. In the case of each port named, only that part of its foreign trade is given that might be directly affected by the opening of the canal.

According to the classification of the United States Bureau of Statistics, the imports number 333 classes and the exports 328. For each item in this list of 661 commodities the value was obtainable; for some of the classes the number or quantities of articles were reported, and, for many commodities, weights were given in the official statistics. In all cases, however, the weights given were net, covering only the commodity and not the packing or "tare" which constitutes a part of the freight cargoes whose weights were to be ascertained.

In order to determine the weight of the tare corresponding to the weight or value of the ordinary unit of each of the many commodities considered, a large amount of detailed information had to be secured from business men concerning the manner of shipping the various articles. The difficulties of this and other parts of the investigations were somewhat complicated by the fact that many commodities of bulky character are handled by ocean vessels as measurement cargo, 40 cubic feet being reckoned as a ton instead of 2,240 pounds, the weight ton commonly employed in maritime traffic. In determining the true cargo tonnage of goods shipped by the measurement ton it was necessary to ascertain the cubic contents, boxing included, of some unit of quantity.

To reduce commodity values to weights, to find the average tare for net weights, to learn whether shipments were made by weight or measure, and, if by measure, to find the weight or value of a measurement ton, an extensive correspondence was carried on with men engaged in foreign trade. Representative business men of the leading commercial cities were requested to give the assistance needed, and by means of personal interviews and a large correspondence a mass of information was secured covering the great bulk of both our import and export trade. In order to insure the greatest possible accuracy for the tables of cargo tonnage, inquiries regarding each line of foreign trade have been made of representative firms of several of the large seaports, and in some instances several firms were corresponded with concerning each commodity about which information was required.

This correspondence extended over several months and required the sending out of several thousand individual letters; but by means of the knowledge obtained from the business men, who generously gave the time required to reply to the requests for information, it was possible to prepare the above tables by converting, item by item, into equivalent cargo tons, the values of nearly all of the articles that our various ports would have imported and exported by way of an isthmian canal during the fiscal year ending June 30, 1899. Although it was not possible to get the requisite data for converting every item, there are but 5.7 per cent of the imports, and 2.4 per cent of exports included in the above tables that were not converted according to the method just described. The small quantity of imports and exports, for which it was not possible to secure satisfactory factors to use in changing values to cargo tons, were converted by using for the multiplier the average ratio of values to tons.

These residuary values and quantities consisted largely of these unclassified articles of import and export. In classifying the multitude of commodities handled in international trade, it is often necessary to include in the larger divisions of the classification a group entitled "All other." For instance, in the general classification of the exports of the United States the division "Iron and steel and manufactures of" contains 42 specific classes and also such general groupings as "All other manufactures of iron and steel," "All other machinery," and "Tools not otherwise specified." For converting the indefinite or unspecified classes it was necessary to assume that the relation of the values to the cargo tonnage was the same as it was for the specified classes of their general division of the classification. The value of "All other machinery," for example, was converted by assuming that the ratio of value to weight and bulk was equal to the average for the 11 specified classes of machinery; and it is probable that the results obtained in this manner were nearly correct. This same method of conversion was applied to the unspecified classes of imports.

It was not practicable in the case of every general grouping entitled "All other, etc.," to secure an average ratio to use as a factor for converting values to tons; consequently, a part of the values comprised within these general groups was included with the residuary quantities that were dealt with according to the method described in the following paragraphs:

After having converted the specified classes of imports and exports and as many as possible of the classes or grouping entitled "All other" or "Not otherwise specified," it was found that 96 per cent of the total value of the maritime foreign trade of the United States available for canal traffic during the fiscal year ending June 30, 1900—in round numbers, $101,000,000 out of $105,000,000—had been accounted for.

The remaining 4 per cent unaccounted for consisted partly of the unclassified imports and exports—the general residuum placed at the end of the tables of imports and exports published by the Bureau of Statistics, and designated "all other articles not elsewhere specified"—and were also made up partly of the commodities concerning which the Commission secured no information in regard to the relation of values to cargo tons.

A classification of commodities could hardly be constructed that would find an appropriate class for every article listed in the merchants' invoice or sales book, and a final grouping of "all other articles not elsewhere specified" is practically necessary in making up tables of imports and exports such as are published by the United States Bureau of Statistics. The total value of the unclassified commodities that had to be dealt with in constructing the above tables of cargo tons of the traffic available for an isthmian canal was small, and the change from value to tons was made by assuming these articles to have the same average weight and capacity as had equal values of typical and carefully selected classified articles. The average of these other commodities was taken as the standard.

The classified commodities, concerning which no information was secured to assist in the conversion of their values into equivalent cargo tonnage, consisted to a limited extent of shipments so small in quantity as not to justify an investigation of them, but most of these commodities were made up of articles which varied so much in value, bulk, and packing that no reliable estimates regarding them could be secured from shippers.

Imported commodities constituted the greater part—65 per cent—of the values that had to be converted by means of general averages. This was to be expected in view of the fact that our exports consist so largely of such articles as raw materials and heavy manufactures whose weight and measurement are readily ascertainable, while our imports contain a large variety of manufactures and other articles whose weight and bulk are difficult to determine.

This fact is well illustrated by comparing the import and export trade of our Pacific ports. The exports from the Pacific ports were made up so largely of raw materials or food products that over 99.9 per cent could be converted from values and quantities to tons. On the contrary, in the case of the imports from Europe to the Pacific coast—a rich agricultural section with but little manufacturing activity—data could be secured to convert only 88 per cent of the total. The amount of these imports, however, is small, and the necessity of converting 12 per cent of their total value by indirect methods was consequently not a serious matter. Ninety-five per cent of the Atlantic imports from the Pacific was directly converted, and for the Atlantic exports to the Pacific the percentage was 96.5 per cent.

The commodities for which no specified data could be secured—$4,000,000 worth—were converted by means of general averages, obtained in the manner described below. The imports and exports of the Atlantic and Pacific seaboards were converted by using different factors because of the diverse characteristics of the trade of the two coasts.

For all the exports of the Pacific coast, except a few from San Francisco, factors were obtained for the direct conversion of each commodity from values to tons, and the San Francisco exports not otherwise accounted for were assumed to average the same as the other exports from that city to Europe.

Twelve per cent of the imports to the Pacific coast from Atlantic countries had to be converted by securing an acceptable average ratio of values to tons. More than 25 per cent of the imports came from England to San Francisco, and comprised a wide range of articles. These San Francisco imports from England included coal and precious stones as two important items, and after deducting the values of these two commodities, the remaining San Francisco imports were used to obtain the factor, by which the values of the unconverted 12 per cent residuum of Pacific coast imports from Atlantic countries was changed from values to cargo tons.

Of the Atlantic coast exports to Pacific countries those sent to British Australasia are the most typical and the most important, amounting to over one-third of the whole. Inasmuch as these exports to Australasia consisted of substantial amounts of nearly all classes of commodities shipped from the Atlantic coast to the Pacific, it was thought that their average was the best one to take for converting from values to tons the small share of the export trade to the Pacific that had not been directly accounted for.

The unconverted Atlantic imports from the Pacific were reduced to tons by making the Chinese and Japanese imports the standard. This was done because from those countries the widest range of the most typical articles was received.

The methods and standards followed in changing the values of the imports and exports, here under consideration, into cargo tons of weight or measurement have been fully explained, because it is upon those methods and standards that the accuracy of the results primarily depends. While the results obtained are necessarily approximately rather than absolutely exact, it is believed that the figures contained in the foregoing tables are as close to the truth as they can be brought by careful statistical work. Having described the manner in which the tables were constructed and how the results presented in them were obtained, attention may now be directed to an analysis of the tonnage totals. To facilitate comparison the totals of Tables I to IV are summarized in the following Table V:

V.—*Value and cargo tonnage of the trade which the United States would have had through an isthmian canal during the fiscal year ending June 30, 1899.*

	Pacific coast.		Atlantic coast other than with Hongkong and Philippines.		Atlantic coast with Hongkong and Philippines.		Total Atlantic.	
	Values.	Cargo tons.	Values.	Cargo tons.	Values.	Cargo tons.	Values.	Cargo tons.
Imports	$5,435,003	300,829.8	$33,751,161	534,371.6	$6,059,678	99,200.9	$39,810,839	633,572.5
Exports	18,352,450	715,682.9	40,210,860	1,020,514.9	1,959,975	151,540.2	42,170,835	1,172,055.1
Total	23,787,453	1,016,512.7	73,962,021	1,555,886.5	8,019,653	250,741.1	81,981,674	1,805,627.6

Grand total: Values, $105,769,127; tons, 2,823,013.3 (including 873 tons miscellaneous exports of foreign exports).

The total value of the maritime commerce of the United States that might have used an isthmian canal to advantage during the fiscal year ending June 30, 1899, was $105,769,127. Of this total trade the Pacific ports had $23,787,453 worth, and the Atlantic, including their trade with the Philippines and Hongkong, $81,981,674 worth. Whether all the trade carried on between our eastern ports and the Philippines and Hongkong may properly be included in this total value of the commerce of the United States available for canal traffic, is an important question that is considered at length in the discussion which follows, regarding the entrances and clearances of the vessels that would have used a canal during the past year. In this connection it is sufficient to note that the value of the trade of the Atlantic coast ports of the United States with Hongkong and the Philippines has been stated separately.

The value of the exports from our west coast to Europe in 1899, $18,352,450, and the corresponding cargo tonnage, 715,682.9 tons, were abnormally small because of the severe drought of the year 1897–98. The larger part of tonnage export of that section consists of grain, and during the year 1898–99 the grain exports were less than 50 per cent of their average for the five years preceding. If the value of the grain exports of the Pacific coast for the fiscal year 1898 be substituted for those of 1899 in the above table, the total value of the west coast exports would have equaled $40,299,881.

The exports other than grain had practically the same value in 1898 and in 1899. Had the grain exports of 1899 been equal to those of 1898, or, in other words, had their amount been normal, the carge tonnage of the west coast exports would have been 1,328,757 tons instead of 715,682.9 tons, the figures in the above table; and the total cargo tonnage, instead of having been 2,823,013.3 tons, as stated in the table, would have been 612,874.1 tons more, or 3,435,887.4. This larger total is a much more accurate expression than is the smaller total of the cargo tonnage of maritime foreign commerce available for canal traffic during the last two years. This larger sum will be used in the comparison that will subsequently be made with the tonnage estimates derived by other methods of investigations that will be described later.

THE AVERAGE VALUES OF THE CARGO TON.

Besides revealing the total value and total cargo tonnage of the import and export trade which our country might have had by way of the proposed isthmian waterway in the fiscal year ending June 30, 1899, the tables indicate some interesting differences in the characteristics of the trade of our Atlantic seaboard as compared with the commerce of the Pacific coast.

The value of the Atlantic coast exports listed in the tables was $42,170,835, and the cargo tonnage of these exports amounted to 1,172,055 tons. This makes the average value of the cargo ton to have been $35.98. In the case of the Atlantic coast imports considered in the tables the total value was $39,810,839, the total cargo tonnage 633,572.5 tons, and the average value of the ton $62.84.

The average values of the cargo ton will doubtless seem low to many persons. It must not, however, be forgotten that the tonnage here given is made up of the commodities packed for shipment. A large amount of weight and space are taken up by the packing. Moreover, in the case of many commodities, 2,240 pounds of the articles would be much more valuable than 40 cubic feet of it would be, even when no allowance is made for the space occupied by the packages containing the goods. The average values just cited are those of the ton of freight as found in the holds of the ocean vessel.

The cargo ton in these tables and throughout this discussion, it may be well to note, is in some cases 2,240 pounds; but in other instances, and more frequently, it is the measurement ton of 40 cubic feet. It was impossible to make a distinction between the weight ton and the measurement ton in compiling the above tables, because both are used by shippers and ocean carriers without distinction.

The difference between the average values of the cargo ton of imports and that of the exports is explained by the fact that the exports to the Pacific markets consist largely of bulky manufactures of iron and wood, of coal and petroleum oil, whereas the average value of the imports from Pacific countries is kept high by the Manila hemp, the products of Japan and China, Australian wool, and the hides, skins, and furs from Australia and South America.

The cargo ton values of both the import and export trade of the Pacific coast with Atlantic countries are low. The total value of the imports considered was $5,435,003, and, their cargo tonnage being 300,829.8 tons, the average ton value was $18.07. The $18,352,450 worth of exports included in the tables comprised a cargo tonnage of 715,682.9 tons, the average ton value being $25.64.

The principal Pacific coast exports were wheat, flour, barley, and lumber, and these commodities tended to lower the average ton value. Their effect, however, was to some extent offset by the exportation of canned salmon and vegetables, and canned and dried fruits. The small ton value of the Pacific coast imports from Atlantic countries is accounted for by the fact that the greater part of the tonnage is made up of coal, salt, cement, and glass. The textiles, gloves, and other high-priced European articles have but a small influence on the ton value.

The amount of cargo tonnage which vessels can carry per gross or net register tonnage varies with different ships, but the ordinary ratio between cargo and register is well known. In the following chapter tables are given which show the net register tonnage of the vessels engaged in the commerce that would have used an isthmian canal in 1899. A comparison of the figures of cargo tonnage, of the part of our foreign trade that has been studied, with the net register tonnage of the ships that carried that trade, will roughly check the accuracy of both the cargo and the vessel tonnage statistics presented as the result of this investigation. Before making this comparison, however, it will be best to wait until the tables of vessel tonnage contained in the discussion that follows later have been presented and analyzed.

TONNAGE OF THE COMMERCE BETWEEN EUROPE AND THE WEST COAST OF SOUTH AND CENTRAL AMERICA AND BRITISH COLUMBIA AND HAWAII.

Up to this point the cargo tonnage discussed has been that of the United States only. Our own present trade that would pass through the canal merited a detailed study, because of the importance of securing as much information as possible regarding the industrial and commercial value of the canal to the people of the United States; but it was not thought that the cargo tonnage of the trade which Europe now has with the west coast of South and Central America, and with British Columbia and Hawaii, need be changed from values and quantities into cargo tons, in the same detailed way that the values of our own available canal commerce were converted into their tonnage equivalents.

The large mass of information which the investigation of American trade had furnished, regarding the relation of values and quantities to cargo tonnage, was equally applicable to the commerce of foreign countries; and this information enabled the conversion of the greater part of the trade of other countries to be made more easily and quickly. The commodities not changed from values to tons by the direct method were converted by means of averages chosen in a manner similar to those methods used in the conversion of American imports and exports.

It was not considered necessary to determine the cargo tonnage which every foreign country now has available for canal traffic. By taking the nine European countries—the United Kingdom, France, Germany, Belgium, Holland, Austria-Hungary, Italy, Spain, and Sweden—nearly all the commerce which foreign nations would have with the west coast of America and Hawaii was reached. Norway has no commerce with this section, and that of Greece and Russia is slight. The trade of Europe with our west coast was included in the study of our canal commerce.

The first of the following tables gives the cargo tonnage of the trade which the nine European countries just named had with the west coast of South and Central America in the calendar year 1898—the figures for Belgium being for 1899—and shows how the countries shared in this commerce. It also indicates how the trade was divided among the several west coast American nations. The table is divided into two sections for the purpose of showing both the import and export cargo tonnage for South America and Central America separately. In another table the trade of Europe with Hawaii and British Columbia is shown.

Cargo tonnage of the trade between Europe and the Pacific coast of South and Central America, 1898.

EUROPEAN IMPORTS.

American countries.	United Kingdom.	France.	Germany.	Belgium.[a]	Holland.	Austria-Hungary.	Italy.	Spain.	Sweden.	Total.
SOUTH AMERICAN.										
Bolivia			9,522							9,522
Chile	294,037	293,668	954,792	124,519	12,461	39	5,063	5,715	4,141	1,694,435
Ecuador	4,832	6,397	15,292	4				1,888		28,413
Peru	126,567	30,342	54,083	16,876	68,547	1	11,814	547		308,777
Total	425,436	330,407	1,033,689	141,399	81,008	40	16,877	8,150	4,141	2,041,147
CENTRAL AMERICAN.										
Guatemala	3,770	[b] 4,330	48,895	215				1,752		58,962
Honduras	390		[c] 10,130							10,520
Nicaragua	3,107			130				89		3,326
Salvador	2,395							117		2,512
Total	9,662	4,330	59,025	345				1,958		75,320

EUROPEAN EXPORTS.

American countries.	United Kingdom.	France.	Germany.	Belgium.[a]	Holland.	Austria-Hungary.	Italy.	Spain.	Sweden.	Total.
SOUTH AMERICAN.										
Bolivia			10,870					45		10,915
Chile	460,255	64,473	119,348	118,862		2	14,745	3,812		781,497
Ecuador	11,303	6,140	17,443	1,798				778		37,462
Peru	97,440	13,158	43,320	4,900		1	9,798	1,314		169,931
Total	568,998	83,771	190,981	125,560		3	24,543	5,949		999,805
CENTRAL AMERICAN.										
Guatemala	11,221		10,224	596				939		22,980
Honduras	2,081	[d] 2,105	[d] 7,783	44						12,013
Nicaragua	7,583			3,421				1		11,005
Salvador	7,970			500				88		8,558
Total	28,855	2,105	18,007	4,561				1,028		54,556

[a] Belgian figures are for 1899.
[b] Including Costa Rica and Honduras.
[c] Nicaragua and Salvador.
[d] Including Nicaragua and Salvador.

It will be seen that nearly two-thirds of the entire cargo tonnage, of the trade between the nine European countries and the west coast of Spanish America, consisted of imports from South America, and that four-fifths of these imports were from Chile. This indicates the present prominence of the nitrate of soda trade.

In cargo tonnage Germany ranks first among the nine nations in the trade with the west coast of Spanish America, but in value of commerce the United Kingdom is much ahead of Germany, because of the high value of the British exports. Germany's large import tonnage is made up mostly of nitrate of soda for use in her chemical industries, and her exports contain some coal, but consist largely of manufactures. The coal exports of the United Kingdom are heavy, but the exports, as a whole, derive their value mainly from the manufactures.

The cargo tonnage of the total exports of the nine European countries to the section of the American continents under discussion was 1,054,361 tons, and the imports 2,116,467 tons. The following table shows how the trade was divided between the South American and Central American countries:

Summary of cargo tonnage of European imports and exports—Trade with South and Central America, 1898.

	South America.	Central America.	Total.
	Tons.	*Tons.*	*Tons.*
Imports	2,041,147	75,320	2,116,467
Exports	999,805	54,556	1,054,361
Total	3,040,952	129,876	3,170,828
Grand total			3,170,828

Whether the entire commerce of Europe with the west coast of South America would make use of the isthmian canal will be considered in the chapter devoted to the discussion of the vessel tonnage that would now pass through the canal, and to the consideration of the question of tolls.

In general, the canal will secure nearly all of this trade unless the tolls should be so high as to make the longer and less desirable route around the Horn or through the Straits of Magellan more profitable. The only trade that would not pay a moderate toll for the privilege of using the canal is that of Chile south of the fortieth parallel of latitude, and the commerce of that section is not, and can hardly become, of much consequence.

The cargo or freight tonnage of Europe's trade with Hawaii and British Columbia in the fiscal year 1899 is shown in the following table:

Cargo tonnage—European trade with Hawaii and British Columbia.

	Hawaii.	British Columbia.	Total.
	Tons.	*Tons.*	*Tons.*
Imports	33,793	37,334	71,127
Exports		24,699	24,699
Total	33,793	62,033	95,826

In this table the figures are based on statistics kept by Hawaii and British Columbia. The vessels entering Hawaii take cargoes mainly of sugar to the United States, hence there are no exports from Hawaii given in the table. The British Columbia trade during the year ending June 30, 1899, was but little more than two-fifths that of the previous year, and for that reason the totals of the above table are unduly small, but for the sake of presenting the latest data it has been thought best to retain the figures for the year 1899.

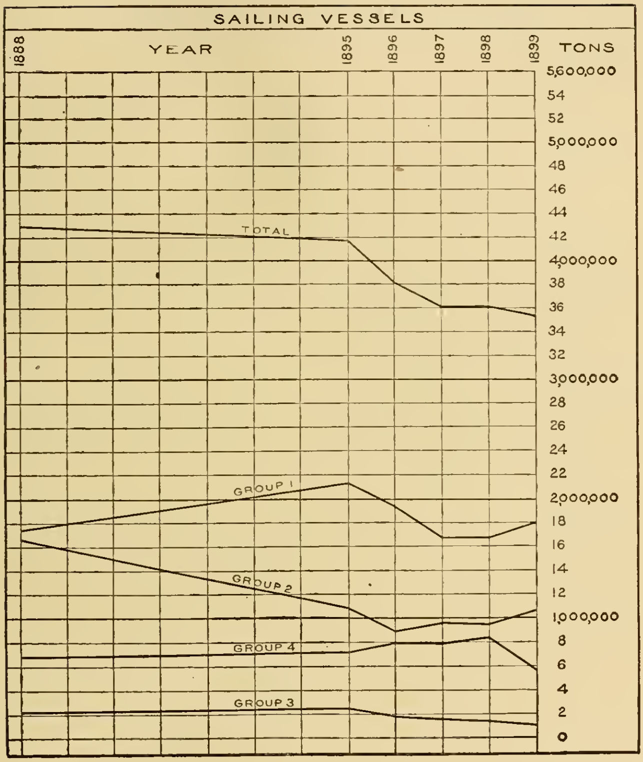
The cargo tonnage or the European trade with the west coast of Mexico is not obtainable, because the European statistics do not separate the commerce with the east coast of Mexico from that with the west coast.

The total freight tonnage of the trade between European countries and western South and Central America, British Columbia and Hawaii, during the latest statistical year for which information was obtainable, was 3,266,654 tons. This total does not comprise the commerce with the west coast of Mexico. Moreover, it does not include any of the commerce between Europe and Eastern countries—a part of which, for reasons stated later, would pass through the American canal. In studying the tonnage of cargo that the commerce of the United States might have furnished the canal in 1898 and 1899, the total was found to be 3,435,887 tons. The sum of these two totals is 6,702,541.

This represents the tons of cargo which the commerce of the United States and the commerce between nine European countries and the west coast of America might have passed through an American isthmian canal during Europe's fiscal year 1898, corresponding with the calendar year, and our fiscal year ending with June, 1899. These are figures applying to the commerce of the past, carried under the conditions then prevailing. They do not refer to the future.

(NOTE.—The totals in this and the subsequent statistical chapter differ somewhat from those published in the preliminary report of the Isthmian Canal Commission, November 30, 1900. In several instances the statistics of the final report of the Commission are for a different year than were the figures comprised in the totals given in the preliminary report.)

DIAGRAM OF TONNAGE 1888 AND 1895-1899



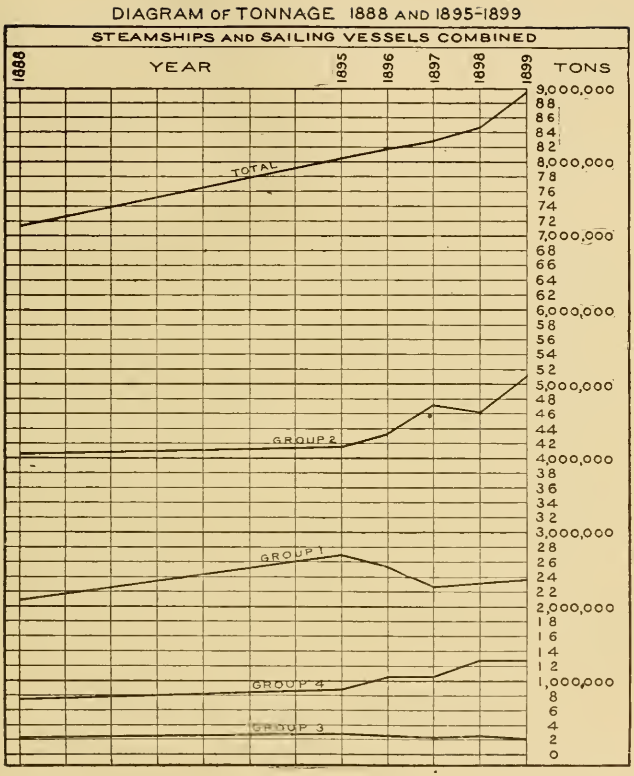
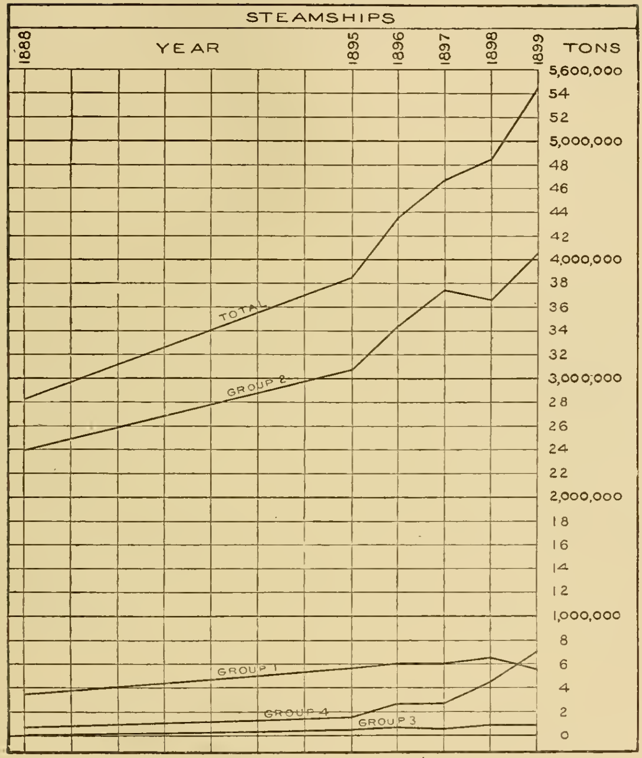


DIAGRAM OF TONNAGE 1888 AND 1895-1899
STEAMSHIPS AND SAILING VESSELS COMBINED
1888
YEAR
1895
1896
1897
1898
1899
TONS
9,000,000
88
86
84
82
8,000,000
78
76
74
72
7,000,000
68
66
64
62
6,000,000
58
56
54
52
5,000,000
48
46
44
42
4,000,000
38
36
34
32
3,000,000
28
26
24
22
2,000,000
18
16
14
12
1,000,000
8
6
4
2
0
TOTAL
GROUP 2
GROUP 1
GROUP 4
GROUP 3

DIAGRAM OF TONNAGE 1888 AND 1895-1899



Chapter XIX.

TONNAGE OF THE VESSELS EMPLOYED IN THE COMMERCE THAT WOULD HAVE USED AN ISTHMIAN CANAL IN 1899.

In ascertaining the tonnage of the vessels now engaged in the world's commerce that would make use of an isthmian canal two methods may be employed. One source of information is the records of entrances and clearances of vessels kept by the leading commercial nations, and this information is fairly satisfactory, although, as will be shown presently, careful analysis is necessary to avoid erroneous conclusions. The other method of getting at the vessel tonnage now available for the use of a canal is to make a record of the movements or the voyages of all ships whose routes are such that the vessels would naturally pass through the canal.

This latter method of recording vessel movements and computing the tonnage from the records thus made was adopted by the New Panama Canal Company in 1894, and the conclusions reached by their elaborate investigation are set forth in the chapter which follows the present one. In this chapter is presented a discussion of the statistics of entrances and clearances of the vessels whose commerce would have taken them through the canal, had such a waterway been in existence during the calendar year 1899. In a few instances it was necessary to take the figures for the year 1898.

Inasmuch as all important commercial nations record the entrances and clearances of the vessels trafficking at their ports, and state with which countries the vessels trade, it is theoretically a simple matter to determine the tonnage of the vessels at present following routes for which the canal route would be substituted. As a matter of fact, however, the statistics of entrances and clearances have certain important limitations, due to the fact that different countries follow dissimilar rules in making their statistical records. In some cases also the records are incomplete—as, for instance, the figures recording the tonnage of vessels trading between Europe, Mexico, and Central America do not indicate whether the European entrances from those countries are from the Atlantic or from the Pacific coast. The same limitation exists as to European clearances to that section of the world.

The lack of uniformity of methods of collecting statistics of entrances and clearances may either result in a duplication of tonnage records or in an understatement of the tonnage engaged in the commerce of certain countries, and it is unfortunate that the statistics of international trade are not compiled in accordance with uniform rules. A vessel entering a German port is recorded as coming from the country that supplied the vessel with the largest share of its cargo. If this vessel were to enter a British port, she would be recorded as having sailed from the most distant country from which cargo was brought. The French practice is the same as the English. In compiling the statistics of clearances it is the practice of Great Britain to record a vessel as clearing for the most distant country for which she has cargo. The German figures credit the clearances to the country to which the most cargo is bound. The French practice is like the English.

Correspondence with the collectors at a number of the ports of the United States revealed the surprising fact that our statistics of entrances and clearances were compiled by various methods at different ports. The New York statistics record a vessel as clearing for the first or nearest country to which cargo is taken. The vessel is entered from the most distant country. At other ports, however, different practices prevail, four variations in methods having been reported by our collectors of customs. [A uniform rule has since been promulgated.]

A German vessel en route from Chile may call at a Belgian or Dutch port and appear both in their statistics of entrances and in the German records. Likewise a vessel outbound from Germany might be duplicated in European statistics. A vessel from a European port may, and usually does, call at a number of Pacific American countries. However, the avoidance of duplication, because of the numerous stops made in American ports, is a comparatively easy matter, because only the records of the entrance and clearance at the European end need to be considered. In the following tables and discussion no figures have been used except those taken from the statistics kept in Europe and in the United States.

There is, furthermore, some danger of confusion because of the difficulty of keeping Europe's trade with the east coast of South America separate from that with the west coast.

This danger, however, is only slight, because most of the lines, both European and American, carry nothing for east coast ports. It is over 2,000 miles between Chilean and Argentina ports, consequently vessels find it unprofitable to run part loaded between the ports of those two countries. Vessels load full cargoes from the North Atlantic to the west coast, and also full cargoes from the west coast to the North Atlantic. The trade of the east coast is mainly handled by vessels that do not go around to the west side.

Although the American statistics of entrances and clearances were not compiled in accordance with uniform rules, there are probably no duplications in the figures. In fact, the practice of New York, from which the major share of our commerce moves, of recording a vessel as clearing for the first port of call for the discharge of cargo, tended toward an understatement rather than an exaggeration of the volume of outbound traffic destined for countries that will be reached by way of an isthmian canal. In the case of European statistics the following duplications are possible:

1. German vessels outbound, as suggested above, may call at Holland or Belgium and be recorded there. These German vessels outbound might possibly, though, as a matter of fact, they seldom if ever do, call en route at British ports. One German line calls at a French port.

2. German vessels inbound may call at a French, Belgian, or Dutch port, but, as a matter of fact, they do not call at Belgian or Dutch ports. Most of the trade from the west coast of South America to Europe is carried in full cargoes, and German vessels are not apt to make calls en route at European ports. This is indicated by the fact that the Belgian clearances in the South American trade consists almost entirely of steam tonnage, while the entrances are made up mostly of sailing vessels. The same is true of the Netherlands. In regard to the French statistics there is some uncertainty.

3. Two British lines to and from the west coast of South America call at French ports. Thus the French statistics are liable to include some tonnage entered in the British and some contained in the German figures. The probable amount of such duplication will be considered below in the discussion of the tables which follow.

4. In the case of Spanish statistics of entrances and clearances, it is possible that some British, some French, and some Italian tonnage may be included.

Such are the possible kinds of duplication. It is, however, only in the statistics of the west coast of South American trade that duplications are possible, and to assist in determining the extent to which duplications probably occur it will be best to study a table showing the figures of entrances and clearances in the trade of European countries with the west coast of South America. The following table summarizes the apparent vessel tonnage of the trade of European countries with western South America. It is compiled from the latest available figures, which in the case of the United Kingdom, France, Belgium, the Netherlands, and Italy were for the year 1899, and for the other countries were for 1898. The totals of the table are subject to such modification as may be found necessary in order to eliminate the results of duplication.

European entrances and clearances, vessels trading with west coast of South America.

	Entrances.				Clearances.				Total entrances and clearances.
	Chile.	Peru.	Ecuador.	Total.	Chile.	Peru.	Ecuador.	Total.	
United Kingdom	227,260	68,343	2,149	297,752	372,053	70,513	10,066	452,632	750,384
Belgium	94,570	16,180	....	110,750	102,789	788	....	103,577	214,327
Netherlands	45,312	[a] 14,635	....	59,947	3,348	....	....	3,348	63,295
German Empire	252,792	[b] 4,078	....	256,870	128,125	13,452	....	141,577	398,447
Italy	12,416	802	....	13,218	4,924	5,256	....	10,180	23,398
Spain	77,156	....	....	77,156	139,599	....	....	139,599	216,755
France	276,306	28,896	20,156	325,358	122,667	8,496	22,088	153,251	478,609
Sweden	2,272	....	....	2,272	472	....	....	472	2,744
Total	988,084	132,934	22,305	1,143,323	873,977	98,505	32,154	1,004,636	2,147,959

[a] Entered as Peru and Bolivia.

[b] Pacific South America other than Chile.

The table shows that the European statistics of entrances and clearances of the vessels engaged in the trade with western South America apparently comprise a total of 2,147,959 tons. In order to determine more nearly what the actual vessel movement was, it is necessary to eliminate duplications as far as it is possible to do so. Efforts have been made to secure information from the statistical departments of European Governments not only regarding the regulations which they follow in the compilation of their statistics, but also concerning the movements of vessels. The information obtained, however, was not sufficient to make possible the avoidance of a resort to estimates in making reductions from the statistical tables above given.

Great Britain and Germany are so situated that they are the European termini of vessel movements between Europe and South America. Accordingly, the German and British figures for entrances and clearances may well be taken without alteration. Such, however, is not the case with Belgium, the Netherlands, France, and Spain, at whose ports both German and British vessels call en route. At Spanish ports French and Italian vessels, as well as British, make more or less frequent calls. An examination of the Dutch and Belgian entrances and clearances shows that the vessels arriving consist of sailing vessels, and that those departing are nearly all steamers. This would indicate that the incoming traffic is carried by chartered sailing vessels with full cargoes. These sailing vessels, after discharging their cargo, doubtless depart for a British port in search of outbound coal cargoes. The steamers clearing from the Belgian and Dutch ports are in all probability mostly German vessels, although some British tonnage may be represented. In view of these facts, it seems that the Belgian and Dutch figures for entrances should be retained in the total without alteration, but that some reduction should be made in the clearances to avoid recording a vessel a second time whose tonnage has already been included in German clearances. The total clearances from Belgium and the Netherlands are 106,995 tons, but these clearances can not all have been entered in the German figures, because the German clearances are much less than the entrances. It seems probable that the larger part of the tonnage of German vessels recorded as clearing for South America goes in ballast to Antwerp and is not recorded in the German clearances. Just how much reduction should be made in the clearances of Belgium and the Netherlands must be entirely a matter of judgment, but it has been thought proper to take 30,000 tons from the total.

The largest amount of duplication in the tonnage figures doubtless occurs in the French statistics. There is one French line of steamers plying between France and the western coast of South America; English vessels call at French ports, and one German line makes calls en route at two French ports. The French entrances are 172,107 tons greater than the clearances, and it is probable that this excess of entrances over clearances is to be accounted for by the tonnage of chartered sailing vessels which bring full cargoes, mainly nitrate of soda, to France. This difference, then, ought to be included in the French figures. Furthermore, the figures which cover the entrances and clearances of the French line ought to be included. Probably 50,000 tons of entrances and a like amount of clearances will cover the vessel movements of that line of steamers. It is probable that the remainder of the total entrances and clearances as shown in the French figures is also comprised in the British and German statistics. It has therefore been thought proper to deduct from the French figures as shown in the table 206,502 tons—that is, the difference between 272,107 (the sum included) and 478,609, the total shown in the table.

Both British and French vessels call at Spanish ports, and probably Italian vessels occasionally do. The amount of commerce which Spain has with the west coast of South America is not much, and probably the figures for the entrances, 77,156 tons, cover all the commerce which that country has with the American section under consideration. The clearances are very much larger than the entrances, but the amount of outbound commerce is slight. It seems certain that the Spanish figures for clearances represent English and French vessels that have already been recorded in clearance statistics before reaching Spanish ports. Accordingly, it is believed that accuracy demands the subtraction of the Spanish clearances from the totals of the above table. The entrances and clearances of Italy are small, and doubtless represent the actual vessel movement between Italy and western South America. The same may be said of Sweden. Russia does not appear in the table because there were no vessel movements between her ports and western South America during the year under consideration.

The reductions which the foregoing analysis suggests ought to be made amount to 376,101 tons, which, taken from 2,147,959 tons, the total of the table, makes the revised total 1,771,858 tons. The absolute accuracy of this corrected total can not be asserted. At best it is only approximately accurate, and must be so considered. It may possibly be as much as 100,000 tons in error, although that is hardly probable. There are various ways of checking these figures so as to determine whether they are approximately correct or whether they are largely in error. One method of checking them will be discussed in a later chapter where the totals reached by the three separate and distinct statistical investigations presented in this report are compared. A study has been made of the importation of nitrate of soda into European countries, the most important export from western South America; and the tonnage of British coal exports have also been considered. The figures of nitrate and coal movements are in general accord with the distribution of vessel tonnage suggested in the above revision of the totals of the table of entrances and clearances. Furthermore, the information that has been obtained regarding the routes of steamers owned by European companies operating vessels in the South American trade has supplemented the data supplied by foreign governments, in such a way as to make it probable that the revised total of 1,771,858 tons fairly approximates the facts.

IMPORTANCE OF THE CHILEAN COMMERCE.

Every student of the industries and commerce of western South America must be impressed with the great importance of that region to the industries of Europe and the eastern part of the United States, and also to the prospective traffic that will make use of an isthmian canal. In

1899, according to the above figures, this section had a commerce with Europe of 1,770,000 tons, an amount equal to nearly one-fifth of the heavy tonnage then passing the Suez Canal.

The greater part of this west coast South American trade consists of Chile's foreign commerce, and Chile's prominent place is due to the nitrate of soda beds in the northern part of that country. Over three-fourths of the Chilean exports consist of nitrate of soda, and more than a million tons of shipping were employed in carrying that commodity. The export of that article, moreover, is rapidly increasing, and there is every reason to believe that it will continue to grow for several decades to come.

The average annual exports of nitrate of soda from Chile for the three calendar years 1897, 1898, and 1899 were 1,226,000 metric tons of 2,204 pounds, the exports for the year 1899 having been 1,360,000 metric tons. The increase during the previous fifteen years amounted to 940,000 tons. If the growth in the export of this commodity during the succeeding fifteen years should prove to be no greater than it was during the previous period of equal length, the nitrate tonnage in 1914 will amount to 2,300,000 weight tons.

This estimate of the increase in the use of nitrate is a conservative one, because it assumes that only an equal quantity increase will take place during the coming period, and not a proportional percentage increase. If it were assumed that the same percentage of growth would continue until 1914, the figures for nitrate shipments of that year would amount to 4,250,000 tons, and the Chilean export trade as a whole would exceed 5,000,000 cargo tons. Estimates based upon the assumption of a geometric ratio of increase might properly be considered excessive, but those which result from the application of the arithmetical rate of increase will doubtless be accepted as moderate, in view of the constantly enlarging demand for nitrate in the manufacture of fertilizers.

Besides being an exporter of nitrate of soda, Chile is the outlet for the mines of Bolivia, and also has copper and other mineral deposits of its own, as well as a variety of industrial resources which, together with the characteristics of the people, combine to make the country industrially and commercially progressive. During the past decade the nitrate of soda has comprised approximately three-fourths of the cargo tonnage of the exports of Chile.

VESSEL TONNAGE OF EUROPEAN TRADE WITH WESTERN CENTRAL AMERICA AND MEXICO.

It is impossible to determine the amount of the trade and shipping passing around the Horn or through the Straits of Magellan, between Europe and the west coast of Central America and Mexico, because Mexico, and all the Central American countries except Salvador, have ports on both oceans, and Germany and Italy are the only European countries whose statistics designate to which coast of these countries the published figures apply. The figures for Salvador, and the German and Italian entrances and clearances for the trade with the other ports on the west coast of Central America and Mexico are shown in the following table. German figures are for 1898; others for 1899.

Tonnage of European entrances and clearances of vessels engaged in European trade with western Central America and Pacific coast of Mexico.

Country.	Entrances, Central America.	Clearances.	
		Central America.	Pacific Mexico.
	Tons.	*Tons.*	*Tons.*
German Empire	15,512	13,118	31,502
Italy		5,873	
United Kingdom with Salvador	363	1,595	
Portugal from Salvador	2,504		
Total	18,379	20,486	31,502

Total entrances and clearances, 70,367 tons.

The combined entrances and clearances recorded in this table amount to but 70,367 tons. The figures refer only to vessel movements around South America. The vessel tonnage engaged in the traffic across the Isthmus of Panama is considered in a later connection. The statistics of other European countries indicate that commerce is carried on with Central American and Mexican ports, but an estimate only can be made of the share of the tonnage that should be credited to the Pacific shore. Considering the importance of the United Kingdom in the maritime and commercial world, and the independent ship-charter trade from Central America and Mexico to the United Kingdom and the other European countries, not mentioned in the tables, it is safe to double the total of the above figures, and probably 140,000 tons may be taken as a fair estimate of the direct vessel movement between Europe and Pacific Central America and

Mexico. A large part of the trade between Europe and western Central America and Mexico is handled via Panama. The vessel tonnage of the Panama trade is considered in a later connection. Reference is here made only to the direct vessel movement between western Central America and Europe around South America. In connection with this estimate of 140,000 tons, attention may be called to the fact that the larger part of the population, industry, and trade of Central America is on the Pacific side, where for climatic reasons the growth in population has thus far mainly occurred.

TRADE OF THE WEST COAST OF THE UNITED STATES, BRITISH COLUMBIA, AND HAWAII WITH EUROPE.

The reports of the United States Bureau of Statistics give in detail the entrances and clearances of vessels engaged in the foreign trade of each of our customs districts. The statistics of the tonnage of vessels engaged in the foreign trade of the United States that would avail itself of the isthmian canal are taken from our Government records. The figures taken are for the fiscal year ending June 30, 1899. In the following table is given the trade of the west coast of the United States, of British Columbia, and of Hawaii with Europe in the year 1899. The Canadian and United States figures are for the year ending June 30; the Hawaiian are for the calendar year. The Hawaiian and British Columbian statistics are taken from the official publications of those countries.

Entrances and clearances, trade of the Pacific coast of the United States, British Columbia, and Hawaii with Europe, 1899.

European trade with—	Entrances.	Clearances.
	Tons.	*Tons.*
Pacific United States	213,798	360,258
British Columbia	26,655	15,437
Hawaii	25,032	None.
Total	266,485	375,695

Combined total, 642,180 tons.

The trade between the Pacific coast of the United States and Europe comprised 213,798 tons net register of entrances and 360,254 tons of clearances, a total of 574,052 tons. During the same year the commerce between our Pacific coast and South Africa employed 55,074 net tons of shipping, but that is not included in the totals reached in this chapter. That trade would find the canal route about 1,500 miles shorter, and if the tolls were low the canal would probably be used.[a] A large number of vessels cleared for Panama with traffic for Europe by way of the Panama Railroad, but that traffic is not being considered here.

The total entrances and clearances for the trade of British Columbia with Europe in 1899 amounted to but 43,092 tons; the previous year they were 106,485 tons. There are no clearances from Hawaii to Europe recorded. The ships take Hawaiian sugar to the United States and clear thence for Europe or elsewhere.

UNITED STATES ATLANTIC COAST TONNAGE WITH PACIFIC COUNTRIES.

Vessels trading between our Atlantic coast and the west coast of South America, eastern Australia, Oceania, Japan, and China will use the isthmian canal, with the possible exception of a part of the vessels passing to and from Hongkong and the Philippines. A portion, and probably the larger share, of the Hongkong and Philippine trade will use the canal.

The records kept at the United States customs offices show the following entrances and clearances in the trade between our Atlantic and Gulf seaboard and the foreign Pacific countries. The first table refers to the Pacific countries of South America; the second to the Orient, i. e., to Japan, Siberia, China, Hongkong, the Philippines, Australia, and New Zealand:

Entrances and clearances, United States Atlantic coast trade with Hawaii and foreign countries of Pacific America, year ending June 30, 1899.

Country.	Entrances.	Clearances.
	Tons.	*Tons.*
Ecuador	1,608	2,057
Peru	9,045	4,229
Chile	68,277	31,274
Hawaii	23,919	25,955
Total	102,849	63,515

Total entrances and clearances, 166,364 tons.

[a] In the preliminary report of the Isthmian Canal Commission the vessel tonnage totals included this item of 55,074 tons.

Entrances and clearances, United States Atlantic coast trade with Oriental countries, fiscal year 1899.

Country.	Entrances.	Clearances.
	Tons.	*Tons.*
Japan	51,284	174,036
Siberia		6,975
China	39,536	49,347
Hongkong	32,621	42,996
Philippines	44,999	25,696
Australia		115,564
New Zealand	4,912	39,456
Total	173,352	454,070

Combined total, 627,422 tons.

The total entrances and clearances between our eastern seaboard and Hawaii and the countries of western South America for the year ending June 30, 1899, were 166,364 tons. There was no direct vessel movement during that year between our Atlantic coast and British Columbia and Pacific Mexico or Central America.

The table of vessel movements between the eastern ports of the United States and trans-Pacific countries shows a total of 454,070 tons of clearances and 173,352 tons of entrances, a combined total of 627,422 tons. There were special difficulties encountered in securing the statistics of the vessel movements between our eastern seaboard and Eastern countries, because the published figures of entrances and clearances did not truly record the actual movements of vessels. This was due both to our practice of recording the statistics and to the fact that vessels stop going and coming at European and other countries on their voyages between the United States and the Orient.

The figures of the above table comprise only the tonnage of vessels which the records of our custom-houses show to have made a voyage from our eastern ports to countries east of Singapore, or to have entered direct from those countries. As a matter of fact many vessels take cargoes from the United States to Europe, then load for the East, whence they may return to the United States either by way of Europe or by sailing in the opposite direction. A large part of our exports to the East are sent to Europe and there reshipped. Likewise a good portion of our imports from trans-Pacific countries comes to us by way of Europe. The above table is defective for two reasons. It gives no information concerning the vessel tonnage employed in carrying our exports that went to Eastern countries by way of Europe and our imports that came from those countries by some European city. Again, it understates the tonnage of the ships that come from Eastern countries to the United States. Many of them come by way of Java and are entered from the Dutch East Indies; others come by way of Europe and are entered as from there. Some come from Chile.

A more adequate measure of the tonnage of the shipping engaged in commerce with Oriental countries would be secured by doubling the tonnage of vessels, making the voyages directly to those countries. This larger total, 908,140 tons, is probably too small, but it has been adopted as the best figure obtainable by the study of the statistics of entrances and clearances and the known facts regarding commercial movements. One reason for thinking it unduly small is that the vessel tonnage of the commerce between our Pacific coast and the trans-Pacific countries east of Singapore in 1899 amounted to 1,591,000 tons. While the vessel tonnage of this Pacific trade was doubtless greater than the vessel tonnage of the American Atlantic trade with the countries east of Singapore, it does not seem probable that the latter tonnage was less than three-fifths of the former. Another reason for thinking that the vessel tonnage engaged in the commerce between our eastern seaboard and Eastern countries was fully as much as, if not more than, 908,140 tons during the fiscal year 1899 is that the Panama Canal Company's record of vessel movements between the American Atlantic seaboard and the Pacific section east of 90 degrees east of Paris makes the total tonnage for the calendar year 1,271,357 tons. This total includes Singapore and Sumatra and Java, and should be larger than the total of 908,140 tons, but probably less than 363,000 tons larger. By their method of study, which is described in the following chapter, they could follow the movements of each ship engaged in the trade, and consequently a chartered vessel that engaged in the trade of a European or some other intermediate country in going from our eastern seaboard to the East or in returning would be included in their record, whereas it probably would not in the American entrance or clearance records. It is of course possible that the records of the New Panama Canal Company may overstate the tonnage that would be required to handle the commerce between the Atlantic seaboard of the United States and the countries east of Singapore, if all the vessels engaged in this trade were to confine themselves to this traffic alone, but their records presumably accurately state the tonnage of the vessels which annually get from our eastern seaboard to Australia, the Philippines, Hongkong, China, Siberia, Japan, and come back again. The discussion of the effect which canal tolls may have upon the commerce between our Atlantic seaboard and Australia, southern China, and the Philippines is deferred to a subsequent chapter, where it is considered in detail.

Our exports to Australia are growing rapidly, and the present clearances to that continent and New Zealand comprise a fair-sized total. The canal may be expected to facilitate our export trade to Australia, and will probably cause our imports from that region to come to us more directly. The vessel that takes American goods to Australia usually loads there with Australian products for Europe, returns thence to this country with pick-up cargo or ballast, and the American importer gets his Australian wool and other products at the London sales. The opening of a direct canal route between New York and Australia may change this, at least to some extent, and lead to a more direct return trade from Australia. Direct importation would enable us to secure the goods from Australia more quickly and cheaply and would be of assistance to our manufacturers, who are requiring increasing quantities of the raw materials obtained in Australia, New Zealand, and Oceania.

From New York and the North Atlantic ports of the United States the distance to the Philippines and Hongkong by the American canal route will not be very much less than by Suez; consequently the trade of our eastern seaboard with those and other places so nearly antipodal will be divided between the easterly and westerly routes. The shipper will have the advantage of the competition of the carriers using the different canals. The coast between Shanghai and possibly Yokohama on the east, and Singapore and possibly India on the west, will be traveled in both directions by vessels bound for American ports.

The overlapping of trade routes in the East, and the tendency of vessels to follow the routes where the greatest volume of traffic can be secured, may possibly bring some of the East Indian trade across the Pacific and through the American canal. One of the advantages of the route by the American Isthmus will be the cheaper coal, and another inducement to vessel owners will be the shorter trip in tropical latitudes, where many commodities are liable to be injured by heat and humidity.

Although a part of the Hongkong and Philippine trade with our Atlantic seaboard will unquestionably make use of the Suez route, the figures in the above table have been allowed to stand without reduction, because the statistics of entrances and clearances, collected at our Atlantic and Gulf ports, do not include all of the present commerce of the eastern half of the United States with trans-Pacific countries that might use the American canal were it available.

In considering the vessel tonnage of the existing commerce that might use an isthmian canal some account should be taken of the shipping that now plies between Asiatic countries and our Pacific coast. With China, Japan, and Siberia this amounts to 333,689 tons. With Hongkong and the Philippines the tonnage is 464,978, and for both sections combined 798,667 tons. A large but indeterminable part of this trade between the Pacific coast and trans-Pacific countries originates and ends east of the Rocky Mountains. Doubtless the greater share of this trade will always go overland to and from the Pacific coast; but some considerable portion will be diverted to the isthmian route after the canal has been opened. If this diverted trade and tonnage should amount to but 20 per cent of the total, it would equal about 160,000 tons, a tonnage nearly equal to that which the table above shows our Atlantic coast vessel movement to and from Hongkong and the Philippines to have been in 1899.

While the Suez Canal will get some of the commerce of eastern Asia and the Philippines with our Atlantic seaboard after the isthmian canal has been opened, it is believed that this traffic through the Suez may be offset by the amount of the vessel tonnage of our present Pacific coast import and export trade that would use an American canal. Furthermore, while the Suez route will draw from Manila and points north and east, the isthmian route will also secure tonnage from the territory lying south and west of Manila. It is thought that these facts warrant the inclusion of all the Atlantic coast tonnage to and from China, Japan, Hongkong, and the Philippines in the estimate of the vessel tonnage that would find use of the canal advantageous. Such an estimate as this can be only approximately correct, because it is impossible to predict closely the routes which the East Indian and south Asiatic trade will actually follow after the American interoceanic canal shall have completed the water route round the world.

The foregoing discussion has made no reference to the effect which the canal will have in diverting, from its present rail and water routes, a portion of the commerce now carried on by way of our Pacific coast ports, between the eastern half of the United States and Australia, Hawaii, and the rest of Oceania. There are excellent steamship connections between the west coast of the United States and Canada, Hawaii, and Australia, and the traffic and travel of the Eastern United States to and from those countries is in part conducted through Pacific coast gateways. The isthmian canal and the steamship connections by way of it will undoubtedly affect the present routes for some of the traffic now carried on between our Eastern States and those countries.

The entrances and clearances of the vessels trafficking between our Pacific coast and Australia, Hawaii, and other islands of Oceania are shown in the following table:

IX.—*Entrances and clearances, United States Pacific coast trade with Australasia and other Oceania, fiscal year 1899.*

	Entrances.	Clearances.
	Tons.	*Tons.*
Hawaii	246,432	205,987
Australasia	148,876	94,037
Other Oceania	8,351	7,960
Total	403,659	307,984

Combined total, 711,643 tons.

Although there is no doubt but that a portion of the traffic covered by the above table would have gone through the canal had it been in existence in 1899, there is no way of deciding what percentage would have taken the isthmian route. None of this tonnage has been included in making up the totals reached in this chapter.[a]

VESSEL TONNAGE ENGAGED IN THE PRESENT TRAFFIC ACROSS THE ISTHMUS OF PANAMA.

In none of the preceding tables is there a statement of the tonnage engaged in the traffic now carried across the Isthmus of Panama by rail. This transisthmian traffic is a part of the Atlantic-Pacific trade of both Europe and America. Three lines of steamers now run north from Panama on the west coast, two lines run south, and the business of those steamers would become canal traffic.

More than a million tons of shipping enter the port of Colon each year, but that tonnage would not be a fair index of the amount that would go through the canal. Colon is a port of call for nearly all the lines of steamships connecting the Gulf, West Indian, and Caribbean waters with the United States and with all the leading European countries. A call at Colon is but an incident in the voyage of the steamers trafficking in the Gulf and Caribbean, but the situation at Panama is different. The geographical location of that city is such that a large part of the steamers from the North or South make Panama the beginning or end of their voyages. Before the year 1899 the lines from the South did not go north of Panama and none from the North went south of Panama. Since then the lines from the South have extended their route beyond Panama, and that city has now become a port of call as well as a terminal point. If, however, the year 1898 be taken, the tonnage of Panama may be considered as indicative of the tonnage which the present transisthmian trade would cause to use the canal.

During the year 1898, 149 steamers, with an aggregate tonnage of 336,998 tons, entered this port. Panama has some sail tonnage, which is omitted from the calculations here made because most of the sailing vessels are either local or are employed in bringing coal from Australia for the steamship lines. This business would disappear with the opening of the canal and the establishment at the Caribbean entrance of coaling stations supplied with coal from the United States.

Whether both the entrances and clearances at Panama should be included in computing the canal tonnage which the commerce at Panama would have contributed to the traffic of an isthmian waterway in 1898, or whether only the entrances should be counted, constitutes an interesting question in statistics. The clearances were practically identical with the entrances, and if they were included, the above total would be doubled. Reasons for doubling the entrances may be found in the fact that there were presumably no vessels engaged in the traffic entering at Panama that did not find the business profitable, and that these vessels in taking cargo from the west coast of North or South America for the American or European Atlantic, stopped their eastbound voyage at Panama instead of at some Atlantic port, simply because there was no waterway across the Isthmus. They would have made a round trip through the canal and back to the west coast had they been able to do so.

The reasons why only the entrances have been counted in the statistical calculations of this chapter are:

1. That the existence of a canal and the avoidance of transshipment of cargo at Panama would have enabled the same tonnage of vessels to have carried a larger amount of traffic.

2. The vessels entering and clearing Panama are also engaged en route in a coasting trade of some importance. The through business done at Panama included only a part of the transportation business of the vessels which entered that port, even in 1898, when it was a terminal instead of a point of call en route.

[a] The statistical total of vessel tonnage published in the preliminary report of the Isthmian Canal Commission included 79,218 as the tonnage of our Pacific coast trade with Australasia and other Oceania which it was estimated would be at once diverted to the canal. Communications received from several officials of the transcontinental railways express the opinion that a considerable share of the foreign traffic now carried over the mountains by rail will be diverted to the canal line, that is to say, is traffic at present available for the canal. However, in order to be conservative and to avoid assumptions whenever possible, there is none of this Pacific coast–Oceania tonnage included in the totals of this report.

3. This last fact is shown by the total tonnage of freight, northbound and southbound, handled by the Panama Railroad in 1898—268,156 tons of freight. In most cases the net register vessel tonnage is considerably less than the cargo tonnage; and for this reason, principally, it has been thought best to count only the entrances at Panama, 336,998 tons, in arriving at the total available canal traffic.[a]

COASTING TRADE OF THE UNITED STATES AVAILABLE FOR THE CANAL.

The coasting trade between the two seaboards of the United States carried on by way of Cape Horn or the Straits of Magellan is the only additional tonnage item requiring examination. The Horn route has been followed since the days of '49, and while it will probably be deserted after the completion of the canal, it or the Straits of Magellan will be increasingly used until that time. Until recently this traffic has been handled by sailing vessels, but the line of seven new steamers recently installed in this trade will largely displace the sailing vessels that have had a practical monopoly of the traffic for a half century.

Owing to the large annual fluctuations to which this trade has been subject, an average of Pacific entrances from Atlantic ports and Atlantic entrances from Pacific ports during the last ten years has been taken. These averages combined give a total of 109,312 tons per year. The Atlantic entrances averaged 26,323, and those of the Pacific 82,989, showing that Europe is the selling market of the Pacific States and our Atlantic States are the buying market. Two-thirds of the vessels sailing to our west coast from our Atlantic seaboard clear from our west coast to Europe, and cross thence to our Atlantic ports to load for the Pacific slope.

SUMMARY.

The entrance and clearance totals for the various categories of commerce studied in the preceding pages are summarized in the following table. It will be remembered that the figures were for the latest available statistical year, which in most instances was 1899.

Summary of entrances and clearances, commerce of Europe with Pacific America, and commerce of eastern seaboard of the United States with Pacific countries.

	Tons.
Europe with—	
Western South America	1,771,858
Western Central America and Mexico	140,000
Pacific coast of United States, British Columbia, and Hawaii	642,180
Eastern seaboard of United States with—	
Western South America and Hawaii	166,364
Pacific coast of the United States	109,312
Trans-Pacific countries	908,140
Panama traffic (1898)	336,998
Total	4,074,852

The total of the above summary, 4,074,852 tons net register, comprises the vessel tonnage of the trade of Europe with Pacific America, and of our Atlantic seaboard with Pacific countries. Every possible effort has been made to analyze, verify, and correct the statistical data consulted. It was thought better to err, if at all, on the side of understatement.

The above total differs somewhat from the total published in the preliminary report of the Canal Commission, mainly because three items have been omitted that were included in the former statement. The sums omitted amount to 471,290 tons net register. Had they been included the vessel-tonnage total of this report would have differed from that of the preliminary report by only 35,986 tons, the total here given being that much less. Since publishing the preliminary report it has been possible to substitute 1899 figures for those of 1898 for a few foreign countries. For some of the countries the figures for 1899 were larger than those for 1898, but in the case of British Columbia the tonnage for 1899 was 63,393 tons less than 1898.

Attention was called in the previous chapter to the abnormally small export of grain from our Pacific coast during the year 1899. If the grain exports of the normal year 1898 were substituted for those of 1899, the above vessel-tonnage total would need to be increased over 400,000 tons. The grain exports of 1898 exceeded those of 1899 by 612,874 cargo tons, and this, according to the ratio of cargo tonnage to net register tonnage, for the Pacific coast exports as a whole, would be equivalent to 408,723 vessel tons.

In closing this discussion of vessel tonnage reference should be made to the fact that this chapter has not considered the commerce of Europe with the western half of the Pacific Ocean, a part of which, it is believed, for reasons elaborated in the succeeding chapter, will make use of the American canal instead of the Suez or Cape of Good Hope route. In stating the entire amount of vessel tonnage that was available for the use of the canal in 1899 some share of the European commerce now using the Suez or rounding the Cape of Good Hope should be included. What that share should be is considered at length in the next chapter.

[a] The tonnage totals published in the preliminary report of the Isthmian Canal Commission included both the entrances and clearances at Panama.

Chapter XX.

TRAFFIC INVESTIGATION BY THE NEW PANAMA CANAL COMPANY—COMPARISON OF THE RESULTS OF THE THREE INVESTIGATIONS.

PLAN OF THE INVESTIGATION.

The New Panama Canal Company divided that part of the world's commerce capable of being affected by the proposed canal into the four groups that had been adopted in 1890 by the Commission d'Etudes appointed by the receiver of the Compagnie Universelle du Canal Interocéanique. These four groups were: (1) The commerce between Europe and the Pacific coast of the American continent; (2) the commerce between Europe and the Far East—i. e., China, Japan, Australasia, and Oceania, and the French and Dutch East Indies; (3) the commerce between the Atlantic and Pacific coasts of America, and (4) the commerce between the Atlantic coast of America and the Eastern countries included in group 2.

Briefly stated, the plan adopted by the New Panama Canal Company to determine what part of the world's present ocean tonnage would make use of an American interoceanic canal, was to record and follow the movements of all vessels engaged in the commerce being carried on between the Atlantic and Pacific oceans. This record of vessel movements was taken from Lloyd's two publications, the Daily Shipping and Mercantile Gazette and the Weekly Shipping Index, where the Canal Company was able to secure information concerning the arrivals, departures, and whereabouts of all ocean vessels, about 12,500 in number, as their records subsequently showed.

During the years 1895 and 1896 the plan followed in making up the record was to go through each issue of Lloyd's daily and weekly publications and place against each vessel, whose route was such as to bring it within one of the four groups of commerce just mentioned, a check indicating to which group the ship was to be accredited.

Lists of the vessels thus checked were arranged alphabetically, showing for each of the four classes, and for sailing vessels and steamers separately, the facts regarding each ship that were given in Lloyd's Gazette and Index. These eight alphabetical lists—four for steamers and four for sailing vessels—were then turned over to draftsmen, who charted the movements of the vessels named in the eight lists by using sheets of paper which had the names of the ships in a column at the left, and which were divided into perpendicular columns headed with the names of the twelve months and with the weeks of the year by number from one to fifty-two.

The movements of a vessel were shown on the sheet by entering in the column of the proper week the name of the port and the day of the month of the arrival of the vessel if it was entering the port, or of the departure of the ship if it was clearing. Horizontal lines were drawn connecting the entries of clearances with those of arrivals. During 1895 eight sets of charts were prepared, sailing vessels and steamers being separately classified according to the four groups into which the commerce being studied had been divided; but after that year the groups of commerce were shown on the charts by using four different colors of crayon, and only two sets of charts were made, one each for sailing vessels and steamers. From these sets of charts, and the vessel lists from which the charts were prepared, it was an easy matter to make an annual computation showing the steam and sail tonnage of the traffic of each of the four groups of commerce.

Experience showed that the plan of checking off and copying from Lloyd's lists the vessels according to groups was somewhat defective, because on the charts some vessels would disappear from one group and appear in another in such a way as not to indicate what the intermediate movements of the vessel had been. It also happened that some vessels disappeared from the record after they had touched at a Pacific port, and that other ships appeared on the record as clearing from a Pacific port, without there being any record regarding their previous voyages. To obviate this defect it was decided at the beginning of 1897 to discontinue checking the names of vessels in the Gazette and Index and preparing lists of the ships thus checked, and instead of doing this work to make a card catalogue (fiches) of every ship named in the Lloyd publications. In this catalogue each ship had its card, and on this card all desired information regarding the vessel was entered and a record kept of the movements of the ship. The graphic charts of the voyages of the vessels were prepared from these cards.

During the year 1897 the canal company further improved its methods of conducting the traffic investigation. From Lloyd's Shipping and Mercantile Gazette tables were prepared showing for each Pacific port, separately for steamers and sailing vessels, and classified according to the four groups of commerce, the name, flag, tonnage, etc., of all the vessels entered and cleared. These tables gave full information regarding the steam and sail commerce of each Pacific port.

These tabular statements are said by the New Panama Canal Company to have "confirmed the correctness of the former work." The preparation of these tables also "established the fact that the graphic method, based upon the use of the Weekly Shipping Index, which has the disadvantage of requiring much more time, is more exact, complete, and reliable." The company further states:

> The justification of the method of statements by ports is that it has the advantage of dividing among the ports interested the world's tonnage stated for each of the four groups, and thus facilitates the study of the results, especially the inquiry concerning that part of the traffic with ports at the limit of the canal's zone of attraction. This method of statements was employed to verify the statistics of the year 1898.

At the close of the year 1898 the traffic of the year 1888 was studied according to the methods that had been developed, and tables were made comparing the years 1888 and 1898 to show what development had taken place during the decade in the commerce being investigated. The tonnage movements of 1899 have also been charted, totalized, and tabulated. The following table, prepared by the New Panama Canal Company and published here with but slight changes in form, presents the results of the elaborate investigations conducted by that company. The table shows the steam and sail tonnage of each of the four groups of commerce for the calendar years 1888, 1895, 1896, 1897, 1898, and 1899:

Tonnage of vessels engaged in trade between the Atlantic and Pacific oceans, 1888 and 1895 to 1899.

	Group 1. Europe with Pacific America.	Group 2. Europe with the Orient.	Group 3. Between Atlantic and Pacific America.	Group 4. Atlantic America with Orient.	Total for the year.
1888:					
Steam	346,015	2,396,105	4,716	78,994	2,825,830
Sail	1,744,661	1,659,759	217,597	681,877	4,303,894
Total	2,090,676	4,055,864	222,313	760,871	7,129,724
1895:					
Steam	570,637	3,081,479	40,551	162,599	3,855,266
Sail	2,130,876	1,087,250	243,209	721,526	4,182,861
Total	2,701,513	4,168,729	283,760	884,125	8,038,127
1896:					
Steam	601,157	3,430,386	68,420	266,354	4,366,317
Sail	1,944,207	891,404	188,445	792,214	3,816,270
Total	2,545,364	4,321,790	256,865	1,058,568	8,182,587
1897:					
Steam	601,784	3,745,397	58,446	271,455	4,677,082
Sail	1,677,461	976,480	164,891	789,694	3,608,526
Total	2,279,245	4,721,877	223,337	1,061,149	8,285,608
1898:					
Steam	648,568	3,669,091	91,082	441,246	4,849,987
Sail	1,680,573	948,222	148,204	835,682	3,612,681
Total	2,329,141	4,617,313	239,286	1,276,928	8,462,668
1899:					
Steam	570,997	4,059,392	94,319	699,913	5,424,621
Sail	1,804,074	1,053,862	107,830	571,444	3,537,210
Total	2,375,071	5,113,254	202,149	1,271,357	8,961,831

The total traffic in 1899 was larger than in 1898. This, however, was not true of all groups, there having been a slight decline in groups 3 and 4. The decline in the vessel movements of group 3 during 1899 as compared with 1898 was due to scarcity of ships and to the sale of a large line of sailing vessels that had been engaged in this traffic. During the year 1900 a line of steamers, comprising seven ships, capable of handling 126,000 tons of cargo each way annually, was inaugurated to take the place of the sailing vessels that were sold the year before. The slight decrease in the tonnage of group 4 was likewise due to the high ocean rates arising from the scarcity of ships. The shipments from the eastern ports of the United States to the Orient were handled more largely by the transcontinental railroads and the Pacific steamers.

The commerce included in groups 1, 3, and 4 of the above table is considered as certainly tributary to the proposed American canal. The commerce of Europe with eastern countries, group 2, will, for the greater part, make use of the Suez route, but a portion of the traffic will find the American waterway more advantageous. What share of the total for group 2 may properly be credited to the westerly canal route must be a matter of estimate. A careful review of the existing trade routes and a consideration of the forces that will affect the ocean routes after the American canal has been opened leads to the conclusion that a portion of Europe's exports to the western half of the Pacific Ocean—that is, to Japan, Australia, and Oceania—will be sent through the American canal.

CONCERNING USE OF AMERICAN CANAL BY COMMERCE OF EUROPE WITH ORIENT.

The volume of traffic to Europe from the East being larger than that outbound from Europe, vessels are obliged to sail both for the eastern part of the United States and for eastern countries lightly loaded, and sometimes in ballast. Our exports from Atlantic ports to Australia, Oceania, and the Orient are in part carried by ships that cross the Atlantic in ballast. When the American canal has become available vessels will probably not infrequently take on a partial cargo in Europe for countries in the western half of the Pacific, and also take freight for the United States, the West Indies, Central America, or Mexico; that is, vessels finding difficulty in securing cargoes outbound from Europe will sometimes find it advantageous to proceed to the East by way of America for the purpose of discharging such European-American cargoes as may be secured, and loading at one or more American ports a full cargo for the Pacific port or ports of its destination. In addition to permitting vessels in Europe to unite the light outbound cargoes for the East and for the United States, and enabling them to secure full cargoes in America for the East, the westerly route by way of the American canal will have the advantage of cheaper coal, and may possibly impose lower canal tolls upon the shipping than will be exacted by the Suez Canal. The Suez Canal is, and doubtless will remain, a highway managed by a corporation, whereas the American waterway under consideration is to be owned and operated by the Government.

The distance from Liverpool to Sydney, Australia, by way of the Panama Canal and Tahiti will be 357 miles greater than via the Suez, Colombo, Adelaide, and Melbourne, but this disadvantage of the westerly course will be partially, if not quite, offset by two facts favoring the American canal route. From Liverpool via the Cape of Good Hope, Adelaide, and Melbourne and Sydney is 534 miles farther than by way of the Panama Canal and Tahiti. The use of the westerly route will enable vessels engaged in the European-Australian trade to avoid the excessive heat of the Gulf of Aden and the Red Sea, and the storms of the tempestuous Indian Ocean. The American route, also, will be favored by the fact that a vessel on its way between Liverpool and the isthmian canal will have to go but 314 miles out of its course to call at New York, next to the greatest port of the world, whence outbound cargoes are practically always obtainable. With the advantages of cheaper coal, a cooler passage in the Tropics, quieter seas, and the attractive force of America's heavy tonnage, the American isthmus route will be used instead of the course through the Suez Canal by some of the vessels departing from Europe for Australia or other regions on that side of the Pacific Ocean.

Vessels proceeding from Europe by way of American ports and the isthmian canal to Oceania and the East, will have the choice of returning to Europe either by way of the Suez or by way of the American route. By whatever route the European vessels reach the oriental and other countries of the western Pacific, the route by which they return to Europe will be determined by the relative opportunities for obtaining cargo by way of the Suez and American routes, respectively.

The reasons for believing that a portion of Europe's imports, from the western half of the Pacific, will come by way of the American route are stronger than the reasons just cited regarding the use of the American canal for the European export trade. A vessel finding itself in the East Indies, Japan, China, or Australia may either take on cargo for Europe and for intermediate points along the Suez route, or it may load with such cargo as may be available for Europe and American countries and proceed—in most cases but partially loaded—across the Pacific to the western coast of the United States, where a great abundance of cargoes destined for Europe may be obtained, or the ship may go to Central America and West Indian ports, where a fair amount of freight for Europe will usually be available, or the vessel may proceed to Chile or some other west South American country, where there is always a heavy amount of outbound traffic. Besides being certain of securing freight from South America or North America for Europe, a vessel returning from the Orient by the American canal will also have the advantage above referred to of being able to secure coal more cheaply than it can be obtained along the Suez line.

It would seem probable, upon a priori grounds that vessels leaving Europe, whether by way of the Suez or by way of the American canal, will frequently find the return trip via America more profitable than by the route in the opposite direction. This general proposition, moreover, seems to accord with the evidence regarding the present round-the-world movement of vessels.

The entrance and clearance statistics of the vessels engaged in the foreign trade of the west coast of North and South America indicate that a large number of vessels now going out from Europe toward the East return from the west.

EVIDENCE OF INCREASING NUMBER OF ROUND-THE-WORLD VOYAGES.

In the trade of the Pacific coast of the United States with Atlantic foreign countries the tonnage of the entrances direct from the Atlantic was 63.8 per cent of the clearances to those ports in 1889; but in 1898 the entrances direct from the Atlantic were but 25.3 per cent of the clearances to the foreign countries of that section. Stated otherwise, in 1889 something over one-third, and in 1898 about three-fourths of the vessel tonnage employed in carrying our west coast trade to Europe arrived at our western ports from other than European countries.

Many vessels take cargo from Europe via the Good Hope route to Australia, or other eastern countries, whence they proceed across the Pacific in ballast, or with coal to our western ports or to Chile. A to and fro movement of vessels between ports situated at great distances from each other is frequently unprofitable unless there are about equal quantities of merchandise to be carried both ways, and whenever possible, chartered vessels—and at the present time they carry most of the world's ocean freight—seek to avoid voyages in ballast by moving as much of the time as possible in the direction of the larger currents of traffic. Our Pacific coast imports but little and exports great quantities, consequently vessels endeavor to approach that section—and the same is true of Chile—from regions having a larger volume of inbound traffic.

In 1888 more ships entered Chile from North Atlantic countries, Europe, and the United States than cleared for them, but in 1898 the reverse was the case. The figures of the entrances and clearances of the Chilean trade with Europe and our Atlantic coast for the years 1888 and 1898, as recorded by European couutries and the United States, are shown by the following table:

Chilean entrances and clearances, direct trade with Europe and east coast of United States, 1888, 1898.

	1888.	1898.
Entrances	767,000	891,000
Clearances	625,000	982,000

Per cent which entrances were of clearances: 1888, 122.7; 1898, 89.7.
Per cent of decline in ratio of entrances to clearances, 1888 to 1898, 28.5.

The ships for the exports of Chile to Europe and the United States were all drawn from Atlantic countries in 1888, and, in addition, vessels entered Chile from the Atlantic and cleared for Pacific countries, but in 1898 the vessels for the exports from Chile to the North Atlantic must have been drawn partly from Pacific ports. According to the table, the tonnage entering Chile from the North Atlantic was 122.7 per cent of the tonnage that cleared for that section in 1888, whereas the per cent was only 89.7 in 1898, an apparent decline of 28.5 per cent in the ratio. This change was mainly due to a movement of vessels from Europe and eastern United States to Australia and thence to Chile.

In compiling the above table the European statistics of entrances and clearances have been taken without making reductions to eliminate duplications. Accordingly neither the figures nor the percentages are strictly accurate. For the purpose of the present argument, however, the value of the table is not lessened by the duplications contained in the statistics, because a study of the European records of entrances and clearances shows very clearly that there is a greater duplication of clearances than of entrances. If the duplications in the figures of the above table were deducted, the tonnage entering Chile from the North Atlantic would bear an even smaller ratio to the clearances to that section than is stated in the table.

Further evidence regarding the increasing movement of vessels around the world is shown by the statistics of entrances and clearances of the Atlantic coast trade of the United States with South America. In the table just given above the North Atlantic trade with Chile is analyzed. The following table contains the figures of the entrances and clearances of the trade of the Atlantic and Gulf seaboards of the United States with the entire west coast of South America:

Atlantic coast entrances and clearances, trade of United States with western South America.

Year.	Entrances.	Clearances.
1889	44,454	27,176
1899	78,930	37,560
Per cent of increase	77.5	38.2

Our east coast entrances from western South America increased during the decade preceding 1899 more than the clearances did. The clearances to South America were less than half the entrances from that section in 1899.

Mention was made of the fact that vessels clearing from the North Atlantic to Australia and other eastern countries frequently return by crossing the Pacific. In 1899, 155,000 tons of vessels cleared from the eastern ports of the United States for Australia and New Zealand, and the direct entrances, all from New Zealand, were only 4,912 tons. This does not indicate that practically all the outbound vessels returned by way of the Pacific, because many, although not all, of the steamers returned by way of Java or Europe and were entered as from those countries. Some of the steamers and nearly all of the sailing vessels returned from Australia to the United States by way of the west coast of North or South America. Under present conditions the tendency is for an increasing number of vessels starting out from Europe and the eastern part of the United States toward the East to return to their starting point by a continuous voyage around the world.

The effect of the isthmian canal upon ocean routes under consideration will be a double one. It will facilitate a round-the-world movement of commerce, and also establish conditions that may cause vessels to pass from Europe as well as from the eastern part of the United States, through the American canal to Oriental countries, to return, as traffic inducements may determine, by way of the Suez Canal or across the Pacific to the west coast of North and South America, and thence to the point of departure. By exercising these influences upon the world's commercial routes the canal will secure a part of the trade of Europe with countries in the western half of the Pacific.

TONNAGE OF AVAILABLE CANAL TRAFFIC.

The records kept by the Panama Company show that during the calendar year 1899 the commerce of groups 1, 3, and 4 might have contributed 3,848,577 tons net register to the traffic of the isthmian canal. This sum does not include any vessel tonnage for the commerce crossing the Isthmus of Panama. The addition of that tonnage, 336,998, raises the total to 4,185,575. The entrances and clearances for the commerce of the eastern seaboard of the United States with Pacific America and with Australia, Oceania, the Philippines, Japan, China, and Siberia, and the vessel movements between the western coasts of the American continents and the North Atlantic American and European ports were found to amount to 4,074,852 vessel tons net register, including the 336,998 tons for the commerce crossing the Isthmus of Panama.

In addition to this tonnage, which comprises only traffic originating or terminating in America, there should be included most of the commerce of Europe with New Zealand and the other islands of the Pacific east of Australia. New Zealand will be 1,318 miles nearer Liverpool by the Panama Canal than via the Suez route and 2,222 miles nearer than by way of Good Hope. The distances to Liverpool from the most important groups of South Pacific islands north of New Zealand will be from 500 to 5,500 miles less via the isthmian canal than by way of Suez. The entrances and clearances of New Zealand's trade with northwestern Europe—France and countries farther north—amounted to 481,178 tons net register in 1899, and the commerce of that part of Europe with the other islands of the South Pacific east of Australia to 181,743 tons. Of this total traffic of 662,921 tons, probably not less than 500,000 might have advantageously used an isthmian canal, and this amount should be added to the tonnage of the canal traffic originating or terminating in America. This makes the total obtained by the Commission's investigation of the tonnage that might have used an isthmian canal in 1899, 4,574,852 tons net register, and the total obtained, by adopting the New Panama Canal Company's figures for the traffic originating or terminating in America, 4,685,575 tons.

The above totals for the tonnage that might have used an isthmian canal in 1899 do not include any of Europe's trade with Australia and Japan, a part of which, for reasons stated above, would have used an isthmian waterway. The distances from Great Britain to Sydney and Yokohama by the Suez and Panama canal routes are approximately equal, and vessels going by America in either direction en route between Europe and Japan or Australia will pass regions from which there is a heavy export tonnage. If it be assumed that only 10 per cent of the vessel tonnage of the Australian trade with the ports of northwestern Europe, and only 5 per cent of the tonnage of the Japanese commerce with those ports, would have taken an American canal route, the totals for 1899 should be increased 316,223 tons, and be raised from 4,574,852 to 4,891,075 tons, and from 4,685,575 to 5,001,798 tons, or to approximately 5,000,000 tons.

GROWTH OF TRAFFIC, 1888–1898.

The total vessel tonnage of the four groups included in the tables prepared by the New Panama Canal Company rose from 7,129,724 tons net register in 1888 to 8,462,668 tons in 1898, an increase of 18.7 per cent. There was a large increase in the commerce of groups 1 and 4. The rapid development of the trade of Europe with the west coast of the Americas, particularly in Chilean nitrates, has been dwelt upon elsewhere. The commerce of the Atlantic coast of America with the Orient, group 4, expanded largely during the decade in spite of the hindrance imposed by the length of the present transportation routes.

The ocean commerce, the tonnage of which is comprised in group 3, that is to say, the trade between the two American seaboards, increased but slightly during the decade; but this total of less than a quarter of a million tons includes only the tonnage of vessels which actually make the trip between the Atlantic and the Pacific oceans. It does not comprise the traffic which now moves across the Isthmus of Panama. The traffic around South America was less in 1899 than it had been in previous years, the reason for this being that the sailing vessels that had been engaged in the trade between our two coasts were sold for the purpose of substituting steamers. Those steamships were all in service before the end of 1901, and the tonnage was then greater than it was previous to the year 1899. After the isthmian canal has been in use for a few years the commerce of group 3 will probably be as large as that of any other one of the four groups, because it is this group in which the coasting trade between the two seaboards of the United States will fall. The present small proportions of this trade between the two coasts of the Americas and the slow rate of its increase indicate an important, although not the only, commercial reason why the United States proposes to construct an isthmian canal.

In the following table the tonnage of 1888 is compared with that of 1898, and the number of steamers and sailing vessels engaged in the commerce of each group is indicated:

Comparison of the tonnage of 1888 and 1898.

	Group 1. Europe with Pacific America.		Group 2. Europe with the Orient.		Group 3. Between Atlantic and Pacific America.		Group 4. Atlantic America with Orient.		Total for the year.	
	Number.	Tons.	Number.	Tons.	Number.	Tons.	Number.	Tons.	Number.	Tons.
1888:										
Steam	215	346,015	1,275	2,396,105	7	4,716	46	78,994	1,543	2,825,830
Sail	1,633	1,744,661	1,595	1,659,759	182	217,597	571	681,877	3,981	4,303,894
Total	1,848	2,090,676	2,870	4,055,864	189	222,313	617	760,871	5,524	7,129,724
1898:										
Steam	265	648,568	1,448	3,669,091	57	91,082	202	441,246	1,972	4,849,987
Sail	1,101	1,680,573	743	948,222	104	148,204	527	835,682	2,475	3,612,681
Total	1,366	2,329,141	2,191	4,617,313	161	239,286	729	1,276,928	4,447	8,462,668
Per cent of increase or decrease 1888-1898:										
Steam	+	87.4	+	53.1	+	1831	+	458	+	71.3
Sail	−	*a* 3.6	-	*a* 42.8	−	*a* 31.9	+	22.6	−	*a* 16.0
Total	+	11.4	+	13.8	+	7.6	+	67.8	+	18.7

a Decrease.

In showing the growth in the commerce of these four groups individually and collectively during the decade 1888 to 1898, the figures of the above table afford the basis for reasoning regarding the probable amount of tonnage that will be ready to use the canal at the time of its probable completion, but a consideration of this is reserved for a separate section, where all the data bearing upon the subject are analytically presented.

There are two other facts shown by this table that are of indirect importance in connection with the traffic of an isthmian canal. One is that the increased traffic of 1898—18.7 per cent larger than the tonnage of 1888—was carried in 1,077 fewer vessels than were used ten years before. The number of ships decreased 19.5 per cent during the decade, thus affording a good illustration of the well-known fact that the size of ocean vessels is growing rapidly larger. The average net register of the vessels engaged in the four groups of commerce was 1,291 tons in 1888. The steamers at that time averaged 1,831 tons net register. In 1898 the average for all vessels, both steam and sail, was 1,903 tons net register and for steamers 2,460 tons.

THE SUBSTITUTION OF STEAMERS FOR SAILING VESSELS.

The figures contained in the table also indicate the rapidity and extent to which the steamer is supplanting the sailing vessel. The table shows that the sailing vessel lost ground most rapidly in the commerce of group 2, where the Suez route has come to be the main traffic highway. These facts regarding the growth of steam tonnage and the declining use of the sailing vessel are graphically shown in the accompanying charts, which indicate for each of the four groups the changes that have taken place in both steam and sail tonnage. The first chart applies to sailing vessels, the second to steamers, while in the third the changes in the total tonnage, steam and sail combined, are represented.

COMPARISON OF THE RESULTS OF THE THREE TRAFFIC INVESTIGATIONS.

Having now set forth the results of three separate investigations instituted to measure the volume of the existing commerce that would make use of an isthmian canal were such a waterway in existence, it will be profitable to compare the results of the three inquires to see whether they tend to stregthen each other, or whether they are so different as to cast doubt upon the accuracy of any or all of the three studies. The three investigations were made not only without reference to each other, but also according to entirely different methods. Two of the investigations were made by the Isthmian Canal Commission, and the other under the direction of the New Panama Canal Company. It is not often in statistical and economic investigations that such an opportunity for checking up results is afforded as is possible in the present instance.

In the chapter on cargo tonnage it was found that the freight tonnage of the trade between Europe and Western America, and the tonnage going by water between the eastern seaboard of the United States and Pacific countries amounted to 6,703,608 tons in 1899. The total entrances and clearances of the vessels engaged in this trade at that time equaled 3,965,540[a] tons net register. This would make the average ratio of cargo tonnage to net register tonnage 1.69. The records of vessel movements kept by the New Panama Canal Company show a tonnage of 3,646,428 net register tons during the calendar year 1899 for the commerce of groups 1 and 4, which correspond in general, although not exactly, with the trade included in the above cargo tonnage total. The ratio of cargo tonnage to the vessel tonnage of groups 1 and 4 is 1.83. This is a somewhat higher ratio than that between the cargo tonnage and vessel tonnage of entrances and clearances.

The tables prepared by the New Panama Canal Company do not include the vessel tonnage of the trade at Panama. Their method of recording the movements of vessels passing from ocean to ocean and totalizing those movements naturally would not take account of the traffic at Panama. In the tonnage total of entrances and clearances obtained by the Isthmian Canal Commission, the Panama traffic was reckoned to be 336,998 tons net register. If this sum be added to the vessel tonnage total of groups 1, 3, and 4 and the cargo tonnage be divided by this larger figure, the ratio becomes 1.60.

The "dead-weight" cargo carrying capacity of American schooners of 500 to 2,000 tons net register averages about 66 per cent more than the net register, but this ratio varies greatly with different vessels. The ordinary modern freight steamer when fully loaded will carry about 2.25 tons of cargo for each ton net register.

Vessels are not fully loaded on all voyages. Some are obliged to make trips in ballast in search of cargo, and many more are but partially laden on the outbound or return voyage of a round trip. There are very few ports of the world where the volumes of exports and imports are equal. Great Britain buys a much larger bulk of commodities than she sends out. The opposite is true of the United States and western South America. Consequently the average cargoes of ocean vessels engaged in international trade are much less than their maximum carrying capacity.

The ratio of cargo to net register tonnage, obtained above by dividing the total available canal freight tonnage by the corresponding net vessel tonnage, are about what might be expected on a priori grounds. The fact that these ratios are apparently correct is not a definite proof of the accuracy of the tonnage totals compared, but it is corroborative evidence. If any one of these three totals compared were grossly in error, there could not be such close correspondence in the ratios.

The total of entrances and clearances in the trade of the year 1899 between Europe and Western America and between the Eastern United States and Pacific countries, 4,074,852 tons, is somewhat less than the New Panama Canal Company's total of vessels engaged in this commerce, if the traffic at Panama be added to their figure for groups 1, 3, and 4. The tonnage of these three groups during the calendar year 1899 was 3,848,577, and this plus the entrances at Panama in 1898, 336,998 tons (the vessel tonnage adopted for the entire Panama traffic), amounts to 4,185,575 tons.

A more detailed comparison of the tonnage figures of tables prepared by the Commission with those made by the New Panama Canal Company would show that the totals for the two coasts of America are not very different. It is uncertain whether the trade of Hawaii is included in group 3 of the Panama Company's tonnage table. If it is, the Commission's figures are larger;

[a] This is 4,074,852 tons minus 109,312 tons, the coasting trade between our two seaboards. The 6,703,608 tons of cargo do not include any of our coasting trade, hence the vessel tonnage total is reduced before comparison is made with the total cargo tonnage.

if Hawaii is not comprised in group 3, its inclusion there would make the Panama Company's figures greater. For the trade between Europe and the west coast of the Americas the Commission's total is somewhat larger than the Panama Company's—178,967 tons if the trade of Hawaii be included in the Commission's figures, and 153,935 tons if omitted. If group 3 does not include the Hawaiian commerce, the vessel tonnage of that commerce should be subtracted from the figures of "entrances and clearances" before the comparison is made. Concerning this difference of 154,000 or 179,000 tons, between totals approximating two and a half millions, it should be said that the periods covered by the two totals are not identical, and that the two methods of determining vessel movements could hardly be expected to yield exactly the same results. Vessels do not always make the port they clear for. Accidents may prevent, or telegraphic orders from the owner or charterer may change the course of the vessel.

It is in the vessel tonnage of the commerce between the eastern American seaboard and the countries of the western part of the Pacific (i. e., the Far East), that the largest difference exists between the figures of the Panama Company and the Commission. The total of group 4 in the calendar year 1899 was 1,271,357, while the total of entrances and clearances accepted for the fiscal year ending June 30, 1899, by the Commission, for the trade between the eastern seaboard of the United States and the western Pacific countries was 908,140 tons net register. This amount, it will be recalled, is twice the tonnage of vessels clearing direct from the Atlantic seaboard to Japan, Siberia, China, the Philippines, and Australasia. Group 4 of the French tables includes some commerce (that of Singapore and the Dutch East Indies) not comprised in the Commission's figures for the trade between our eastern seaboard and trans-Pacific countries. Moreover, a complete statement of the vessel tonnage of this commerce can not be made from our statistics of entrances and clearances, because a share, not only of the commodity traffic, but also of the vessel tonnage of this commerce, is credited in our statistical records to our trade with Europe. It is quite possible that the vessel tonnage engaged in the commerce between our eastern seaboard and the countries of the western Pacific is somewhat greater than 908,140 tons net register. Group 4 applies to the commerce between the entire east coast of the American continent and the countries of the western Pacific; but there can be but very little vessel movement between the Far East and any Atlantic American countries other than the United States.

The only other tonnage item requiring mention in this comparison is that of the commerce at the city of Panama referred to above. The total of entrances and clearances, as determined by the Commission, credit that traffic with 336,998 vessel tons net register; whereas the methods in accordance with which the calculations of the New Panama Canal Company were made were such as not to include that tonnage.

The results of the three traffic investigations are such as to affirm the essential accuracy of each. The ratio between cargo tonnage and vessel tonnage apparently accords with the facts of ocean commerce. In view of the complexity of the statistical problem, the difference in the methods of dealing with the problem, and the slight difference in periods covered, the vessel tonnage totals obtained by the Commission's investigation of entrances and clearances, and the New Panama Company's record of vessel movements correspond as closely as could be expected.

Chapter XXI.

GROWTH OF CANAL TRAFFIC, 1899 TO 1914 AND 1914 TO 1924.

The factors affecting the growth of commerce are so numerous and so interrelated that it is difficult to estimate the growth in traffic that will take place during the period that must intervene before an isthmian canal can be ready for use. The only basis of calculation is the increase of the past under the conditions of production and transportation and the requirements of international trade that then prevailed. All of these conditions are constantly changing and thereby affecting the volume and nature of the commodities exchanged, and the routes followed by the commerce of the world.

Of one thing, however, there can hardly be any uncertainty, commercial progress during the near future will be fully as rapid as it has been the past ten or twenty years. The demands of consumers are everywhere expanding, and sections like Africa and eastern Asia, that have thus far had but slight contact with the rest of the world, are being rapidly brought within the sphere of international commerce. The costs of transportation, both inland and maritime, continue to decline with the improvement of mechanical appliances and the accumulation of capital seeking profitable investment. Nations and individuals are devoting themselves with energy to the extension of trade and commerce. This is particularly true of the people and Government of the United States.

Such being the case, the probable tonnage of the traffic that will be available for an isthmian canal at the time of its completion, will doubless be conservatively estimated by predicating a continuation of the rate of increase that has prevailed during the past decade. In all probability the growth will be more rapid in the future; it surely will not be slower.

RATE OF INCREASE SHOWN BY TABLES OF THE PANAMA CANAL COMPANY.

The statisticians of the New Panama Canal Company found that the tonnage of the vessels trafficking between the two coasts of America, between the eastern United States and the Orient, between Europe and Pacific America, i. e., the available canal tonnage originating or terminating in America, increased from 3,073,860 tons net register in 1888 to 3,845,355 tons in 1898, a gain of 25.1 per cent. In determining whether this rate of increase per decade is one whose use will result in a conservative estimate of the probable available canal traffic in 1914, references to the progress in the vessel tonnage and value of the international trade of a few typical regions will be of assistance.

The growth that has taken place in the commerce between the Atlantic coast of the United States and Pacific foreign countries is shown in the following table, which compares the year 1899 with that of 1889. The facts are shown separately for western South America and all other Pacific countries.

The trade of the United States Atlantic coast with foreign countries on the Pacific—Growth in value, 1889–1899.

	With South America.			With all other Pacific.			Combined total.
	Imports.	Exports.	Total.	Imports.	Exports.	Total.	
1889	$3,325,115	$3,854,341	$7,179,456	$30,107,332	$17,478,531	$47,585,865	$54,765,319
1899	5,168,766	3,942,139	9,110,905	34,642,073	38,228,696	72,870,769	81,981,674
Absolute increase	1,843,651	87,798	1,931,449	4,534,741	20,750,165	25,284,906	27,216,355
Per cent increase	55.4	2.2	26.8	15.1	118.7	53.1	49.7

The value of the imports from South America rose 55.4 per cent. The total value of our import and export trade with western South America increased 26.8 per cent during the decade 1889–1899.

The commerce between the Atlantic and Gulf seaboard of the United States and Australia, Japan, and the mainland of Pacific Asia has grown more rapidly than our trade with western South America. The growth in the value of the imports was 15.1 per cent, and of the exports 118.7 per cent, the increase in the total trade having been 53.1 per cent. Our ability to produce cheaply has enabled us to enter freely into the expanding markets of the western half of the Pacific, although the costs of transportation, except to Australia during the last three years of the decade being studied, have necessarily been higher than our rivals have had to bear. The competition of the three lines from New York to Australia became severe in 1897 and greatly facilitated the development of the large trade which we have latterly secured with Australia.

The total trade of the United States with Australasia more than doubled during the decade 1890 to 1900, having been $32,194,000 in the year ending June 30, 1900, as against $15,544,000 in 1890. Our exports to that continent increased from $11,266,000 to $26,725,000 during the decade.

INCREASE IN TRADE BETWEEN EUROPE AND WESTERN COAST OF AMERICA.

The European entrances from Chile increased from 575,890 tons in 1888 to 914,091 tons in 1898, a gain of 58.7 per cent. These figures contain a certain amount of duplication, but the elimination of those duplications would not much affect the percentage. The duplications in clearances from Europe are greater than in the records of entrances, and for that reason the statistices of clearances are not cited in this connection. On their face the figures of entrances and clearances indicate that the total trade between Chile and Europe was 33.3 per cent greater in 1898 than ten years before, and while neither the statistics nor the per cent of increase are to be taken as absolutely correct, they possess illustrative value. The European entrances from all the west coast of South America increased from 789,278 tons in 1888 to 1,077,346 tons in 1898, a gain of 36.5 per cent.

In the chapter dealing with the vessel tonnage available for the use of a canal, the cargo tonnage of the nitrate of soda exported from Chile was shown to have grown from 420,000 to 1,360,000 long tons during the fifteen-year period ending with the calendar year 1899. This increase of over 200 per cent in the nitrate trade is, of course, due to causes peculiar to it, and not generally operative upon international trade as a whole. Nevertheless, the growth of the foreign trade in such articles as nitrate of soda, phosphate rock, lumber, coal, iron and steel products, and others that might be cited, and the practical certainty that the increase will continue for some decades to come, must have much significance in any reasoning regarding the probable rate of increase that will take place during the coming decade and a half, in the commerce available for an isthmian canal.

The trade of Europe with the Pacific coast of the United States is subject to great fluctuations, because it consists largely, although to a continually less degree, of the exports of grain, the annual volume of which depends upon whether the crop yield is abundant or light, and whether European prices are high or low. The entrances recorded at our Western ports comprise a decreasing number of vessels from Europe, because the majority of the ships reach those ports from trans-Pacific points. The export trade is particularly subject to fluctuation, but the last decade of the last century witnessed a moderate growth in the tonnage of vessels cleared. There was, likewise, an increase in the value of the exports, which amounted to about 25 per cent. The exports of wheat are not so heavy as they formerly were, but other commodities, particularly horticultural products, are acquiring a large place in the foreign trade.

GROWTH IN TRANS-PACIFIC TRADE OF THE WEST COAST OF THE UNITED STATES.

The trade between the Pacific coast of the United States and Hawaii, Japan, China, and Hongkong will not make use of the canal, but for the purpose of discussing the rate at which the Pacific commerce is growing, this trade may be most advantageously considered. In the following table the entrances and clearances of the vessels engaged in that trade are indicated, the absolute increase in the total tonnage during the decade is shown for the five countries separately and collectively. According to the table the total entrances and clearances increased 191 per cent during the decade.

34998°—12——25

Vessel tonnage of the trade between the west coast of United States and trans-Pacific countries.

Country and year.	Entrances.	Clearances.	Total.
Hawaii:			
1889	43,254	96,200	139,454
1899	246,432	206,887	453,319
Increase			313,865
Siberia:			
1889	1,029	1,980	3,009
1899	7,631	19,639	27,270
Increase			24,261
Japan:			
1889	29,480	2,095	31,575
1899	165,701	44,731	210,432
Increase			178,857
China:			
1889	3,785	3,982	7,767
1899	72,145	23,790	95,935
Increase			88,168
Hongkong:			
1889	107,794	114,507	222,301
1899	183,679	207,430	391,109
Increase			168,808

Total entrances and clearances: 1889, 404,106; 1899, 1,178,065; per cent of gain, 191.

In reading this table it is necessary to bear in mind that a considerable tonnage of vessels enter our Western ports not to secure cargo for the Orient, but to load with grain, lumber, or other freight for the North Atlantic, and if allowances could be made for this the average percentage of gain would be somewhat reduced. However, it will be observed that the clearances from our ports for the five Pacific countries—and the clearances represent the movements of vessels actually engaged in carrying our goods abroad—show a large increase in each instance.

The foregoing paragraphs have referred to the rate of growth prevailing in the commerce of the Atlantic coast of the United States with (1) western South America, (2) with all Pacific countries other than South America, and (3) with Australia; reference has also been made to rate of increase in Europe's commerce (4) with the west coast of South America, (5) with Chile, and (6) with the Pacific States of the United States; and, finally, attention was called to the progress being made in (7) the commerce of our west coast with Hawaii, Australia, Hongkong, China, Japan, and Siberia. In only one of these seven references to international trade—the commerce between our west coast and Europe—was the rate of increase per decade found to be less than 25.1 per cent, obtained by comparing the records of the New Panama Canal Company for 1888 with those for 1898. In most of the seven special divisions of commerce above noted the rate of growth was found to be much more than 25.1 per cent.

PROBABLE AVAILABLE CANAL TRAFFIC IN 1914.

In view of these facts it would seem that an increase of 25.1 per cent per decade up to the time of the opening of the canal may be very safely and conservatively predicated concerning the traffic that might have advantageously used the waterway in 1899. Predictions concerning the future ten or fifteen years must necessarily be based upon the experiences of the past, and unless the decade upon which the calculations here presented as to the future are made to rest was one of abnormally rapid or slow commercial progress, it may properly be made the basis.

Taken as a whole the decade preceding 1899 was probably one during which the world made normal industrial and commercial progress. In the United States the earlier years and the last year of the period were characterized by great business activity, but during fully a third of the decade a business depression of unusual severity prevailed. The years from 1893 to 1897 were more trying ones in this country than they were in Europe, but business was dull rather than active in Europe during that time. Consequently it is probable that estimates based upon this decade will not lead to an exaggeration of the facts.

The Panama Canal Company's figures for the vessel movements of the commerce originating or terminating in America, increased by the present transisthmian traffic, and 816,223 tons of Europe's trade with Oceania, Australia, and Japan, show that the available canal traffic for the calendar year 1899 was 5,001,798 tons net register. An increase of 25.1 per cent during the decade ending in 1909 would raise the amount to 6,257,249 tons; and the same rate of growth would bring the total to 6,998,733—or, in round numbers, 7,000,000—tons in 1914.

If the tonnage of available canal traffic in 1899, as determined by the Isthmian Canal Commission's study of entrances and clearances, be made the basis of estimate, and the increase of 25.1 per cent per decade be assumed, the figures for 1909 will be 6,118,735 net register tons, and for 1914, 6,843,805 tons.

In the foregoing estimates of tonnage the figures refer to the available canal traffic. It is not probable that all of the commerce included in the above totals will at once abandon the routes at present followed and immediately make use of the isthmian waterway. It will take some time to readjust trade with reference to the new conditions which the canal will establish, and possibly two years may be required for merchants and carriers to adapt themselves to all the changes in the routes and methods of international trade that the use of the canal will necessitate. The totals to which the three investigations of available canal tonnage have led may be designated as the measure of all the commerce that would have used the canal in 1899, had the commerce of our own and foreign countries been adjusted to the condition of trade which the canal would have established. There is no tonnage included in the totals which might not advantageously use the canal, except during the temporary period of transition from the existing conditions governing international trade and controlling the commerce between our eastern and western seaboards, to those conditions which will exist after the isthmian route has been opened.

ESTIMATE OF GROWTH OF TRAFFIC DURING FIRST DECADE OF THE USE OF THE CANAL.

The new interoceanic communication will so greatly modify the routes of commerce, and the conditions controlling the progress of the industries and commerce of many sections of the world, that the problem of estimating the increase that may be expected to take place in the tonnage using the canal, during the first decade following the opening of the waterway, is a different one from that of predicting the growth of available traffic up to the time of the completion of the canal. The rate of increase will be much more rapid after the canal has been put into service and its economic effects have begun to be realized.

The present small amount of ocean tonnage plying between the two seaboards of the United States affords a most striking instance of the restrictions which the absence of an isthmian canal imposes upon the growth of a traffic that will become large when the isthmian waterway has been opened. During the past decade the vessel movements between our two seaboards have averaged less than 250,000 tons annually, and until the current year (1901) have tended to decline, at a time when our domestic and foreign trade has been making rapid progress. Our small trade with western South America, a region with which we should, and some day will, have a large commerce, is another example of the restraints of existing transportation facilities. The effect of the isthmian canal upon the interoceanic coastwise commerce of the United States and upon our trade with western South America will be revolutionary, and the influence upon our commerce with foreign countries of the North Pacific will be, to say the least, highly stimulative.

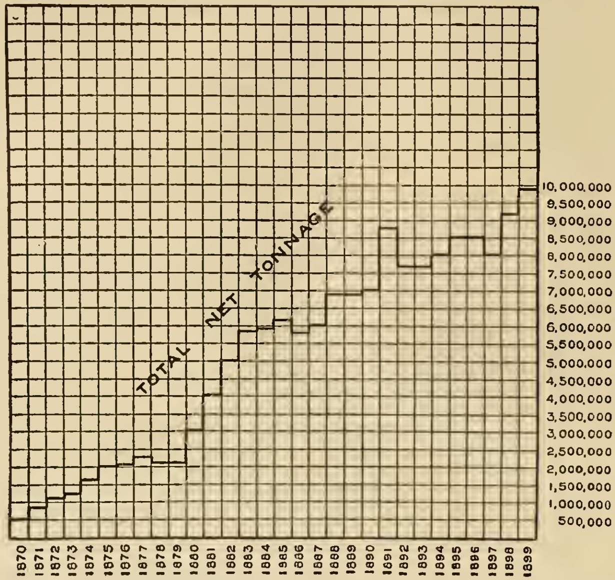
During the decade following the opening of the canal numerous forces will operate to accelerate the growth of American commerce. Besides being influenced by the new isthmian waterway, commerce will be served by one or more Pacific cables and our trade will have the advantage of closer and more direct international banking facilities than now exist. Likewise, there is reason to expect a large development in our merchant marine during the coming ten or fifteen years. The combined effect of these four commercial agencies will be to supplement our ability to produce cheaply, with facilities as favorable as our rivals possess for communication and transportation and for the settlement of international obligations, and the result will be the sure progress of our coastwise and foreign maritime commerce.

While it is not to be expected that the traffic of the isthmian waterway during the early years of its operation will increase so rapidly as did the tonnage passing through the Suez Canal, the best basis for estimating the probable increase that will occur in the tonnage of the American isthmian waterway is the rate of growth that the traffic of the Suez Canal has had. The number of vessels that have passed through the Suez Canal each year up to and including 1901, and the gross and net tonnage are shown by the following table:

Suez Canal traffic.

Year.	Number of vessels.	Gross tonnage.	Net tonnage.	Year.	Number of vessels.	Gross tonnage.	Net tonnage.
1870	486	654,915	436,609	1886	3,100	8,183,313	5,767,656
1871	765	1,142,200	761,467	1887	3,137	8,430,043	5,903,024
1872	1,082	1,744,481	1,160,743	1888	3,440	9,437,957	6,640,834
1873	1,173	2,085,073	1,367,768	1889	3,425	9,605,745	6,783,187
1874	1,264	2,423,672	1,631,650	1890	3,389	9,749,129	6,890,094
1875	1,494	2,940,708	2,009,984	1891	4,207	12,217,986	8,698,777
1876	1,457	3,072,107	2,096,772	1892	3,559	10,866,401	7,712,029
1877	1,663	3,418,950	2,355,448	1893	3,341	10,756,798	7,659,068
1878	1,593	3,291,535	2,269,678	1894	3,352	11,283,855	8,039,175
1879	1,477	3,236,942	2,263,332	1895	3,434	11,833,637	8,448,383
1880	2,026	4,344,520	3,057,422	1896	3,409	12,039,859	8,560,284
1881	2,727	5,794,491	4,136,780	1897	2,986	11,123,403	7,899,374
1882	3,198	7,122,126	5,074,809	1898	3,503	12,962,632	9,238,603
1883	3,307	8,051,307	5,775,862	1899	3,607	13,815,992	9,895,630
1884	3,284	8,319,967	5,871,601	1900	3,441	13,699,238	9,738,152
1885	3,624	8,985,412	6,335,753	1901	3,699	15,163,233	10,823,840

The growth in the tonnage using the Suez Canal is graphically shown by the following diagram:



The increase in the traffic of the Suez Canal is well shown by grouping the figures of the foregoing table into five-year periods and comparing the totals of these periods. This is done in the following table:

Increase in the number of vessels and tonnage of the Suez Canal by quinquennial periods.

Years.	Number of vessels.	Net tonnage.	Increase.	Percentage which the tonnage of each five-year period is of the tonnage of 1875–1879.
			Per cent.	
1870–1874	4,770	5,358,237	....	....
1875–1879	7,684	10,995,214	105	....
1880–1884	14,542	23,916,374	117	217
1885–1889	16,726	31,430,454	31	286
1890–1894	17,848	39,899,143	27	363
1895–1899	16,939	44,042,274	10	401

If the first five-year period were made the basis of comparison, the rate of increase would be so great as to exaggerate the progress which the traffic made during the subsequent quinquennial periods. The Suez Canal could be used advantageously only by steamers, and in 1870 the number of steamers available for the commerce between Europe and the East Indies was limited. For some years the greater part of the commerce continued to go in sailing vessels around the Cape of Good Hope. After the canal had been in use a few years, however, steamers were to a large extent substituted for the sailing vessels, and the Suez route for the Cape route for the greater part of the business. It will be seen that the traffic of the five years 1880–1884 was 217 per cent that of the previous quinquennial period. The tonnage of 1885–1889 was 286 per cent of the period from 1875 to 1879; the tonnage of 1890 to 1894 was 363 per cent, and that of 1895 to 1899, 401 per cent of the traffic of the five years 1875 to 1879. During the last quinquennial period of the twenty-five years from 1875 to 1899 the traffic of the Suez Canal was four times what it was during the first five years. Had the traffic of the years 1870–1874 been made the basis of comparison the above percentages would have been very much larger.

Omitting the first two years, when the traffic was comparatively light because but few steamships were available for the trade between Europe and the East, and making 1872 the basis of comparison, it will be seen that the traffic grew from 1,160,743 net tons in 1872 to 5,074,809 net tons in 1882, a gain of 337 per cent. The tonnage of 1875 had increased 215 per cent by 1885. The traffic of 1890 was 125 per cent greater than that of 1880. Since 1890 the absolute gain in the tonnage figures has been large, although the percentage of increase is less than it formerly was. The gain of 46 per cent from 1889 to 1899 represents an increase of 4,210,247 tons gross register and 3,112,443 tons net.

Should the rate of increase in the tonnage of the isthmian canal during the first ten years be half that of the Suez during the second decade of its use, the rate would be 62½ per cent. In view of the much larger rate shown by the Suez Canal, and in view of the conditions that will favor commercial progress at the time of and subsequent to the opening of the American canal, 62½ per cent is believed to be a conservative estimate.

THE ESTIMATE FOR 1924.

A decennial increase of 62½ per cent in the estimated traffic available for the canal in 1914, as determined by the figures obtained by using the tables prepared by the New Panama Canal Company, would give a tonnage of 11,372,941 net vessel tons in 1924. A 62½ per cent increase in the estimated vessel-tonnage total of 1914, reached by the Commission's study of entrances and clearances—6,843,805—would amount to 11,121,183. These two estimates for 1924 average about 11,250,000 tons.

For reasons stated above the entire amount of the available canal tonnage can hardly be expected to use the new route during the first year or two of the operation of the waterway, the period required for the readjustment of commercial arrangements. This adjustment will, however, not be delayed by a scarcity of steamers, and will be quickly made. After two years the full amount of the available canal tonnage—the available tonnage of 1916, not of 1914—will be passing the canal in all probability, and the 62½ per cent increase in the available tonnage of 1914 may fairly be expected to represent the actual tonnage at the close of the decade ending in 1924. In this calculation it is assumed that the canal will have been put in operation by the beginning of 1914.

Chapter XXII.

THE QUESTION OF TOLLS.

In levying tolls, three different purposes may control action. Such charges may be imposed as will cause the receipts to cover expenses only, or to cover the expenses and a fair rate of interest on the capital invested, or charges may be fixed for the purpose of securing the greatest possible income from the canal.

Should the principle of maximum revenue be adopted, the effect of tolls upon the volume of traffic will need to be carefully studied, because the receipts derived from the operation of the canal will be the product of two factors—the rate of toll and the volume of traffic. The tonnage of traffic being dependent upon the tolls charged, it would be necessary, in order to secure the maximum revenue, to ascertain what rate of toll could be paid by that volume of traffic which when multiplied by the rate would yield the maximum product. It is hardly necessary to say that there is no fixed rule by which the rate can be determined that would yield the greatest revenue. If there were such a rule, it ought not to be the one adopted in fixing the tolls of the Isthmian Canal.

The policy in regard to tolls should be adopted with reference to all the purposes which the canal is constructed to accomplish, and no argument need be advanced to enforce the truth that the revenue-producing function of the canal will be a minor one as compared with its function of promoting the industrial, commercial, and social progress of the United States and all countries whose trade will be affected by it. The exaction of charges that would largely restrict the volume of business done through the canal would permit the waterway to perform only in part the chief services it is designed to accomplish.

The canal is to be constructed and operated by the Government primarily for the promotion of the economic and political welfare of the people of the United States, and the tolls charged will doubtless be fixed so as not unnecessarily to interfere with the realization of this purpose. The principle of maximum charges would be inconsistent with the public welfare, and if tolls are levied the choice will lie between a rate that will cover only the expense of operation or a rate that will, in addition, yield an income on the capital invested.

Before beginning the discussion of tolls with reference to the American canal, it will be profitable to study the experience of the Suez Canal. That interoceanic waterway has now been in use over thirty years, and the main features and results of the financial policy maintained in its management may well be considered.

SUEZ CANAL TOLLS.

The charges for passing the Suez Canal are 9 francs[a] per net vessel ton, the tonnage being determined by the so-called Danube measurement, a system adopted by the International Tonnage Commission of Constantinople. Vessels in ballast obtain a reduction of 2½ francs per ton from the regular toll charges. Each vessel carrying passengers is obliged to pay 10 francs for each passenger above 12 years of age, and 5 francs for each passenger between the ages of 3 and 12 years. There are, in addition to these tolls, certain port and transit dues. A towage service is maintained for the use of such ships as may require towing, and for this service there is a fixed schedule of charges.

In applying the Danube rules to the measurement of a vessel the net tonnage resulting is considerably larger than the net tonnage of a vessel registered under the British or American flags. The following table shows the relation of gross to net tonnage, as determined by the Danube and other measurements, for three typical vessels which passed through the canal in 1900. The toll paid by these three ships is given and the amount which this charge would have been per ton net register, British measurement, is stated for two of the vessels, and per net ton Norwegian measurement for the third ship:

[a] The tolls were 9 francs at the time this report was prepared. They have since been reduced to 8½ francs.

Tolls charged for passing Suez Canal.

Name of ship.	Nationality.	Gross register.	Net register.	Net register tonnage, Danube measurement.	Percentage which Danube is of other measurements.	Tolls paid.	Charge per ton net, British and Norwegian measurements.
		Tons.	*Tons.*				
Sunderland	British	3,414.07	2,198.282	2,571.45	117	$4,466.61	$2.03
Queen Christiana	do	3,596.00	2,291	2,747.66	119.9	4,775.84	2.08
Bergenhus	Norwegian	3,628.00	2,361	2,986.72	126	5,376.09	2.19

The table shows that, according to the Danube rules, the net tonnage of a vessel will average fully one-fifth more than when measured according to British or Norwegian measurements. The toll charges of 9 francs were considerably over $2 per ton on the net register of the vessels, British or Norwegian measurement. The American measurements are made by practically the same rules as the British.

The total transit dues of the steamer *Bergenhus* were 27,887.95 francs, of which 26,880.45 francs were paid for tolls—the charges other than tolls amounting to 1,007.50 francs, or $194.45.

The traffic receipts of the Suez Canal from the first year of its operation to the close of 1901 is shown by the following table. The receipts are given in francs and in dollars, a franc having been considered equal to $0.193. The number of vessels and their mean net tonnage is also given in the table:

SUEZ CANAL TRAFFIC.

Number and size of vessels, receipts from tolls.

Year.	Number of vessels.	Mean net tonnage per vessel.	Transit receipts.	Receipts.	Year.	Number of vessels.	Mean net tonnage per vessel.	Transit receipts.	Receipts.
			Francs.					*Francs.*	
1870	486	898	5,159,327	$995,750	1886	3,100	1,860	56,527,391	$10,909,786
1871	765	995	8,993,733	1,735,790	1887	3,137	1,881	57,862,371	11,167,437
1872	1,082	1,071	16,407,591	3,166,665	1888	3,440	1,930	64,832,273	12,512,628
1873	1,173	1,166	22,897,319	4,419,182	1889	3,425	1,951	66,167,579	12,770,343
1874	1,264	1,290	24,859,383	4,797,861	1890	3,389	2,033	66,984,000	12,927,912
1875	1,494	1,345	28,886,302	5,575,056	1891	4,207	2,067	83,422,101	16,100,465
1876	1,457	1,439	29,974,999	5,785,174	1892	3,559	2,167	74,452,436	14,369,320
1877	1,663	1,416	32,774,344	6,325,448	1893	3,341	2,292	70,667,361	13,638,800
1878	1,593	1,425	31,098.229	6,001,958	1894	3,352	2,398	73,776,828	14,238,928
1879	1,477	1,532	29,686,061	5,629,410	1895	3,434	2,460	78,103,718	15,074,008
1880	2,026	1,509	39,840,488	7,689,214	1896	3,409	2,511	79,569,994	15,357,009
1881	2,727	1,517	51,274,353	9,895,950	1897	2,986	2,645	72,830,545	14,056,295
1882	3,198	1,586	60,545,882	11,685,355	1898	3,503	2,637	85,294,770	16,461,891
1883	3,307	1,746	65,847,812	12,708,627	1899	3,607	2,743	91,318,772	17,624,553
1884	3,284	1,787	62,378,116	12,038,976	1900	3,441	2,830	90,623,609	17,490,356
1885	2,624	1,748	62,207,439	12,006,035	1901	3,699	2,926	100,386,397	19,374,574

It is shown that there has been a fairly steady and a comparatively rapid growth in the traffic receipts of the canal almost from the time when it was opened for commerce. The traffic and the revenues were comparatively small the first two years, because there were not many steamers available for the commerce between Europe and the East. The transit receipts for the year 1899 amounted to $17,624,553. By grouping the canal receipts into five-year periods and comparing those periods with each other the rate of growth can be shown more accurately than by comparing one year with another. The annual variations are frequently large, but when quinquennial periods are compared the effects of these annual variations are minimized. In the following table the figures of the preceding table are grouped according to quinquennial periods. In comparing the periods the first five years are omitted, because if the figures of that period were made the basis of comparison the rate of increase would be so great as to give an exaggerated statement of the growth that has taken place since 1875:

Increase in number and size of vessels, and receipts of Suez Canal, by quinquennial periods, 1875–1899.

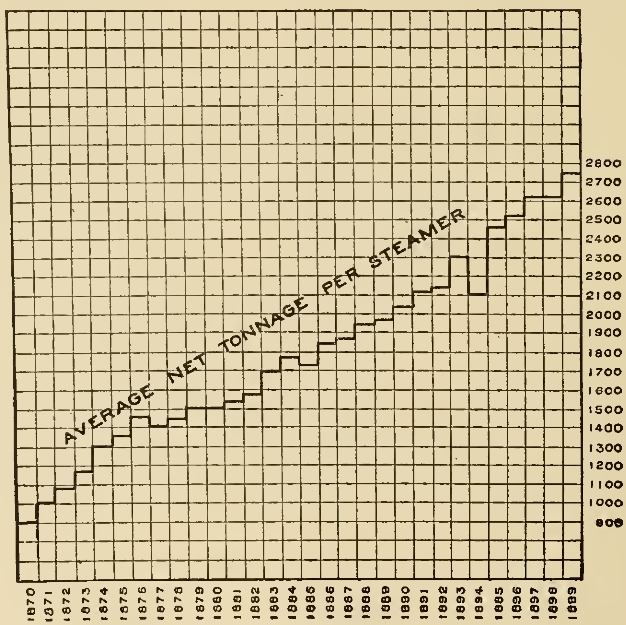
Year.	Number of vessels.	Mean net tonnage per vessel.	Receipts.	Percentage which receipts of 5-year periods are of receipts of 1875–1879.	Year.	Number of vessels.	Mean net tonnage per vessel.	Receipts.	Percentage which receipts of 5-year periods are of receipts of 1875–1879.
1870–1874	4,770	1,123	$15,115,248		1885–1889	16,726	1,879	$59,366,229	202
1875–1879	7,684	1,430	29,317,046		1890–1894	17.848	2,108	71,275,425	243
1880–1884	14,542	1,644	54,018,122	184	1895–1899	16,939	2,659	78,213,756	266

The receipts of the period 1880 to 1884, inclusive, were 184 per cent of those of the previous five years. The revenues from traffic during the five years 1885–1889 were 202 per cent of those obtained during the period 1875–1879, whereas the revenues for the five-year periods 1890–1894 and 1895–1899 were, respectively, 243 and 266 per cent of the receipts obtained in the years 1875 to 1879. The transit revenues of the last five years of the quarter century were two and two-thirds those of the first five years. The traffic of this later period was fourfold that of the five years which are made the basis of comparison.

The Suez Canal has been a very pro˜table investment of capital. There are 400,000 shares of capital stock, with a par value of 500 francs each, and bonds which amounted to 177,340,000 francs in 1898. The dividends paid on the stock reached 5 per cent in 1874, were $5\frac{7}{10}$ per cent in 1876, and 6 per cent in 1879. They have been as high as 17 per cent. In 1898 the net balance for distribution, after paying costs of operation, interest on the bonds, and other expenses, amounted to 46,618,000 francs. In the distribution of this sum the shareholders received 71 per cent of the total, 33,098,780 francs, i. e., 16½ per cent of the face value of their stock. Of the remaining 29 per cent of the net earnings, 15 per cent went to the Egyptiai Government, 10 per cent to the founders, 2 per cent to the directors, and 2 per cent to the employees.

An additional fact of mu interest is shown by the preceding tables. It will be noted that the number of vessels passing the canal was no greater in 1899 than in 1885. During those fifteen years the tonnage has increased 56 per cent. The number in 1901 was 508 less than in 1891, but the gross tonnage in 1901 was nearly 3,000,000 greater than in 1891. The larger volume of traffic has been accommodated by increasing the size instead of the number of the ships. The mean net register of the vessels using the Suez Canal is now about 3,000 tons. Should the present rate of increase continue until 1914, the vessels will then average 3,600 tons net, and it is probable that the large dimensions about to be given the Suez Canal will result in more rapid increase ın the size of vessels than is now taking place.

The growth in the size of ships using the Suez Canal is graphically shown by the following diagram:



The tendency to increase the size of ocean vessels is important in connection with the study of the traffic of the isthmian canal, because the cost of operating the canal will depend, to some extent, upon the number of lockages. The maximum traffic capacity of the canal will also be greater if vessels of large instead of small dimensions are used. A traffic of 10,000,000 tons net per year would require the passage of 5,000 vessels, with an average net register of 2,000 tons, or about 7 ships each way per day on an average. The same number of ships double the size would make the annual tonnage 20,000,000 tons without any increase in the number of lockages required.

In this connection attention may properly be called to the possible traffic capacity of a twin-lock canal such as the isthmian waterway will be. By the time the canal has been put into operation the vessels using it will, in all probability, average as much as 4,000 tons net register. If 50 such vessels were to pass through the canal daily, 25 each way on an average, the total annual net tonnage would be 73,000,000 tons. Inasmuch as the time ordinarily required for a ship to pass a lock will not exceed three-fourths of an hour, a canal with twin locks could readily handle an average of 25 vessels per day each way, and do so without delay to commerce, except, perhaps, at certain times when the rush of traffic might largely increase the average daily number of vessels making the passage.

EFFECT OF TOLLS UPON VOLUME OF TRAFFIC OF SUEZ CANAL.

In the case of the Suez Canal there is but a comparatively small percentage of the total available tonnage situated on the margin of advantage, and for that reason the Suez Canal Company has been able to derive large revenues from the maintenance of high tariffs. The trade of Europe with Australia is more liable than any other important category of available commerce to be kept away from the canal and sent around the Cape of Good Hope, but a part even of that trade is done by way of Suez. The passenger and mail steamers all use the canal, while most of the slow freight steamers take the Cape route.

A reduction in the Suez Canal charges would draw to that waterway some, but not a very large amount, of the European trade with the East. The change from sail to steam power is helping the Suez Company to get the business without reducing its charges. The high tolls of the Suez have a greater deflecting effect on the commerce of the eastern seaboard of the United States with the East than on the trade of Europe with the countries of that region, because the saving in distance accomplished by the canal is much less for the American than for the European commerce. From New York to Australia the Cape route is no longer than the canal route for full-powered steamers, and of course vessels go by the Cape. In going from New York to Singapore and points in China and Japan the course by way of Suez saves less than 2,000 miles, and the canal route is from seven eighths to five-sixths as long as that around Good Hope.

Sailing vessels leaving New York for the Far East take the Cape route, but steamers always go through the canal. A large reduction in the Suez Canal tolls would doubtless hasten the substitution of steamers for sailers, and secure for the canal a larger share of the total traffic, at least until the American isthmian waterway had become available.

The traffic of the Suez Canal could be increased by a reduction of 50 per cent in the transit charges, but the effect of tolls upon the tonnage of the Suez waterway is not so great as the influence of the isthmian-canal charges will be on the volume of traffic using that waterway. The marginal traffic is much greater in the case of the American waterway, and high tolls will cause much trade to adhere to existing ocean routes. Moreover, the traffic between our two seaboards, which will constitute a large share of the total canal tonnage, will be competed for by rail as well as water routes, and the higher the canal tariffs are the larger will be the share of the total commerce between the eastern and western sections of our country that will move by rail.

The commerce whose routes will be most affected by the tolls of the isthmian canal will be that between Europe and Chile, that of the United States and Europe with Australia, and that of the United States with the Philippines, southern China, and a part of that with the Dutch East Indies.

ISTHMIAN CANAL TOLLS AND THE CHILEAN TRAFFIC.

Three-fourths of the Chilean tonnage consists of nitrate of soda, the deposits of which are located in the northern part of the country, in the middle part of the west coast of South America. The route north from the nitrate beds of northern Chile by way of an isthmian canal will require the vessel to make a detour of some length to the west, and the average distances from Europe to the nitrate deposits will be shortened about 2,800 nautical miles by the canal. About 30 per cent of the present distances through the Straits of Magellan will be saved. A saving of 2,800 miles would shorten the time of the voyage for a 10-knot steamer, eleven days and sixteen hours. In using the canal route for the purpose of saving this distance of 2,800 miles, something over a day would be required for passing a Nicaragua canal, and somewhat more than a half day for the transit across Panama. In general, a 10-knot steamer could shorten the time of its voyage between Europe and the central part of western South America ten days by using a Nicaragua canal, and eleven days by passing through a Panama waterway instead of going around by the Straits of Magellan. A vessel operated at a speed of 9 knots per hour, which is the present speed of the larger share of tramp steamers—the vessels in which the major portion of the world's ocean commerce is carried on—would shorten the time of its voyage thirteen days by avoiding 2,800 miles of sailing. Such a vessel could get from Europe to the middle part of the west coast of South America eleven and one-half days sooner by way of a Nicaragua canal, and twelve and one-half days earlier via a Panama route.

Would the possibility of saving from ten to eleven and a half days cause a vessel running between Europe and Chile to pay tolls for the privilege of passing an isthmian canal, and what charges could the vessel afford to pay? This depends mainly upon the costs of operating the ship when at sea.

The information received from a firm operating several ships is:

> The cost of operating a modern freight steamer of, say, 2,500 tons net register (dead weight cargo capacity, say, 6,000 tons), averages not exceeding, say, $175 per day. This includes wages, provisions, coal, interest on capital invested, insurance, wear and tear.

Another authority states:

> We find that the average cost of operating a steamer of, say, 8,000 gross tons dead weight capacity (about 3,500 tons net), which includes bunker coal as well as cargo, making an average speed of 9 knots per hour between New York and San Francisco, to be about $300 per day. This covers cost of bunker coal, victualing and manning, and insurance only. The cost of bunker coal is based upon the average cost of same to-day (1901).

This latter statement of costs of operating ships does not inclnde the expenses of interest on capital, nor is anything allowed for depreciation in the value of the ship. The addition of these items would somewhat increase the average daily expenses.

These two calculations as to the costs of operating vessels give results differing largely, doubtless for the reason that the first calculation is based on experence in the operation of ships under a foreign flag across the Atlantic, where coal is cheap, and for the reason that the costs are for normal times instead of for a year, when prices were unusually high, while in the second estimate the experience drawn upon consisted in the management of vessels under the American flag at a time of high prices and upon a route where the costs of coal are very much higher than in North Atlantic ports.

The costs of chartering British steamers in 1900 and 1901, and operating them at a speed of 9 knots in the trade between the Atlantic and Pacific coasts of America are given by a firm having a large business.

The actual monthly and daily expenses incurred for two of these British ships by the American firm chartering them was as follows:

1.

Gross register	tons..	3,048
Net register	do..	1,954
Dead-weight capacity, including coal and stores	do..	5,000
Freight, at 4s. 6d. per dead-weight ton per month (30 days), say, 1,125, at $4.86		$5,467.50
Coal, 20 tons per day, 30 days = 600 tons, at $3		1,800.00
Total		7,267.50

$7,267.50 ÷ 30 days = $242.25 per day.

2.

Gross register	tons..	3,244
Net register	do..	2,104
Dead-weight capacity, including coal and stores	do..	5,100
Freight at 5s. 6d. per dead-weight ton per month (30 days), say, 1,402–10, at $4.86		$6,816.15
Coal, 20 tons per day, 30 days = 600 tons, at $3		1,800.00
Total		8,616.15

$8,616.15 ÷ 30 days = $287.20 per day.

In the case of both of these ships the charterer paid port charges, agency fees, stevedoring, and pilotage. The vessel owner paid for engine stores, wages of crew, insurance on vessel, and victualing, and in fixing his charges included payment for wear and tear, and presumably a profit to owners.

The rates paid to the owner by the charterer—a certain amount per month per ton, dead-weight capacity—vary according to the supply of and demand for ships. The supply of vessels since these figures were submitted has been such as to reduce existing charter rates very considerably.

A saving of $175 a day for ten days would amount to $1,750, and for eleven and one-half days to $2,022.50. A toll of $1 per net ton register on a ship of 2,500 tons would equal $2,500, or considerably more than such a vessel operated at a speed of 9 or 10 knots could save by shortening the voyage between Europe and Chile 2,800 miles. However, something should be added to these amounts saved by shortening the voyage, because the insurance would be less on the vessels that used the canal instead of passing through the Straits of Magellan, which are especially dangerous to navigate. Moreover, freight rates could be made somewhat higher by the vessel that could deliver its cargo in a shorter time. Time is money in most lines of trade. Furthermore, men operating vessels would for a like reason prefer to have the ships use the route that would enable them to do the greatest possible amount of business each year. It would be difficult to put these advantages of the isthmian over the Straits route into their exact money equivalent, but they would constitute a strong reason for using a canal and for paying something for the privilege. It is probable that a freight steamer of 2,500 tons net, even if operated at a total daily cost of no more than $175 while running between Chile and Europe, would prefer to pay $1 a ton net register for using an isthmian canal to taking the route through the Straits of Magellan.

If the daily expenses of the steamer of 3,500 tons net are $300 when run at 9 knots, it could save $3,750 by using a Nicaragua canal, and $4,050 by a Panama waterway, instead of going around through the Straits of Magellan. If the expenses were $300 when operated at a speed of 10 knots, it could save $3,050 by way of Nicaragua and $3,350 by way of Panama. A toll of $1 per net ton on the ship would amount to $3,500, and for the reasons just stated a charge of that sum for the use of the canal could profitably be paid.

The chartered steamers above referred to had a net registered tonnage of 1,954 and 2,104 tons, respectively. At the rate of $1 a ton their toll charges would amount to $1,954 and $2,104. A saving of ten days in making a voyage would reduce the expenses of the ship whose net register is 2,104 tons $2,872. It is evident that these vessels would pay $1 a ton for the use of an isthmian canal if they were being operated over a route that the canal could shorten ten days. They would, moreover, use the canal were the costs of chartering and operating them considerably lower than at present.

The commerce between the eastern coast of the United States and western South America would be so facilitated by an isthmian canal that a toll of more than $1 a ton could be paid for practically all this trade. The distance from New York to a point as far south as Valparaiso will be 3,831 miles, or 45 per cent, less by way of the Panama canal than via the Straits of Magellan; and between ports on our coast south of New York and cities on the west coast of South America north of Valparaiso the absolute and percentage reduction in distance will be much greater.

ISTHMIAN-CANAL TOLLS AND THE AUSTRALIAN TRADE.

For the trade from New York to Australia the best route at present is that by way of the Cape of Good Hope, the distances by the Suez and Cape routes being practically the same; consequently, when the American canal has been opened the competition for the New York-Australian trade will be between the isthmian canal and the Good Hope routes. The distance from New York to Sydney via the Panama Canal and Tahiti will be 9,852 nautical miles, and by way of St. Vincent, the Cape of Good Hope, Adelaide, and Melbourne 13,658, the difference in favor of the Panama route being 3,806 miles. Adelaide is 1,640 miles nearer New York by the Panama Canal, and Melbourne is 2,656 miles nearer.

A 10-knot vessel going out from New York to Sydney, Australia, would save between fourteen and fifteen days by taking the American canal route, and would certainly take that course if the toll were not over $1 a ton net register. Practically all vessels going to Australia, whether from the United States or Europe, call at Sydney, because it is the most important port and is a good place to obtain coal. A steamer from New York to Melbourne would save 2,656 miles and ten days by going by way of Panama, Tahiti, and Sydney instead of by the way of the Cape of Good Hope and Adelaide. A toll of $1 per ton could profitably be paid to accomplish this.

There is, then, no probability that steamers outbound from the eastern seaboard of the United States to Australia will take the Cape of Good Hope route in order to avoid American canal tolls of $1 a net ton. The route taken by the vessel on its return will be determined by the destination of the Australian exports. If the vessel should secure a full cargo in Australia for America, it would return by the Panama Canal. The ability to secure a partial cargo for the United States and a partial cargo for Europe would probably cause the American canal to be used. Upon reaching the United States, the freight destined for the United States might be exchanged for European cargo, with which the ship would proceed to Europe; or the steamer might discharge its entire cargo, that for Europe being transhipped to another vessel. The line steamer making the round trip from New York to Australia and return might come back by the

Suez route at times; but the return voyage would usually be by way of the American isthmus. If the American tolls were much lower than those of the Suez, the route across the Pacific would certainly be taken.

Steamers securing a full cargo for Europe in Adelaide, Melbourne, or Sydney would probably return by the Cape of Good Hope, although cheaper coal in American stations might turn the scale in favor of the isthmian canal. The distance from Sydney to Liverpool via Melbourne, Adelaide, King Georges Sound, Colombo, and Aden is 12,234 miles, and via Tahiti and Panama the distance is 12,591, or 257 miles more by the American canal. A vessel starting from Melbourne for Liverpool would find the route via Sydney, Tahiti, and Panama 1,507 miles more than the one via Suez.

A ship obliged to leave Australia in ballast or with but little freight would seek cargo either in the East Indies, New Zealand, Chile, or elsewhere as the needs of commerce might determine. Those ships seeking freights west and north of Australia would naturally return by the Suez Canal.

THE PHILIPPINE TRADE.

The effect of the isthmian canal upon the routes followed by the trade between our eastern seaboard and the Philippines will be to divert a considerable share of the traffic from the Suez to the American canal. Steamers now use the Suez, and after the American canal has been opened the choice will lie between the two canal routes. The distance by the Cape of Good Hope is too great to permit that route to compete with the canals for the traffic handled by steamers. The distances from New York to Manila by the two canals are nearly equal—11,601 miles via Suez, 11,585 by way of Panama, San Francisco, and Yokohama, and 11,675 via Honolulu and Guam. From our South Atlantic and Gulf ports the distance to Manila will be much less by the American canal than by way of Suez. As explained above in the chapter on the vessel tonnage of available canal traffic, chartered vessels outbound from New York will doubtless go sometimes by one route and sometimes by the other. The chief attractions of the American canal route will be the coasting trade of both seaboards of the United States—the shortest route from Central America to Manila being by the great circle which passes close to San Francisco—the large volume of exports from the United States to Asia, the Asiatic coasting trade of Japan, Shanghai, and Hongkong, and the cheap coal obtainable in the Caribbean and Japanese coaling stations. The inducements of the Suez route will be the large volume of exports from the United States to Europe, and the possibility of trading at numerous intermediate ports in the British, Dutch, and French East Indies. Likewise chartered vessels returning to the United States from Manila will sometimes come by way of Hongkong, Shanghai, Yokohama (or other Japanese ports), Puget Sound, San Francisco, Central America, etc., and sometimes by the East Indian ports, the Suez Canal, and Europe. Line steamers plying under the American flag, between our eastern seaboard and the Philippines, would probably be operated through the isthmian canal and would participate in the trade between the eastern and western coasts of the United States.

The Philippine Islands are so nearly antipodal to the eastern seaboard of the United States that the commerce between the two sections will be divided between the two opposite routes, unless the tolls charged at one of the canals should be much higher than those levied at the other. A toll of nearly $2 at Suez and $1 at the American canal would doubtless cause the latter route to secure much more than half of the total traffic. The certainty of competition between the Suez and American canal routes, for the trade between our eastern seaboard and the Philippines and southern China, suggests the desirability of making the isthmian canal tolls lower than those charged by the Suez Canal Company, in order that as much as possible of the commerce of our antipodes may be made tributary to the isthmian canal. In view of the fact that the larger part of the Suez traffic can afford to pay a high toll in preference to changing from the Suez to some other route, it is not probable that the Suez Canal Company will find it profitable to make radical reductions in its charges—a reduction of 50 per cent, for instance—in order to hold the commerce of the regions situated on the margin of advantage as regards the use of the easterly or westerly canal routes; consequently, it would seem that the adoption of moderate tolls—not to exceed $1 per ton net register, American measurement—for the use of the American canal would enable that waterway to secure a large share of the commerce carried on between sections so situated that their trade with each other can and will choose between the Suez and American routes.

In general it may be said that there is but little of the available canal traffic that will be kept from using the waterway by a toll of $1 a ton, net register. The European trade with western South America, and the commerce of our eastern seaboard with Australia, will not be driven from the isthmian canal by a toll of that amount; but it seems probable that a higher charge than $1 a net ton would largely restrict the tonnage using the canal.

The tendency of traffic to follow round-the-world lines will be emphazied by moderate charges for the use of the American canal. The distance between Europe and the eastern shore of Asia is somewhat farther by way of Panama than by way of Suez, but there are commercial reasons why a portion of the trade between these two sections should pass by the eastern and western seaboards of the United States and through the American canal. A toll of $1 a net ton would probably not much restrict the operation of those commercial forces.

In the foregoing discussion a toll of $1 a net ton has been made the basis of reasoning because that represents a maximum beyond which the charge ought not to go. A tariff much higher than that would in all probability so restrict the tonnage passing the canal as to reduce the revenue derived from the tolls. Such a restriction would unfortunately limit the industrial and commercial value of the canal. The lower the tolls the greater the traffic of the canal and the larger the industrial and commercial benefits. It is believed that a toll of $1 a vessel ton net register would yield an income sufficient to pay the expenses of operation and maintenance and a moderate return on the capital invested. Should the United States prefer to levy tolls sufficient only to cover the cost of operation and maintenance, a tariff of one-third of a dollar a ton would probably suffice.

NOTE.—The advautages of the Panama route over alternative routes as regards coal costs—a subject that is fully considered in the 1912 report—are such as to enable tolls of more than one dollar a net ton to be charged without limiting the traffic and the industrial and commercial value of the Panama Canal.

APPENDIX II.

TOLLS AND OTHER CHARGES IMPOSED BY THE SUEZ MARITIME CANAL COMPANY.

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TOLLS AND OTHER CHARGES IMPOSED BY THE SUEZ MARITIME CANAL COMPANY.

THE ACT OF CONCESSION, JANUARY 5, 1856.

ARTICLE 14.

We hereby solemnly declare for ourselves, and for our successors under reserve of ratification by His Imperial Majesty the Sultan, the great maritime canal from Suez to Pelusium and ports belonging to it henceforth and forever open, as neutral passages to any merchant vessel crossing from sea to sea without any distinction, exclusion, or preference whatever for persons or nationalities, against the payment of dues and execution of regulations established by the said universal company grantee for the working of the said canal and its dependencies.

ARTICLE 17.

To indemnify the company for the expenses of construction, maintenance, and working devolving upon them by these presents, we authorize the company henceforth, and during the whole term of their lease, as determined by clauses 1 and 3 of the preceding article, to establish and levy for the passage through the canals and ports thereunto appertaining, navigation, pilotage, towage, tracking, or berthing dues according to tariffs which they shall be at liberty to modify at all times upon the following express conditions:

First. That these dues be collected without exception or favor from all ships, under like conditions.

Second. That the tariffs be published, three months before they come into force, in the capitals and principal commercial ports of all nations whom they may concern.

Third. That for the special navigation due the maximum toll shall not exceed 10 francs per ton of capacity on vessels and per head of passengers.

[NOTE.—Articles 1 to 10 of the "Regulations for the Navigation of the Suez Maritime Canal" are rules governing the operation of the canal. They are reprinted as an appendix to "The report upon the measurement of vessels." The articles here reproduced—11 to 16—and the "Tariff for hire of plant" contain all the canal company's charges.]

REGULATIONS FOR THE NAVIGATION OF THE SUEZ CANAL.

ARTICLE 11.

SECTION 1. The net tonnage resulting from the system of measurement laid down by the International Commission of Constantinople, and inscribed on the special certificates issued by the competent authorities or on the ship's official papers, is the basis for levying the special navigation due, which is at present 6 francs 25 centimes [after Jan. 1, 1913].

In levying the dues any alteration of net tonnage subsequent to the delivery of the above-mentioned certificate or papers is taken into account.

SEC. 2. The canal authorities may ascertain whether cargo or passengers are carried in any spaces which, as shown by the certificate of tonnage, have not been included in the gross measurement, or which were allowed as deductions for the accommodation of the crew after measurement, or which, being within the engine, boiler, or bunker space, form no part of the net tonnage shown on the certificate; and generally may verify whether all the spaces which ought to be included in the tonnage are entered on the certificate and are exactly determined thereon.

SEC. 3. Every vessel not provided with a special certificate or official papers giving the net tonnage laid down by the Constantinople commission is measured by the company's officials in conformity with the Constantinople rules and must pay her dues on such measurement until she produces a special certificate issued by the authorities of her own country.

SEC. 4. Ships in ballast are allowed a reduction of 2 francs 50 centimes per ton on the full transit rate.

Any ship carrying mails or passengers or having in her holds coals or merchandise of any description, in whatever quantity, is not considered as being in ballast.

The space occupied by bunker coal must not exceed in volume 75 per cent of the engine room as measured.[1]

Sec. 5. Transit dues are charged on all passengers at the rate of 10 francs per passenger above 12 years of age and 5 francs per passenger between 3 and 12.

Children under 3 years of age pay no dues.

Sec. 6. A reduction of one-half of the dues is allowed to ships and passengers using the canal only as far as Ismailia, or, conversely, from Ismailia to either Port Said or Port Thewfik only.

Sec. 7. All transit and passenger dues must be prepaid at Port Said or Port Thewfik.

Sec. 8. The berthing or anchorage dues at Port Said, Ismailia, and off the company's embankment at Port Thewfik are fixed at 2 centimes per ton per day, whatever be the duration of the ship's stay, but the first 24 hours are not included. These dues are payable every 10 days.

Sec. 9. Claims for errors in the declaration of tonnage or in the levying of the dues must be sent in within a month after the ship's passage through the canal.

No erroneous application of the tariff can ever be brought forward as a precedent against the company.

Article 12.

Sec. 1. The charge for towage over the whole length of the canal is as follows:

(1) When towage is compulsory (see art. 2): For steamers, 50 centimes per ton of the ship's net tonnage, subject to keeping her engines going or in readiness to assist the tug; the maximum charge being 2,500 francs; for steamers unable to give the assistance of their propelling power, or not desiring to do so, and for sailing ships above 400 tons gross, 1 franc per ton of the ship's net tonnage; the maximum charge being 5,000 francs.

(2) When towage is not compulsory, but takes place at the captain's request: For ships using their engines or holding them in readiness, 1 franc per ton of the ship's net tonnage, 1,200 francs being a minimum charge; for ships not desiring to assist the tug with their propelling power, 2 francs per ton of the ship's net tonnage, 2,000 francs being a minimum charge.

(3) When a tug tows a vessel one-half of the length of the canal only, one-half only of the dues above specified for towage over the whole length is charged.

No other division than one-half of the length of the canal is admitted in charging for towage; from Ismailia to Port Said being considered one-half, and from Ismailia to Port Thewfik the other half.

(4) By way of exception to the above scale of charges, a rate or charge is fixed by private agreement for the towage, whether compulsory or optional, of lighters, dredgers, and floating appliances of any description. The towage charge for sailing ships with a tonnage of 400 tons gross or under is also fixed by private agreement.

All ships towed must furnish their own warps.

Sec. 2. The charge to ships applying for towage to or from the roads by the company's tugs is fixed at 10 centimes per ton of their net tonnage: At Port Said, for the distance between the inner docks and the end of the jetties and conversely; at Port Thewfik, for the distance between the docks and the roads and conversely; the minimum charge being 25 francs.

For towage over a greater distance, the charge is fixed by private agreement.

Sec. 3. When a ship requires a tug to act as a tender, the charge for convoying is 1,200 francs per day if a tug of the first class be employed, and 800 francs per day for a tug of the second class. In the event of stoppage, the tug renders assistance in getting the vessel underway as often as may be necessary. If the vessel is towed by the tender any distance exceeding that from one station to another, the charge for towage may be demanded in lieu of the charge for doing duty as a tender.

Sec. 4. In all other cases tug hire is invoiced at the tariff rates annexed to the present regulations.

Sec. 5. Shipowners are authorized to have their vessels towed or convoyed by their own tugs, or tugs on hire, under their entire responsibility. Such tugs must be approved of by the canal company.

Ships towed or convoyed by approved tugs, however, pay 50 centimes per ton as towage dues.

Such approved tugs, whenever they tow or convoy vessels belonging to their own proper owners, are free of any tax whatever.

Whenever they go through the canal for the purpose of meeting vessels of their owners which they are about to tow or convoy, or when returning to their home berth after having towed or convoyed the said vessels, tugs are not liable to payment of the special navigation dues, but they must take a pilot on board.

[1] See art. 16, of the regulations for the measurement of tonnage. [Reproduced in Appendix XI of volume on "Measurement of Vessels"

They must carry neither goods nor passengers; the fact of having on board passengers or goods renders them liable to the payment of all dues and charges to which ships in transit are subject.

Whenever approved tugs are used for towing or convoying vessels not belonging to their own proper owners, the same dues and charges are levied on them, for every passage through the canal, as on ships in transit.

Notwithstanding the special treatment here specified, tugs belonging to private owners are subject to the strict observance of all other articles of the regulations relative to vessels underway or berthed.

Article 13.

Pilotage in or out of Port Said is charged for as follows:

(1) For ships not going through the canal:

	Francs.
By day:	
Steamers	25
Sailing vessels	10
By night (between sunset and sunrise):	
Steamers	50
Sailing vessels	20

(2) For ships going through the canal:

By day	Free.
By night:	
Steamers	25
Sailing vessels	10

Pilotage in or out of Port Said is compulsory on all ships above 100 tons gross measurement.

Pilotage in or out of Port Thewfik, whether by day or by night, is not charged for.

When the pilot is kept on board beyond the time required for pilotage proper, a charge of 20 francs per day is due.

Article 14.

The navigation of all undecked vessels is governed by special regulations, a copy of which is handed to the masters of all craft engaged in that navigation about to enter the canal.

All dues are charged at the rates prescribed in the present regulations, notably as regards the transit dues, article 11.

When navigation does not extend over the whole length of the canal the transit dues are charged proportionately to the distance covered, reckoned from station to station.

Article 15.

Shipping of every description, whether native craft, lighters, ships, or other vessels, effecting a complete return journey between Ismailia and Port Said, or conversely, one half of the journey being effected in ballast or empty and the other half laden, are not liable to the special navigation dues, and are charged 2 francs 60 centimes per ton on the laden portion of the journey only. Payment must in every case be made previous to the commencement of the journey.

Any other dues are payable in full.

Article 16.

All charges prescribed in these regulations must be paid in cash. Payments may be tendered either at the company's offices in Egypt, or at the head office in Paris, or to any duly appointed agent of the company.

In the case of amounts tendered otherwise than at the company's offices in the Isthmus, receipts are delivered to shipowners or consignees, which the captain tenders as cash to the company's officials in Egypt appointed to collect the dues.

In case of payments tendered too late for receipts reaching captains by post the company are prepared to wire out to their Port Said office, at owner's cost, due notice of the payment.

Whenever amounts thus paid in advance are insufficient for the discharge in full of all charges and incidental expenses due by ships the balance must be paid in Egypt at the company's offices.

Tariff for the hire of plant.

	Francs.
A tugboat:	
First class, per hour	92
Second class, per hour	55
Third class, per hour	27
Fourth class, per hour	18
A lighter:	
First category, per day	37
Second category, per day	19
Third category, per day	12
A sheer hulk of—	
60 tons, for the first hour	60
40 tons, for each consecutive hour after the first	30
25 to 30 tons, for the first hour	50
A floating self-propelling crane of 12 tons, for each consecutive hour after the first	25
A sheer hulk of 8 tons:	
For the first hour	35
For each consecutive hour after the first	17
Greindl exhausting pump:	
Hire (of whatever duration)	500
Plus—	
Per hour of working	50
Per hour of berthing at anchor	40
Ordinary lighter pump, per hour	15
Diving appliances:	
(1) Hire of diving apparel and appliances	8
(2) Each hour of diving proper, reckoned from the moment the diver enters the water to the moment he leaves it, over and above the hire of the diving apparel and appliances	6.25

NOTE.—For tugboats, hire is reckoned from the time of first firing; for the other appliances, from the time they leave the depot. It ceases when they reenter the depot. The charges for towage of the appliances have to be paid over and above the amount for hire.

APPENDIX III.

STATUTE OF THE GERMAN EMPIRE CONCERNING CHARGES FOR THE USE OF THE KAISER WILHELM CANAL, JUNE 20, 1899.

Appendix III.

STATUTE OF THE GERMAN EMPIRE CONCERNING CHARGES FOR THE USE OF THE KAISER WILHELM CANAL, JUNE 20, 1899.[1]

I, Wilhelm, by God's grace German Emperor, King of Prussia, etc., in agreement with the Imperial Council and the Diet, order the following in the name of the Empire:

Article 1.

The period from the enactment of May 27, 1896 (Imperial Gazette), to the 30th of September, 1899, inclusive, within which the determination of the canal tariff governing the payment of fees was left to the Emperor in conjunction with the Imperial Council, is extended to the 30th of September, 1902.

Article 2.

The exemption from the payment of canal fees extends only to those vessels which are authorized to fly the imperial war flag, public ships which are the property of the Empire or one of the Federated States, and other vessels which during their passage through the canal remain exclusively in the service of the Empire or of one of the confederated States.

This exemption does no apply to the towing charges and other liabilities for special services of the canal authorities.

Article 3.

As far as possible the canal fees are paid in advance unless the canal officials grant an extension of time. The duty of calculating the approximate amount of the total fee can not be postponed by an objection to the amount determined.

The officers of the canal administration, as the officers intrusted with the collection of dues, are required to test the accuracy of the statements in the papers presented for the determination of the amount of the canal fees, in case it is necessary, by means of an inspection of the ship's compartments and by an examination of any additional ship's papers or bills of lading. The officers can only require sufficient information concerning other documents as is necessary to determine whether or not they belong to either the ship's papers or bills of lading.

Article 4.

An objection to the amount of the canal fees can be made at the imperial canal office within a period of six months after the notification of the total amount to the captain or person who is to make the payment in his place. An appeal from a decision of the canal authorities must be made to the chancellor within a period of one month after the finding. The filing of an appeal against the decree of the chancellor is permitted within six months after the finding as long as the payment or avoidance of the claim is made valid.

The notification in the foregoing case, as in the case of article 10, can be made through an officer of the canal administration or other public officer.

Article 5.

A subsequent claim for canal fees for a discontinued or unimportant trip can only be made within a year of the trip. The liabilities for an afterpayment of old fees become void in three years.

[1] Translation by Lieut. Edward B. Dennis, Coast Artillery Corps, from "Betriebsordnung Fuer den Kaiser-Wilhelm Kanal," Reichs-Gesetzblatt Feb. 23, 1911, pp. 315 et seq.

ARTICLE 6.

The claims of the canal authorities for back or current fees are outlawed in four years after the termination of the year in which they became due.

The period of limitations, without regard to the grounds of interruption, as expressed by the municipal law, is terminated by a demand for payment, or by an extension of time. After the end of the year, which contains the point of time determining the end of the interruption, or in case the time period is up, a new period of outlawry of four years begins.

ARTICLE 7.

The canal fees and the expenses incurred in their determination are subject to collection by forcible procedure which conforms to the regulations in force in Prussia.

ARTICLE 8.

Whoever undertakes either in whole or in part to evade the payment of fees for the use of the Kaiser Wilhelm Canal, and its appurtenances, and especially by such means that he—

(*a*) Exhibits false papers to be used in the calculation of the fees, to the officers concerned, especially if they are ship's papers which are false, or makes false statements which are material to the determination of fees, or

(*b*) Uses the Kaiser Wilhelm Canal, or its appurtenances, by evading the locks, or uses the canal without a pass, in case a pass is required, will be punished by a fine in amount four times as large as that evaded, but at least 30 marks. If the amount withheld can not be ascertained, then a fine of from 30 to 1,500 marks is levied.

In addition to this punishment, the amount withheld must be paid.

ARTICLE 9.

The liability of prosecution for acts contrary to the regulations of article 8 is outlawed in three years.

ARTICLE 10.

Fines for acts in violation of article 8 are determined by a sentence conforming to article 459 of the Criminal Code. The abatement of such a sentence is made under the authority of the canal superintendent. The judgment must include the necessary specifications according to article 459, part 2, of the Criminal Code, and the evidence upon which the fine is adjudged.

To aid in the determination of the facts the canal authorities can cause the examination of the accused. Forceful measures for the personal appearance are not authorized. The canal office must summon and procure witnesses in accordance with the provisions of the ordinance of prosecution. Whoever does not comply with the obligation to testify will be arrested at the request of the canal authorities by proper application of articles 50 and 69 of the ordinance of prosecution by the court in whose jurisdiction he dwells or is stopping.

ARTICLE 11.

The superintendent of the canal, the other officers of the canal administration, and the officers intrusted with the collection of fees, in case there is danger of delay, are authorized to effect the arrest of any object which could be used as a medium of proof for any investigation of importance.

If the residence of the defendant is unknown or is situated without the Empire, the superintendent of the canal office and the higher executive officers of the canal administration are authorized, upon violation of this act, and in case there is danger of delay, to attach the vessels, together with their accessories and other accompanying articles, so far as they belong to him and are subject to attachment, for the amount of the fine which is presumably appropriate to the defendant, the cost of the proceedings and the canal fees. The canal management may refuse the release until the payment of the designated amount.

The ratifications for a seizure which is not directed by the canal office should be sought within 3 days after the ordering of the seizure. The party concerned can also appeal from the decision of the superintendent at any time.

A seizure requiring confirmation loses its effect if the confirmation ruling does not take place within a week after the ordering of the seizure at the place of service from which the ordering proceeds.

ARTICLE 12.

The execution of the finding is made according to the rule of article 7 by the officer charged with the collection of canal fees.

The transformation of an uncollected fine into an exemption follows according to the rules in article 463 of the ordinance on criminal proceedings, and in article 28 and article 29 of the penal code book.

ARTICLE 13.

The fines paid on account of judicial findings are paid into the Imperial Treasury.

ARTICLE 14.

The rules of the statute of June 9, 1895 (Imperial Legal Gazette, p. 256), governing the assistance rendered in the collection of dues and in the execution of judgments, apply to the collection of canal fees and to the accomplishment of the prosecution by the Government for acts contrary to article 8.

ARTICLE 15.

These regulations go into effect on July 1, 1899.

Authenticated by our exalted signature and affixed with the imperial seal.

Published at Helgoland, June 20, 1899.

WILHELM.

[Location of the seal.]

Count POSADOWSKY.

APPENDIX IV.

TOLLS AND OTHER CHARGES FOR USE OF THE KAISER WILHELM CANAL.

APPENDIX IV.

RULES FOR THE COLLECTION OF FEES ON THE KAISER WILHELM CANAL.[1]

TARIFF I.

I. TOLLS FOR PASSING THROUGH THE CANAL.[2]

Tolls are collected from all vessels using the canal; for exemptions see article 2, law of June 20, 1899 (see p. 389.

A. FROM LOADED VESSELS.

1. Through traffic (from the Elbe to Kiel Bay and in opposite direction):

	Marks.
(*a*) General traffic.	
For the first 400 net register tons each	0.60
Each ton above 400 and up to 600, inclusive	.40
For each ton above 600 to 800, inclusive	.30
For each ton above 800 net	.20
Minimum amount to be paid	10.00
(*b*) German coastwise traffic (law of May 22, 1881—Imperial Law Gazette, p. 97)—	
Displacement up to 50 net register tons, inclusive, for each	.40
Minimum	6.00

2. Local traffic (from the Elbe or the Baltic to a place on the canal or in opposite direction, or locally on the canal); for each net register ton:

(*a*) For passing one of the terminal locks	.20
(*b*) For each section of 5 kilometers or fraction	.01
Minimum when passing one terminal lock	4.00
Minimum otherwise	1.00

EXCEPTIONS.

(*aa*) Vessels in the coastwise traffic (law of May 22, 1881, Imperial Law Gazette, p. 97) up to 50 net register tons, inclusive, pay for each net register ton:	
(*aaa*) For passing one of the terminal locks	.10
(*bbb*) For every 5 kilometers or fraction	.01
Minimum when passing one terminal lock	3.00
Minimum otherwise	1.00
(*bb*) Vessels with papers from any of the water routes crossed by the canal in the Burg-Kudensee Valley pay for the section from the Elbe to kilometer 23, inclusive, for every net register ton	.10
Minimum	1.00
(*cc*) Small open row or sailing boats go free of charge in the canal, but for passing one terminal lock they pay	1.00

(*dd*) For navigating a section no higher fees are charged than for the entire canal in the through traffic. The same rule applies for navigating the canal in its entire length in the local traffic if a vessel either enters the canal with a cargo, unloads part or all of it, and proceeds in the same direction, or if she enters empty, takes a cargo in the canal and proceeds in the same direction. The sum of the charges on these local trips equals the charges on one through trip with cargo.

If a vessel engaged in local traffic passes through the whole canal, passing through both terminal locks, and breaks the trip only in the canal and for less than 24 hours at a time, then she is charged at least the amount payable in case a through trip had been applied for at the beginning.

In all other cases, where the entire canal is navigated in the local traffic, only the rule of paragraph 1 applies for every such passage.

[1] Translation by Chaplain F. J. Feinler, 1st Infantry, from *Centralblat für das Deutshe Reich*, Supplement No. 33.

[2] During months October to March, both inclusive, the charges payable under Sec. I are increased 10 per cent.

B. From empty or ballasted vessels.

Such vessels pay the tolls under 1 and 2, less 20 per cent, regardless of the minimum tolls allowed.

C. From dredges.

Through traffic (1*a* and *b*): For every gross register ton, 0.60 marks.

Local traffic: For every gross register ton the same tolls as are given under 2*a* and *b*. Dredges are always treated like vessels with cargo.

II. TOWAGE CHARGES IN THE KAISER WILHELM CANAL.

1. Besides the tolls specified in Tariff I, towage charges must be paid:

A. For using the regular tow trains of the canal office—

	Marks.
1. Through traffic—	
(*a*) With cargo	0.40 –0.30
(*b*) Empty or ballasted	.25 – .20
(*c*) Coastwise traffic up to 50 net register tons, inclusive	.25
2. Local traffic for every 5 kilometers or fraction—	
(*a*) With cargo	.02 – .015
Minimum	.10 – .10
(*b*) Coastwise traffic up to 50 net register tons, inclusive	.015
Minimum	.10
(*c*) Vessels empty or in ballast pay as per 2*a* and *b*, less 20 per cent.	
Minimum	.10 – .10

Note.—Rates in first column are for each net register ton up to 200, second column above 200.

B. For use of a special tugboat of the canal office—

	Marks.
(*a*) Towing through the whole canal—	
1. Tugboat class A (400–500 indicated horsepower)	240.00
2. Tugboat class B (200–300 indicated horsepower)	180.00
3. Tugboat class C (180 indicated horsepower)	135.00
4. Tugboat class D (100 indicated horsepower)	90.00
(*b*) Towing only a section of the canal: For every 10 kilometers or fraction—	
1. For a tug of class A	30.00
2. For a tug of class B	15.00
3. For a tug of class C	12.50
4. For a tug of class D	10.00
(Except where the charges under A are higher.)	

For larger tugboats there are correspondingly higher rates.

The charges under *b* are in force:

(*a*) For trip of empty tugboat to starting place of tow train.

(*b*) For the section of towage or escort.

The sections in *a* and *b* are summed up and rounded to the next higher ten. No charges are collected for the return trip after leaving the tow train.

C. For towage in the locks of Brunsbuettelkoog and Holtenau, see Section VII.

2. If fault or wish of the master cause any delay at the beginning or end of the trip, or any interruption of more than two hours, the charges payable therefor are for every hour or fraction thereof, according to the rates of I Bb.

3. The payments for use of the tugboats of the canal office for assistance in accidents (towing out of the way, pumping, etc.) are every hour or fraction thereof:

	Marks.
1. Tugboat class A	12.00
2. Tugboat class B	9.20
3. Tugboat class C	6.50
4. Tugboat class D	5.20

The payable service of the tugboats begins with the departure to the place of accident and ends with their return to the home station or place of duty.

III. FEES PAID TO THE CANAL PILOTS.

[See section 12c of operating regulations of the Kaiser Wilhelm Canal in volume on the Measurement of Vessels, Appendix 20.]

No.	Kilometers.	Dock at—	Pilot station.	Pilotage (marks).	Telephone station.
1	3.3	Ostermoor	Brunsbuettelkoog.	0.80	
2	6.3 or 7.3	Kudensee	do	1.60	Ferry, Kudensee.
3	13.8	Burg i. D.	do	2.80	Ferry, Burg i. D.
4	18.0	Hochdonn	do	3.60	Ferry, Hochdonn.
5	20.8	Dueckerswisch	do	4.20	Lay-by at Hohenhoern.
6	22.9	Hohenhoern (Schafstedt)	do	4.60	
7	30.0	Gruenenthal	Nuebbel	5.60	Canal master.
8	34.7	Fischerbuette	do	4.60	Lay-by at Fischerhuette.
9	40.0	Oldenbuettel	do	3.60	Ferry, Oldenbuettel.
10	49.0	Hamwedel (Breiholz)	do	1.80	Lay-by at Breiholz.
11	49.5	Luhnau River	do	1.60	
12	56.0	Schuelp	do	.40	
13	58.3	Westerroenfeld	do	.40	Lay-by at Westerroenfeld.
14	61.0	Rendsburg (district harbor)	do	1.20	Dock at Saatsee.
15	62.8	Dock at Saatsee	do	1.80	Do.
16	65.0	Upper Eider, west of kilometer 65	do	2.40	Do.
17	66.8	Borgstedt	do	2.50	Lay-by at Audorf.
18	68.2	Lehmbeck	do	3.00	Lookout station at Lehmbeck.
19	69.5	Rade or Schirnau	do	3.60	Lay-by at Rade.
20	71.8	Steinwehr	do	4.00	
21	75.0	Sehestedt	do	4.60	Ferry, Sehestedt.
22	80.0	Kl. Koenigsfoerde	Holtenau	3.80	Lookout station at Koenigsfoerde.
23	84.0	Rosenkranz	do	3.00	Lay-by at Grosser-Nordsee.
24	85.0	Flemhuder See	do	2.80	Do.
25	86.0	Landwehr	do	2.60	Ferry, Landwehr.
26	92.6	Levensau	do	1.40	Canal master.
27	95.2	Knoop	do	.80	Signal station for praam-bridge.

IV. TARIFF FOR THE PILOT'S OVERTIME ON BOARD.

If the master wishes the pilot to stay on board during a voluntary stop of over two hours, he must pay a special fee of 1 mark for every hour or fraction at the terminal office.

V. TARIFF FOR THE RENT OF CUSTOMS SIGNALS, ETC.

A. SIGNALS, ETC., OF THE CANAL OFFICE.

	Marks.
For rent of signals (flags and light) for every trip	2.00
For rent of green globe lantern	1.00

The articles shall be returned to the pilot at the terminal station, and full value shall be paid for damaged articles.

B. SIGNALS OF THE STATE OF HAMBURG.

	Marks.
For rent of a complete set	6.00
For rent of a customs flag alone	2.00

VI. TARIFF FOR REVENUE ESCORT BY A PILOT.

Masters of sailing vessels or other towing vessels who omit to have their vessel sealed by the revenue service for the trip through the Kaiser Wilhelm Canal or to have her classed with the free traffic, or whose vessels or cargoes do not admit of sealing by the revenue service, shall for the sake of customs regulation pay a special fee to the pilot acting as customs escort.

	Marks.
(*a*) In the through traffic	20.00
(*b*) For every 10 kilometers or fraction	2.00

VII. TARIFF FOR TOWING VESSELS AT BRUNSBUETTELKOOG AND HOLTENAU.

Towing services done by canal office steamers at Brunsbuettelkoog and Holtenau, independently of a towing trip through the canal by canal steamers in through or local traffic, unless Section II, 1, allows a smaller fee, are charged, in addition to the tolls prescribed in Section I, for every vessel:

	Marks.
(a) Towing service up to half hour	5.00
(b) Towing service up to 1 hour	10.00
(c) Towing service for every subsequent hour	5.00

Fractional half hours or hours are taken for full. This tariff applies to every towing service at the locks and neighboring waters; for instance, when towing from the anchorage to the inner harbor and in the opposite direction, from the anchorage into the lock chamber, from the chamber to the anchorage or to the inner harbor docks, etc. No charge is made if this service is according to the intent of section 22 of the Operating Regulations. (See Appendix 20 in volume on the Measurement of Vessels.)

EXPLANATIONS OF THE ABOVE TARIFF SCHEDULES.

1. Passenger boats, pleasure boats, war vessels, and dredges are always considered as vessels with cargo.
2. Steamers (motor boats) and rowboats, when using a *regulation tow train*, pay the same rates as sailing vessels.
3. Yachts, dredge praams, diver praams, and tugboats are *not* considered as being in the coastwise traffic. Tugboats are "empty" if they have no cargo of their own.
4. In computing fees, fractional marks are rounded to multiples of 10 pfennigs, neglecting amounts of less than 5 pfennigs and making 5 and above equal 10 pfennigs.

The total amounts of fees are rounded up, all fractional marks being taken for full.

Fractional register tons are taken for full if more than one-half and smaller fractions are neglected.

5. The fees include compensation for the use of all facilities of the canal, and for the pilotage between the stations of Brunsbuettelkoog, Nuebbel, and Holtenau.
6. Vessels going to or coming from the North Sea are charged pilotage on the Elbe together with the canal pilotage in one amount. Should the canal tolls of Tariff I amount to less than the Elbe pilotage, the vessel shall pay the difference of Elbe pilotage above the canal tolls, in case a pilot was asked for on the Elbe.
7. If the application does not name a certain destination (vessels on order), the highest amount of fees is charged.
8. The canal fees become due on entering the canal locks.
9. A duplicate receipt is made out upon payment of 10 pfennigs.
10. "Ballast" means sand, earth, building waste, undressed stone, and water, as long as they serve to give stability to the vessel.

TARIFF II.

COLLECTION OF TOLLS, TOWAGE CHARGES, AND PILOTAGE.

I. General Rules.

1. The payment of all dues shall as a rule be made at the entrance offices (customhouses I at Brunsbuettelkoog and Holtenau). The dues are based on the vessel's tonnage certificate made out on a German blank or one countersigned in Germany, indicating net capacity in tons, and on the duplicate application blanks, which serve also as a receipt. (A few blanks are given the master free of cost by the pilot or the customhouse. A greater number of blanks can be obtained for the cost of printing—100 for 1 mark—from the customhouses or the canal office.) That copy will be taken as authentic, which was used in the application and has been approved by the customhouse. One copy is left with the collector; the other serves as the master's passport during the canal trip. On leaving the canal, the master shall cut off the receipt, handing the second paper to the pilot, master of the tugboat, master of the locks, or his deputy.

2. No vessel is allowed to enter or leave the canal till the master presents the stamped receipt as proof of having paid the duties.

Vessels which have no pilot or which are not attached to a tow train must show the receipt to the master of locks on duty.

3. Vessels going from a place outside to a place on the canal, and using the same route for return, can pay the dues for the return also at the time they enter.

4. Vessels starting or continuing their trip from a place on the canal, and having made no application for this trip, shall, before starting, buy tickets from the lay-by tenders, ferry tenders, canal masters, harbor master of the district port at Rendsburg, the lock master at the Burgerau Locks, or at the coke ovens of Rade. (Vessels

subject to pilotage, taking their pilots on board at Nuebbel or in the Rendsburg Locks, can obtain their tickets from the pilot.) If such a vessel arrives at the terminal she shall immediately pay the accrued dues, or at least inside of eight days after buying the passage ticket, to the customhouse indicated on the ticket.

II. Application Blanks.

A. Through Traffic.

White blanks are to be used according to model A for the section between Holtenau-Brunsbuettelkoog.

B. Local Traffic.

1. For trips from outside to a place on the canal, the application blanks of model B, with *red* stripe, shall be used.
2. For trips from a place on the canal to an outside point, the tickets are of model C, with *yellow* stripe.
3. Vessels domiciled in the Burg-Kudensee Valley use for the section from the Elbe to kilometer 23, and in the opposite direction, the application blanks of model D, with *green* stripe.

III. Verification of the Statements Made in the Applications.

The officials of the canal office have the right at all times to verify in a tactful manner the statements made by the masters in their application. The masters are obliged to assist the officers diligently.

The destination as well as the starting point of a trip in local traffic must be truthfully indicated to the collector.

IV. Measuring Capacity.

Vessels which do not possess regulation (Sec. I) tonnage certificates are measured, or their measurement is verified as to net capacity by the officials, and dues are collected accordingly. The final decision is reserved to the canal office.

Protests against overcharge of canal dues should be made inside of six months after the bill of charges was tendered to the master or other party settling accounts to the imperial canal office. (Art. IV of act fixing tolls for the navigation of the Kaiser Wilhelm Canal, June 20, 1899—Consult Appendix III, above, of this volume.)

A set of ship's papers, recognized in the German Empire, must be presented to the canal office inside of a further term of six months from the date of the summons.

V. Passage Tickets.

Vessels navigating the entire canal repeatedly under the same conditions can buy passage tickets of model E.

These tickets are good for two years from date of sale and are sold by the imperial canal office at Kiel and by the customhouses I at Holtenau and Brunsbuettel directly or by mail. The request must be accompanied by an application blank filled out in duplicate and by the ship's papers.

VI. Monthly Settlements.

The canal office is empowered but not obliged to accept on special request monthly settlements of accounts from frequent navigators of the canal who pay at least 300 marks per month.

Applicants for this accommodation may obtain the conditions from the imperial canal office.

VII. Mediums of Exchange.

Payments are accepted not only in German money but also in English, Scandinavian, Dutch, Russian, and Latin Monetary Union currency. These foreign moneys are accepted according to a table of exchange placarded in the collectors' offices.

Checks of the Reichsbank system, payable to the imperial post treasury (canal office) at Kiel, are accepted in place of cash payments.

VIII. Examination of Accounts.

The canal office, through its officials, reserves the right to verify statements at any time to determine whether the vessels navigating the canal have made proper payments of dues.

APPENDIX V.

SCHEDULE OF PORT CHARGES AND DEMURRAGE FEES IMPOSED BY THE KAISER WILHELM CANAL ADMINISTRATION.

APPENDIX V.

SCHEDULE OF PORT CHARGES AND DEMURRAGE FEES IMPOSED BY THE KAISER WILHELM CANAL ADMINISTRATION.[1]

TARIFF FOR HARBOR DUES.

Authorized decree of June 4, 1894, concerning the rates for the canal extending from Holtenau to Rendsburg and the use of the facilities at the Holtenau Harbor. (Imperial Legal Gazette of 1894, pp. 464, 467–469.)

In accordance with the report of May 28 of this year in agreement with the federal council, I approve the accompanying tariff for the canal extending from Holtenau to Rendsburg and for the use of the port facilities at Holtenau Harbor, on the basis of the provision in article 3, paragraph 2, of the statute of March 16, 1886, concerning the construction of the North Sea Canal. (Imperial Legal Gazette, p. 58.)

This decree is published through the Imperial Legal Gazette.

New Palace, June 14, 1894.

WILHELM

VON BOETTICHER.

To the IMPERIAL CHANCELLOR.

TARIFF OR SCHEDULE OF CHARGES.

According to which the dues are to be levied for the use of the port facilities at Holtenau Harbor at the eastern outlet of the North Sea Canal.]

The following are the harbor dues:

	Pfennig.
I. For vessels:	
1. Up to and including 12 cubic meters net capacity for each vessel—	
Upon arrival	10
Upon departure	10

REMARK.—Vessels of the above described class are exempt from the dues, if they are empty, or in ballast, or carry cargoes composed entirely of items of the kind mentioned below in 2*b* of the list of exceptions.

2. Over 12 up to and including 170 cubic meters net capacity (for each cubic meter net capacity)—	
(*a*) When loaded—	
Upon arrival	1
Upon departure	1
(*b*) When in ballast or empty (for each 2 cubic meters net capacity)—	
Upon arrival	1
Upon departure	1
3. Over 170 cubic meters net capacity (for each cubic meter net capacity)—	
(*a*) When loaded—	
Upon arrival	4
Upon departure	4
(*b*) When in ballast or empty—	
Upon arrival	2
Upon departure	2
II. For lumber rafts (per cubic meter):	
(*a*) Of oak timber and lumber	10
(*b*) Of other woods	5

[1] Translation by Lieut. Edward B. Dennis, Coast Artillery Corps, from *Betriebsordnung Fuer den Kaiser Wilhelm Kanal, Reichs-Gesetzblatt*, Feb. 23, 1911, pp. 51–58.

EXCEPTIONS.

1. Ships of more than 170 cubic meters net capacity are required to pay only half the foregoing dues determined under I 3 *a* and *b*, if they travel between ports in German territory only, without touching at foreign ports.

2. Ships whose entire cargo (*a*) does not not exceed 2,000 kilograms in weight, or (*b*) consists exclusively of roof plates, roofing slate, drain pipes, cement, brick; cement-, granite-, stucco-, lime-, building-, plaster-, or composition blocks of all kinds; chalk, clay, pipe clay, seaweed, sand, firewood, peat, coal, coke, raw sulphur, salt, hay, straw, thatching, fertilizer, or fresh fish, are only required to pay the harbor dues described in I 3*b*.

3. Vessels which make regular or frequent calls at the harbor at Holtenau during the year are given a choice of paying dues determined under the tariff for each individual call, or of making a yearly settlement, which is determined by the Chancellor.

EXEMPTIONS.

The following vessels are exempted from the payment of harbor dues upon entrance and exit:

1. Vessels which enter the harbor without a cargo and leave in the same condition.

2. Vessels which on account of maritime accidents or other misfortunes or because of ice floes, storms, or adverse winds, and all vessels which only enter the harbor for news or to receive orders and leave again without loading or unloading their cargo, and without disposing of any part of it.

3. Vessels up to and including 170 cubic meters net capacity, if they are en route to one of the German ports and enter the harbor at Holtenau for the sole purpose of unloading or receiving a part of the cargo which may not exceed a tenth part of the net capacity.

4. Vessels which enter the harbor while en route through the North Sea Canal for the purpose of adjusting duties or for the payment of canal dues, if they do not unload any cargo amounting to more than a tenth part of their net capacity.

5. Vessels which go out to or return from the relief of ships which are stranded or are in danger, if they are not used for unloading or recovering the shipwrecked goods.

6. Lighters, if the ship unloaded or loaded from the lighter itself pays harbor dues.

7. Ships which enter Holtenau Harbor only to land or take on passengers and leave immediately afterwards; in like manner so-called pleasure boats and steam tugs.

8. Public vessels which are the property of the Empire or one of the confederated states, or vessels which promote objects to the sole benefit of the Empire or a state. However, in the latter case only upon the presentation of a free pass.

9. Pilot boats, in so far as they are used in carrying out their purpose.

10. Boats which belong to vessels which are subject to dues, and also all vessels up to and including 5 cubic meters net tonnage.

11. Vessels which bring in stone gathered from the sea bottom, or from the shore, upon arrival; if they leave the harbor either empty or in ballast they are also exempted upon departure.

12. Vessels which are used only for fishing.

ADDITIONAL REGULATIONS.

1. In case the dues are levied according to I 2*b*, if the number of cubic meters is not divisible by 2, the surplus, if it amounts to less than 1 cubic meter, is left out of the calculation; but in case it amounts to more than 1 cubic meter it is counted as 2 whole cubic meters. In the transformation of the weight of cargo or dead-weight tonnage into vessel capacity 500 kilograms are counted as equal to 1 cubic meter net capacity.

2. The area at Holtenau subject to the payment of harbor dues is bounded on the north by the shore, on the south by the center line of the North Sea Canal, on the west by a line drawn perpendicular to the center line of the canal at 97.267 kilometers at the end of the lighthouse, on the east by the extension of the shore line of the fill lying to the north of the canal.

*   *   *   *   *   *   *   *

In accordance with rule 1, No. 8, of the Canal Tariff of June 4, 1895 (Imperial Gazette, p. 241), the following tariff is announced. (Official Gazette of the Royal Administration at Schleswig of 1896, pt. 17, pp. 129–131.)

Tariff or Schedule of Charges.

[For the public use of the inner harbor and the loading wharves in the Kaiser Wilhelm Canal at Brunsbuettelkoog.]

The use of the inner harbor at Brunsbuettelkoog for the purpose of unloading and loading is only permitted, with power of revocation at any time, to such an extent that its utility and its through traffic will not be limited.

A. HARBOR DUES.

	I.—For ships, empty, in ballast, with bulky articles,[1] or loaded with other articles up to 2,000 kilograms.	II.—For ships loaded with other goods weighing over 2,000 kilograms.
1. For all ships in the Kaiser Wilhelm Canal which are subject to dues:	*Marks.*	*Marks.*
Upon arrival, for each cubic meter net	0.02	0.04
Upon departure of the same	.02	.04
Minimum for each vessel upon arrival and departure	.50	1.00
2. For lumber rafts:		
(*a*) Of oak timber or lumher, per cubic meter	.10	....
(*b*) Of other woods	.05	....

[1] To bulky articles in the meaning of this tariff belong roof plates, roofing slate, drainpipes, cement, brick; cement-, granite-, stucco-, building-, plaster-, or composition blocks of all kinds, chalk, clay, pipe clay, seaweed, sand, firewood, peat, coal, coke, raw sulphur, salt, hay, straw, thatching, fertilizer, fresh fish, and quartz sands, Ships with mixed cargo pay dues uuder Tariff No. II.

B. DEMURRAGE.

1. Ships which pay harbor dues pay demurrage for the use of the harbor for more than one week, and for each succeeding week, per cubic meter net, 0.02 mark.

2. Ships which do not pay harbor dues, if they voluntarily remain in the harbor longer than one day, pay demurrage for the second and each succeeding day, per cubic meter net, 0.02 mark.

The most to be paid, however, is the harbor dues payable under A and the demurrage payable under B 1 at the end of one week.

3. Barges (coal hulks, etc.) which at the owner's wish remain for a period of time, or which are consigned to a definite anchorage for a considerable period of time, shall pay such dues as are specially determined by the canal office.

C. WHARFAGE DUES.

	Marks.
1. For bulky articles, if no special provision is made, for each 100 kilograms and fraction	0.02
2. For all goods other than those mentioned in article 1 and articles 3 to 10, for each 100 kilograms and fraction	.03
3. For firewood per 1 cord (cubic meter)	.045
4. (*a*) For lumber and timber, per cubic meter	.15
(*b*) If the cargo consists entirely of lumber and timber, per cubic meter net vessel capacity	.15
5. For building stone and roof tiles, per 1,000	.06
6. For all kinds of vehicles, per vehicle	.70
7. For horses, steers, cows, per animal	.60
8. For colts, young cattle, calves, sheep, goats, and hogs, per animal	.30
9. For poultry and pigs, per animal	.03
10. For rough granite, according to the net capacity of the ship in which it is brought, per cubic meter	.03

The minimum payment for each consignee must amount to at least 0.10 mark.

Exemptions.

A. Harbor dues.

The following are exempted from the payment of harbor dues:

1. Vessels which enter the harbor without a cargo and leave the harbor again in the same condition.

2. Vessels which enter the harbor because of trouble at sea or other misfortune, on account of ice floes, storms or adverse winds, as well as all vessels which enter for news or to receive orders and leave again without unloading or taking on any cargo or disposing of it, either in whole or in part.

3. Vessels which enter the harbor while en route through the Kaiser Wilhelm Canal and do not unload or take on cargo amounting to more than a tenth part of their net capacity.

4. Vessels, which go out to or return from the relief of ships which are stranded or are in danger, if they are not used for unloading or recovering shipwrecked goods.

5. Lighters, if the ship unloaded or loaded from the lighter itself pays harbor dues.

6. Vessels which enter the harbor for the sole purpose of landing passengers, or taking them on board, and leave immediately afterwards; this also applies to the regular passenger steamers, even if they unload or load freight.

7. Public vessels, which are the property of the Empire or of one of the confederated states, or those which solely promote the welfare of the Empire or of one of the confederated states; however, in the latter case only upon the presentation of a free pass.

8. Pilot boats, in so far as they are used to carry out their purpose.

9. Boats which belong to vessels subject to the payment of dues, and all vessels up to and including 5 cubic meters net capacity.

10. Vessels which bring in stones gathered from the sea bottom or from the shore, upon arrival; and if they leave the harbor, either empty or in ballast, they are also exempted upon departure.

11. Vessels which are used only for fishing.

B. Demurrage.

The following are exempt from the payment of demurrage:

1. The regular passenger steamers between trips.

2. The vessels mentioned under 5 and under 7 to 9.

The vessels mentioned under Nos. 10 and 11, and also such other vessels as are detained longer than one day in the harbor on account of trouble at sea, or other misfortune, or on account of ice in the canal, in the Elbe, or in Kiel Bay, and on account of storms may have the demurrage dues rebated either wholly or in part by the Imperial authorities.

C. Wharfage dues.

The following are exempted from the payment of wharfage dues:

1. Articles belonging to the Emperor, the Imperial Government, and the Kingdom of Prussia—in fact everything shipped on the account of the Emperor, the Empire, or the Kingdom of Prussia.

2. Passengers and their baggage arriving or departing on passenger steamboats.

3. Fresh fish and sea sand.

4. Merchandise and goods transferred from one ship to another without use of the wharf.

5. Empty packing cases which have been used, such as chests, casks, sacks, etc.

Additional Regulations.

In case the collection of fees is made according to the net capacity of the ship, if the number of cubic meters is not divisible by 2, the surplus, if it amounts to less than 1 cubic meter, is omitted from the calculation, but in case it amounts to 1 or more cubic meters, it is counted as 2 whole cubic meters.

In case of the conversion of the weight of cargo or dead-weight tonnage into vessel capacity, 500 kilograms are considered the equivalent of 1 cubic meter net capacity.

The fees to be paid are rounded off to an even 0.10 meter; amounts under 0.05 meter are not considered, and from 0.05 meter up to 0.10 meter they are counted as 0.10 meter.

The collection of wharfage is based upon the customs declaration, but if no such declaration has been made the collection is based on the verbal statement of the warehouse manager, or upon the information supplied by the harbor master.

This tariff goes into effect on the day of publication.

Kiel, April 10, 1896.

IMPERIAL CANAL OFFICE.

In accordance with the provisions of part I, No. 8, of the canal tariff of August 4, 1896, the following ariff is published. (Imperial Legal Gazette, p. 683.)

TARIFF OR SCHEDULE OF CHARGES.

[For the use of the public unloading and loading docks and wharves (harbors) on the Kaiser-Wilhelm Canal: To Hochdonn, 18 kilometers; to Hohenhoern, 22.9 kilometers; to Schafstedt, 22.9 kilometers; to Oldenbuettel, 40 kilometers; the Luhnau River, 49.5 kilometers; Westerroenfeld, 58.3 kilometers; Schestedt south, 75 kilometers; Koenigsfoerde, 80 kilometers; Landwehr, 86 kilometers; Levansau, 92.6 kilometers; and Holtenau (inner harbor).]

NOTE.—The unloading and loading docks and wharves at Hochdonn belong jointly to the Empire and to the village of Suederhastedt; those at Hohenhoern and on the Luhnau, to the Empire and to the district of Rendsburg. The other unloading and loading docks and wharves mentioned belong to the German Empire.

A. HARBOR DUES.

Harbor dues for entrance and clearance are payable at the same time:

For vessels of 6 to 10 cubic meters net capacity, 10 pfennigs.
For vessels of 11 to 30 cubic meters net capacity, 20 pfennigs.
For vessels of 31 to 50 cubic meters net capacity, 40 pfennigs.
For vessels of 51 to 75 cubic meters net capacity, 60 pfennigs.
For vessels of 76 to 100 cubic meters net capacity, 80 pfennigs.
For vessels of more than 100 cubic meters net capacity, 100 pfennigs.

B. DEMURRAGE.

Vessels which remain in the harbor more than 1 week, without unloading or loading, pay demurrage:

	Marks.
If their net capacity is not over 50 cubic meters	1.00
If their net capacity is from 51 to 100 cubic meters	1.50
If their net capacity is more than 100 cubic meters	2.00

for each month and fractional month.

EXEMPTIONS.

The following are exempted from the payment of harbor dues:

1. Vessels which enter and clear the harbor without cargo.
2. Vessels which have been obliged to seek refuge in the harbor.
3. Lighters, in case the ship which unloaded or loaded from the lighter has, itself, paid harbor dues.
4. Vessels which only enter the harbor to land passengers or to take them on board and leave immediately afterwards; also steamships in the regular passenger service, whether or not they unload or load freight.
5. Public vessels which are the property of the Empire, or of a confederated state, or used only in the interest of the Empire, or the local state; in the latter case, however, only upon the presentation of a free pass.
6. All vessels up to and including 5 cubic meters net capacity. Vessels mentioned under 5 and 6 are also exempted from payment of demurrage.

In figuring the harbor dues and demurrage, fractional parts of a half cubic meter or more, are counted as whole cubic meters, and smaller fractional parts are omitted from the calculation.

In case of the conversion of weight of cargo or dead-weight tonnage into net vessel capacity, 500 kilograms are taken as the equivalent of 1 cubic meter net capacity.

This tariff goes into effect on February 1 of this year.

Kiel, January 12, 1901.

IMPERIAL CANAL OFFICE.

(Published in the official organ of the royal government of Schleswig of 1901, p. 21.)

APPENDIX VI.

MANCHESTER CANAL: "SHIP DUES" AND OTHER CHARGES PAYABLE BY SHIP OWNERS.

APPENDIX VI.

MANCHESTER CANAL: "SHIP DUES" AND OTHER CHARGES PAYABLE BY SHIP OWNERS.

[This schedule cancels all previous schedules of ships' charges, and operates on and from November 1, 1911, until further notice.]

PORT OF MANCHESTER.

SCHEDULE OF SHIP DUES AND CHARGES AND CONDITIONS FOR THE USE OF THE MANCHESTER SHIP CANAL CO.'S TUGS, ALSO OTHER CHARGES PAYABLE BY SHIP OWNERS.

The "harbor and port of Manchester," which includes the whole length of the ship canal, was constituted by the Manchester Ship Canal act, 1885, and was extended by the Manchester Ship Canal act, 1911. The Manchester Ship Canal Co. is the harbor authority of the port.

DOCK OFFICE, *Manchester, September 30, 1911.*

INDEX.

SUBJECT.

Schedule of ship dues per net registered ton payable on vessels entering the Manchester Ship Canal and chargeable upon each registered ton.

	Upon vessels trading between—			Period a vessel may remain in canal, after which rent will be charged.
	Eastham or any of the other River Mercy estuary locks and Runcorn Swing Bridge.	Eastham or any of the other River Mersey estuary locks and places beyond Runcorn Swing Bridge up to the entrance to Latchford Locks.	Eastham or any of the other River Mersey estuary locks and Latchford locks (including locks) and places above up to Manchester Docks.	
	Section A.	Section B.	Section C.	
	s. d.	*s. d.*	*s. d.*	*Days.*
Between St. David's Head and the Mull of Galloway, including the Isle of Man and the Island of Anglesea	0 2	0 2	0 2	14
Between the Mull of Galloway and Duncan's Bay Head, including the Orkney Isles and all the islands on the western coast of Scotland; and between St. David's Head and the Land's End, including the Scilly Islands and the east coast of Ireland from Cape Clear to Malling Head	4	3	2	14
All parts of the east and southern coasts of Great Britain between Duncan's Bay Head and the Land's End, including the islands of Shetland; and all parts of the west coast of Ireland from Cape Clear to Malling Head, including the islands on that coast	5	4	2	14
All parts of Europe to the northward of Cape Finisterre, and to the westward of the North Cape, and without the Cattegat and Baltic Sea, and including the islands of Guernsey, Jersey, Alderney, Sark, the Faro Islands, and Iceland	9	7	4	28
All parts within the Cattegat and Baltic, including the whole of Sweden, the White Sea, and all parts to the eastward of the North Cape; all parts in Europe to the southward of Cape Finisterre without the Mediterranean, Greenland, Davis Straits, Canaries, Western Islands, Madeira, and Azores	1 0	9	6	28
All parts of the east coast of North America, Newfoundland, the West Indies, the east coast of South America to the northward of Rio La Plata inclusive; all parts of the West Coast of Africa, and islands to the northward of the Cape of Good Hope, and all parts within the Mediterranean, including Gibraltar, the Adriatic, the Black Sea and Archipelago, the island of St. Helena, Ascension, and the Cape de Verde Islands; and all parts in South America to the southward of the Rio La Plata, in the Pacific Ocean, and in Africa and Asia, to the eastward of the Cape of Good Hope	1 3	10	$7\frac{1}{2}$	56

Statutory method of ascertaining the tonnage of unregistered vessels for the purpose of charging ship dues thereon.

Dead-weight carrying capacity of vessel.	Assumed registered tonnage.
Not exceeding 50 tons	20 tons.
Exceeding 50 tons and not exceeding 75 tons.	30 tons.
Exceeding 75 tons	10 tons (in addition to the above-mentioned 30 tons) for each 25 tons of dead-weight carrying capacity in excess of 75 tons. Any dead-weight carrying capacity in excess of a complete multiple of 25 tons to be reckoned as 25 tons.

RENT.

Rent of 1 penny per net registered ton per week is chargeable on vessels remaining in the canal after the expiration of the period allowed in the preceding schedule. Should vessels remain in the canal beyond six months from date of entry, double these rates will be charged. Masters and [or] owners or other persons in charge of vessels so lying up will be required to conform in all respects to the company's rules, regulations, and by-laws for the time being in force.

1. Ship dues are payable on a vessel's net registered tonnage, as well as upon any space that may be occupied by deck cargo, as defined in the merchant shipping act, 1894, whether the deck cargo is discharged within the ship canal or not.

2. The master of every registered vessel shall, on demand, produce the certificate of the registry of such vessel. If any such master refuse or neglect to make such production on demand, he shall be liable to a penalty not exceeding £20.

3. Vessels entering the ship canal and not passing beyond the Runcorn Swing Bridge will pay ship dues as for section A of the canal, and beyond Runcorn Swing Bridge to the entrance to Latchford Locks as for section B of the canal, and from Latchford Locks (including the locks) to Manchester as for section C of the canal, as per schedule of dues shown on page 412.

4. Vessels entering the ship canal with cargo are charged as from the most distant port of lading, and when loaded outward as for the most distant port of destination. Vessels entering in ballast are charged as from the port whence they sailed, and when outward in ballast as for the port of destination.

5. Vessels having paid dues on their inward voyage as from the most distant port of lading will not be charged dues on their outward voyage when the dues chargeable as for the most distant port of destination do not exceed the amount paid for inward dues on the net registered tonnage, but should the outward dues exceed the inward the difference in excess will then be charged.

6. Any person applying to make payment of dues may be questioned as to the most distant port from which such vessel has arrived or to which such vessel is bound; and if such person shall refuse to answer any reasonable question, or shall willfully give a false or untrue answer, he shall be liable to a penalty not exceeding £50.

7. Vessels discharging cargo in more than one section of the canal on the way up or down will be charged ship dues on their inward voyage at the rate applicable to the section wherein the greatest portion of such cargo has been discharged.

8. Vessels discharging cargo in sections A and [or] B only, and afterwards loading cargo outward in any other section or sections, will be charged on their outward voyage at the rate applicable to the section wherein the greatest portion of their entire cargo has been loaded.

9. Vessels coming to section C with cargo for discharge there, and calling at any point in sections A and [or] B on the way down to load cargo outward, will be charged ship dues on their outward voyage at the section C rate only. If such vessels load cargo in sections A and [or] B whilst on the way up to section C, ship dues will be charged on their outward voyage at the rate applicable to the section wherein the greatest portion of their entire cargo has been loaded.

10. Vessels entering the ship canal in ballast and loading cargo in more than one section of the canal will be charged ship dues on their outward voyage at the rate applicable to the section wherein the greatest portion of their entire cargo has been loaded.

11. Vessels trading exclusively on the River Mersey and entering the ship canal through any of the estuary locks, either loaded with transshipment cargo for loading to outward seagoing vessels, or, if in ballast, to load transshipment cargo from import seagoing vessels in the canal for lighterage to places either within or without the canal (on the Mersey), will not be charged ship dues; but if such vessels enter the canal to load cargo from any warehouse, grain elevator, and [or] storage ground therein, they will be charged ship dues at the rate applicable to the section wherein such cargo is loaded.

DIFFERENTIAL SHIP DUES.

1. Vessels entering the ship canal with cargoes not less than one-half of which shall consist of all or any of the following articles, and discharging the whole of any such cargoes in the canal, will be charged only one-half of the ship dues specified in the preceding schedule, provided they leave the canal in ballast or load cargoes in the canal, consisting exclusively of all or any of the articles named in clause 2.

The articles above referred to are bauxite, blende ore or black jack, copper ore, copper precipitate, copper pyrites, copper regulus, esparto grass, green fruit from Mediterranean ports, guano, iron ore, iron pyrites, lead ore, magnesite ore, manganese, manganese ore, manganiferous iron ore, phosphate, phosphate rock, sulphur ore, and sulphur pyrites.

2. Vessels entering the ship canal in ballast or with cargoes not less than one-half of which shall consist of all or any of the articles named in clause 1, and discharging the whole of any such cargoes in the canal, and loading cargoes in the canal, consisting exclusively of all or any of the following articles, will be charged one-half of the ship dues specified in the preceding schedule:

Bricks, coal, coal briquettes, purple ore briquettes, coke, creosote in bulk, pig iron, iron ore, phosphate, pitch, salt, salt cake, slag, steel rails, and superphosphate.

3. Steamers entering the ship canal to discharge or load cargo may call at any point for bunker coal without being charged any additional ship dues; but if entering the canal for the purpose of bunkering only, they will be charged differential ship dues as if cargo coal had been loaded in the section wherein the bunker coal has been taken.

4. Vessels, including yachts, launches, small steamers, and any other craft not cargo carrying (exclusive of tugs, licensed by the canal company, attending on vessels), using the ship canal from point to point, will in lieu of ship dues be liable to lockage toll, as follows:

For passing through any lock, 5s. per lock each way, in addition to canal toll on passengers carried.

Minimum charge for lockage, £1 1s.

Upon payment of the foregoing lockage charge, such vessels may remain in the canal seven clear days, after which laying-up rent will be charged thereon at the rates noted in the "rent" clause on page 412.

VESSELS ENTERING THE SHIP CANAL FOR SHELTER.

Any vessel, whether in ballast or loaded, entering the ship canal for shelter from stress of weather or other cause will be charged ship dues, with the following exceptions, viz:

If, after leaving the canal, any vessel which has incurred ship dues is immediately obliged to return (with the same cargo, if laden), and reenters the canal from stress of weather or other sufficient cause, such vessel shall not become liable to further ship dues under such circumstances.

In either of the foregoing cases the vessel must not remain in the canal longer than two tides. In the event of a vessel remaining longer than two tides, she will become chargeable with rent as per the "rent" clause on page 412, except that such rent shall be chargeable after the first two tides in lieu of after the expiration of the period specified in the schedule of ship dues.

Barges when leaving the canal must pass out by the same set of locks through which they entered.

SHIPS' MANIFESTS AND SHIPS' PASSES.

The master or agent of every vessel must, on arrival and departure, lodge with the canal company a signed and complete manifest of the vessel's inward or outward lading; and as respects small cargoes, such as sets, clay, ore, etc., must produce the bill of lading and declare the weight of the cargo on arrival or the cargo will be weighed by the company at ship's expense. Loading, discharging, or service of tugs will only be undertaken by the company after a requisition for services required and all other necessary documents have been lodged with them, together with a cash deposit to cover the cost of same.

Every vessel will be required to give up on leaving the canal a ship's pass, which will be granted on application after payment of all charges or deposit to cover same has been made. The master or his agent should see that such a pass is obtained in order to avoid detention of the vessel, for which the company can not accept responsibility.

TOWAGE.

Charges and conditions for use of the canal company's tugs assisting steamers and towing sailing vessels within the ship canal (per tug).

Steamers:	£	s.	d.
1. From Eastham Locks or any point in section A or B direct to any point in section C, or vice versa	7	10	0
NOTE.—Steamers stopping at Partington to take in coal on returning from Manchester to Eastham Locks will not be considered as breaking the direct journey.			
2. From Eastham Locks direct to any point in section A or B, or vice versa; also from one point to another in these sections	4	10	0
3. From Manchester Docks direct to any point in section C, or vice versa; also from one point to another in this section			
4. Waiting at Eastham Locks, per tide	2	0	0
EXCEPTIONS.			
5. From Manchester Docks direct to any point below Mode Wheel Locks and above Barton Aqueduct, or vice versa	2	10	0
6. From one point direct to another between Mode Wheel Locks and Barton Aqueduct	2	0	0
7. From one point direct to another in Manchester Docks			
8. From one point direct to another within the canal at Ellesmere Port, or at Runcorn			
9. From Eastham Locks to Dolphins within the canal at Eastham, or vice versa	1	0	0
10. From one tip to another at Partington coal basin			

NOTE.—As regards services Nos. 6, 7, 8, 9, and 10, when tugs are occupied for more than one hour an additional charge of 10s. per hour or part of an hour per tug will be made. The service to be calculated from the time the tug is in attendance, as ordered, until the time the service is finished.

EXCEPTIONS—continued.

Sailing vessels:

From Eastham Locks direct to any point in section A, B, or C in the canal, or vice versa, or when proceeding from one point direct to another in the canal, or in the Manchester Docks—

If light, 2d. per net registered ton.

If loaded, 3d. per ton upon the weight of the cargo, with a minimum as for when light.

These rates will operate until the higher scale under the preceding table for steamers is reached by the charges payable on the tonnage of the vessel, if light, or on the weight of cargo on board, if loaded, when the charges as per the said table will apply.

Detention of tugs attending steamers and sailing vessels:

Per hour or part of an hour, 10s. per tug.

NOTE.—If tug assistance or towage services other than those named above are required, the charges will be by special arrangement.

CONDITIONS UNDER WHICH THE MANCHESTER SHIP CANAL CO. SUPPLY TUGS FOR ASSISTANCE TO STEAMERS AND FOR THE TOWAGE OF SAILING VESSELS.

1. The company, its servants and agents, are not to be responsible or liable for delay, damage, or injury to any ship, vessel, or craft, or the persons or goods on board thereof, of which the company may undertake the towage, assisting, or docking in the River Mersey and [or] the Manchester Ship Canal, or which may be piloted to or from any place in the River Mersey and [or] the said ship canal, or for any loss sustained or liability incurred by anyone by reason of such delay, damage, or injury, or for any loss or liability incurred in consequence of any such ship, vessel, or craft colliding with or otherwise damaging any other vessel or thing, or for any damage, loss, or liability of any kind whatsoever arising from the towing, docking, assisting, or piloting, whatever may be the cause or causes of such delay, damage, injury, loss, or liability, or under whatever circumstances such delay, damage, injury, loss, or liability may have happened or accrued, even though arising from or occasioned by the act, omission, incompetence, negligence, or default, whether willful or not, of the company, its servants or agents, or any other persons, or any defect, imperfection, insufficiency of power, or unseaworthiness in, or any delay, stoppage, or slowness of speed of, any tug or vessel, her machinery, equipment, appliances, or gear, engaged in towing, docking, assisting, or piloting any ship, vessel, or craft, even though such defect, imperfection, insufficiency of power, or unseaworthiness be in existence before or during the said services.

It is further agreed that on the hiring of the company's tugs for towage, docking, piloting, or assistance services, the master and crew of such tugs become in all respects the servants of and are identified with the ship, and are under the control of the person in charge of the ship, whilst the towage, docking, piloting, or assistance services are being performed.

Further, the hirer agrees to indemnify the company against all losses, damage, and claims whatsoever, including damage sustained by the tug and her machinery, equipment, appliances, and gear, even though caused by the neglect or default of the servants or agents of the company.

If a tug is engaged to tow a ship, vessel, or craft to any place, and, through stress of weather or any other unavoidable circumstances, she runs short of coal, or is separated from such ship, vessel, or craft, and the service is not completed, the company shall, nevertheless, be paid pro rata according to the time occupied as compared with the ordinary period of the intended services.

The company reserve the right to substitute one tug for another, and the terms hereof shall apply to the substituted tug, although the substituted tug may be owned by other owners.

2. The company's printed form of towage requisition must be signed by the master of the vessel, and deposited either at the dock office, Manchester, the company's office at Runcorn, or at the company's Liverpool office, 18 Chapel Street, at least 12 hours before the tug is required, and not later than 5 p. m.

3. Upon receipt of the signed towage requisition (for copy of which see next page) the company will endeavor to supply towage power at the time reqiuired, but can not guarantee to have tugs always at liberty, and will not be responsible for delay that may arise from any cause.

4. When tugs are in attendance at the time ordered, and the ship is not ready to proceed, a charge will be made for the time occupied in waiting if the tugs remain, or an equivalent charge if the tugs are ordered off to other employment.

FORM OF TUG REQUISITION AND AGREEMENT.

To the Manchester Ship Canal Co.

..................Station,

......p. m. a. m..........191....

Please supply......tug....for my vessel, the............to be at............at......p. m. a. m. on the....day of......191....cargo....net registered tonnage......draft of water aft......from......to ......on the conditions named herein, and upon the terms specified on the other side of this agreement.

(For terms and other conditions, see pp. 414 and 415 of schedule.)

The company, its servants and agents, are not to be responsible or liable for delay, damage, or injury to any ship, vessel, or craft, or the persons or goods on board thereof of which the company may undertake the towage, assisting, or docking in the River Mersey and [or] the Manchester Ship Canal, or which may be piloted to or from any place in the River Mersey and [or] the said ship canal, or for any loss sustained or liability incurred by anyone by reason of such delay, damage, or injury or for any loss or liability incurred in consequence of any such ship, vessel, or craft colliding with or otherwise damaging any other vessel or thing, or for any damage, loss, or liability of any kind whatsoever arising from the towing, docking, assisting, or piloting, whatever may be the cause or causes of such delay, damage, injury, loss, or liability, or under whatever circumstances such delay, damage, injury, loss, or liability may have happened or accrued, even though arising from or occasioned by the act, omission, incompetence, negligence, or default, whether willful or not, of the company, its servants, or agents, or any other persons, or any defect, imperfection, insufficiency of power or unseaworthiness in, or any delay, stoppage, or slowness of speed of, any tug or vessel, her machinery, equipment, appliances, or gear, engaged in towing, docking, assisting, or piloting any ship, vessel, or craft, even though such defect, imperfection, insufficiency of power, or unseaworthiness be in existence before or during the said services.

It is further agreed that on the hiring of the company's tugs for towage, docking, piloting, or assistance services, the master and crew of such tugs become in all respects the servants of and are identified with the ship and are under the control of the person in charge of the ship, whilst the towage, docking, piloting, or assistance services are being performed.

Further, the hirer agrees to indemnify the company against all losses, damage, and claims whatsoever, including damage sustained by the tug and her machinery, equipment, appliances, and gear, even though caused by the neglect or default of the servants or agents of the company.

If a tug is engaged to tow a ship, vessel, or craft to any place, and through stress of weather or any other unavoidable circumstance she runs short of coal, or is separated from such ship, vessel, or craft, and the service is not completed, the company shall nevertheless be paid pro rata according to the time occupied as compared with the ordinary period of the intended services.

The company reserve the right to substitute one tug for another, and the terms hereof shall apply to the substituted tug, although the substituted tug may be owned by other owners.

(Signature)

....

Master.

Note.—Canal tolls and wharfage are chargeable upon cargo, and are payable by the owners of such cargo (for particulars see separate schedule of merchants' charges); but if the owners of vessels bringing in or taking out cargoes elect to pay the ship canal tolls and wharfage thereon by arrangement with the owners of such cargoes, they must also, as respects inward cargoes, pay any quay porterage that may be incurred thereon. As respects outward cargoes, the shipowners are liable to pay the charge payable for receiving same to quay or shed.

CANAL TOLL ON PASSENGERS.

When carried between Manchester Docks and Eastham, 1s. each single journey; Latchford Locks and Eastham, 6d. each single journey; between places not stated above, ½d. per mile per passenger. Maximum charge (single journey), 1s. per passenger; minimum charge (single journey), 1d. per passenger.

UPPER MERSEY DUES.

The Upper Mersey commissioners have power to charge dues on vessels proceeding to, from, or through Ellesmere Port, the Weston Marsh Lock, the Weston Point Docks or Locks, or the Runcorn Docks, or along the River Weaver Navigation, or along the Bridgewater Canals, or along the Shropshire Union Canal, but vessels loading or discharging elsewhere in the ship canal are not charged with these dues provided they enter and leave via the Eastham Locks only.

APPROPRIATED BERTHS.

Appropriated berths, with shed accommodations in the Manchester Docks, are allocated by the canal company on reasonable terms to lines running regular services.

DANGEROUS GOODS.

Explosives of the various kinds described in the "Special classification of explosives and other dangerous goods by merchandise trains" embodied in the general railway classification (with the single exception of safety small-arm cartridges) are not allowed to pass over the canal, nor are any of the inflammable liquids giving off vapor inflammable at less than 73° F., set forth in the same "Special classification."

Other dangerous articles, but of a less dangerous character than those named above, which from time to time may be allowed specially to be imported or exported by means of the canal, must not be unloaded on to the dock quays, but must be discharged or shipped direct from or to vessel, to or from barge, road vehicle, or railway wagon alongside. If the traffic for any reason can not be discharged or shipped direct from or to vessel, the canal company will haul same to a place of safety at the expense of the owner of the goods or the steamship owner as the case may be, and at his risk in all respects.

In the case of inflammable liquids not giving off vapor inflammable at less than 73° F., shippers or importers of the traffic must before shipment or unloading lodge at the dock office a declaration to this effect.

OBJECTIONABLE GOODS.

Articles which may be deemed objectionable by the canal company, and through contact with which other goods are liable to be damaged, such as chemicals, charcoal dust, soot, etc., will not be permitted to be placed inside the transit sheds except by special arrangement.

TRANSSHIPMENT CARGO.

Transshipment goods are hauled in railway wagons (or barged at canal company's option) on the conditions stated in the canal company's printed haulage requisition form from alongside ship to other vessels in any part of the docks at a charge of 6d. per ton (single articles over 5 tons and not exceeding 10 tons each 9d. per ton), minimum charge as for 2 tons per wagon (except as per note below), which does not include responsibility for loading, stowing, checking, counting, custody, or condition of goods; but the company will accept the usual liability of carriers either by railway or barge (at the company's option) at a rate of 1s. 6d. per ton (no single article to exceed 10 tons in weight) with a minimum of 2s. 6d. per wagon (except as per note below), but both rates are exclusive of canal toll or charges for any labor that may be incurred in the handling of the goods. The company do not guarantee to discharge goods direct ex ship to railway wagon or barge, but will endeavor to do so with the view to avoid quay porterage.

NOTE.—The charge for haulage or conveyance of articles of unusual length, bulk, or weight, or of exceptional bulk in proportion to weight, will be by special arrangement.

A requisition on the canal company's printed form for haulage must be filled up and lodged at the dock traffic offices, Trafford Road, Salford, previous to the service being required, and the rate to be charged inserted to indicate whether the goods are to be hauled at the owner's risk or conveyed by the company as carriers.

CARGO FOR OTHER PORTS BROUGHT BY VESSELS INTO THE CANAL.

Cargo, as above, remaining in the vessel while she discharges or loads other cargo in the canal will not be liable to pay canal toll.

CUSTODY OF AND REGULATIONS WITH REGARD TO GOODS WHILE LYING ON THE DOCK QUAYS OR IN THE TRANSIT SHEDS.

All goods laid down on or passing over the quays of the docks of the ship canal company, or deposited in the quay sheds, are at the owner's sole risk in every respect; the company have not custody of such goods, and will not be responsible for leakage, loss of weight or measure, or for damage by fire, theft, strikes, combinations of workmen, weather, deterioration from natural causes, acts of God, the King's enemies, or otherwise howsoever.

Goods are not in the custody of the canal company until taken possession of by them as warehousemen, wharfingers, or railway carriers.

The canal company's police patrol the Manchester docks, and their police superintendent will, upon receipt of a requisition to do so, place a special watch upon merchandise lying in the transit sheds or on the quays, for which service a charge of 5s. per day and 5s. per night is made, with a minimum charge of 5s. The service of watching merchandise will, however, only be undertaken on the express understanding that the company will not be responsible for, and that no liabiilty shall attach to them in respect of, the safe custody of such merchandise.

For watching on board oil tank steamers the charge is 8d. per hour per man, with a minimum charge of 5s. for each man employed.

FIRES, LIGHTS, AND SMOKING.

Fires and lights are only to be used under certain conditions, and smoking in the sheds or warehouses, etc., and on the docks or wharves, or on the decks of vessels lying in the docks, is strictly prohibited.

For further particulars see the canal company's regulations and by-laws, which can be had on application, if not already given to the master of the vessel on entering the canal.

REFUSE, ETC.

Refuse such as cinders, boiler scrapings, hold sweepings, etc., must not be landed on the quays or wharves from ships (except by special permission of the dock traffic superintendent), but must be removed direct from the company's premises at the ship's expense. Railway wagons, into which refuse may be deposited, can be obtained from the canal company at a charge of 5s. per wagon, which includes haulage to tipping ground and tipping.

PILOTAGE CHARGES AND ARRANGEMENTS.

The Manchester Ship Canal Co., being the pilotage authority for the ship canal, under their by-laws are empowered to collect all charges for pilotage on the canal. Pilotage outside the canal is not payable to the canal company.

Pilotage within the canal is not compulsory, but when a pilot is employed he must be the holder of a pilotage license issued by the canal company, and must not, without the company's consent, claim for his services any greater or lesser sum than is provided for in the following table.

For vessels entering or leaving the canal loaded or in ballast the following initial fees according to net registered tonnage:

	£.	s.	d.
Up to 300 tons	0	10	0
Over 300 tons, and up to 600 tons	1	0	0
Over 600 tons, and up to 1,200 tons	1	10	0
All over 1,200 tons	2	0	0

And in addition thereto a sum at the rate of 1s. per mile, or portion of a mile, for the distance navigated when loaded, and 6d. per mile, or portion of a mile, when in ballast.

For vessels piloted from one point of the canal to another, i. e., when not entering or leaving the canal, one-half of the above-named initial fee is charged, and the full mileage rate of 1s. per mile whether loaded or in ballast.

Extra services.—When vessels are detained on their journey up or down the canal for the purpose of bunkering or otherwise for the convenience of the owners, and proceed on their journey within 4 hours, 5s. is charged; but when detained over that time, and not exceeding 24 hours, the charge will be 10s. for detention, provided this does not exceed one-half of the full initial fee; but should it do so only half the full initial fee will be charged.

If a vessel is detained beyond 24 hours at any one point of call, she will be treated as moving from point to point in the canal, and charged accordingly.

When for the convenience of owners vessels are moved at Eastham from the locks to the sluiceway or dolphins within the canal, or vice versa, or between the sluiceway and dolphins, 10s. is charged for each service.

For any special services undefined herein the charge shall be as agreed between the pilot and the ship's master at the time rendered.

The master's signature on the pilot's certificate of services rendered is accepted by the canal company as binding upon the master, owner, or ship's agent to pay the charges named thereon.

REGULATIONS AND RATES FOR LOADING AND DISCHARGING VESSELS AT THE MANCHESTER DOCKS, PAYABLE BY SHIPOWNERS.

Section 146 of the canal company's 1885 act provides that the company shall have the exclusive right to supply all the labor required for loading and discharging vessels and the handling of the merchandise within the canal or docks, and that the company may charge for such services an amount equal to the actual cost of labor, a proportionate cost of the wages of foremen, of office expenses and material, and in addition a sum of 10 per cent on such amounts, and also a premium to cover liabilities for accidents and losses, which, until further notice, will be after the rate of 5 per cent. In order, however, that shipowners may have the advantage of inclusive fixed tonnage rates, the rates in the tables on pages 421, 422, and 423 are quoted by the company.

When the services of loading, discharging, etc., are requisitioned at such tonnage rates the canal company, although acting as servants of the shipowners, will, in respect of their own workmen, accept the responsibility attaching to them as their employers under the workmen's compensation act, 1906, or any other act, except in the case of accidents for which the shipowners themselves may be liable at common law.

Shipowners (except where the crew discharge, see p. 425) may elect to have the loading and discharging performed in accordance with section 146 as named above, provided the work be carried out in accordance with the canal company's regulations. It is optional for the shipowner to requisition from the company the services of men at cost plus 10 per cent, or cost plus 15 per cent. When men are requisitioned at cost plus 10 per cent they will not be under the supervision or control of the company's foremen, and therefore are only supplied at cost plus 10 per cent subject to the hirer agreeing to indemnify the company from the consequences of any accident that may occur to any of the men supplied and to reimburse the company any sum they may have to pay in respect of any such accident, as compensation under the workmen's compensation act, 1906, or any other act.

If workmen are requisitioned at cost plus 15 per cent, the work will be performed under the supervision or control of foremen belonging to the canal company, and in such case the company, in respect of such men and foremen, accept responsibility as their employers under the workmen's compensation act, 1906, or any other act, except in the case of accidents for which the shipowners themselves may be liable at common law.

The canal company only undertakes the work of loading, discharging, etc., or the supply of workmen on the express condition that they will not be responsible for, and no liability shall attach to, the company in consequence of any delay in loading and unloading of vessels, or for improper stowage of the cargo in vessel's hold, or for the safe custody of merchandise, or for the consequences of strikes, labor stoppage or disputes, or lockouts of laborers or other workmen employed by the company, or for any person acting as agent or contractor for the company, or for leakage, loss of weight or measure, or for damage by theft, fire, strikes, combinations of workmen, weather, deterioration from natural causes, acts of God, the King's enemies, or otherwise howsoever. Work will only be commenced after a requisition for services required, together with cash deposit to cover same, have been lodged at the dock office.

MINIMUM PERIOD OF EMPLOYMENT.

Men booked on between (*a*) 6 a. m. and noon, (*b*) 1 p. m. and 6 p. m., and (*c*) at 7 p. m., or during the night, have to be paid for not less than four hours' work.

When the canal company handle cargo at tonnage, etc., rates, and are requested to work in such a manner as to cause men to be employed for less periods than four hours between the times named above, the actual cost of wages paid to the men plus $12\frac{1}{2}$ per cent from the time they finish work until the expiration of the period for which the minimum of wages has to be paid will be payable in addition to the tonnage, etc., rates.

When men are ordered out at night, and it is subsequently found they are not required to work, a charge of 1s. 6d. per man plus 12½ per cent will be payable.

When men ordered for work are kept waiting the actual wages paid to the men plus 12½ per cent for waiting will be payable.

(See also regulations re cranes.)

Classification of traffic, for purposes of loading and discharging only.

Articles.	Class.
Acetate of lime	3
Alum	3
Aluminoferric in slabs (as bulk)	3
Ashes	1
Asphaltum	3
Asphalt blocks (package rate)	3
Ballast (for loading, see p. 424)	3
Barytes	1
Bauxite	2
Block tin	3
Bone ash	3
Bones	5
Borax	3
Bran	5
Bricks (fire and common square) as bulk	3
Bricks (glazed) as bulk	4
Brimstone or sulphur	3
Cement (in bags)	3
Chalk	3
Charcoal	4
Chicory	5
China stone	1
China clay	1
Clay, wet	2
Coal (see pp. 427–429)	......
Coke	4
Copperas	2
Copper ingots (package rate)	3
Copper wire and rods	4
Cotton (in iron-bound pressed bales)	3
Corkwood (in bundles)	5
Currants and raisins (in half cases and cases)	4
Currants, sultanas, and raisins (in small boxes)	5
Dyewood (see p. 422)	......
Emery stone	3
Esparto grass (in bales)	4
Extract of dyewood	5
Farina	3
Fiber (in bales)	4
Flints	1
Flour	3
Frozen meat (as bulk)	5
Fruit, etc.:	
Oranges, onions, lemons, melons, apples, and tomatoes—	
Packages over 1 hundredweight	3
Packages under 1 hundredweight	4
Gas purifying refuse	2
Glucose (in casks and bags)	3
Granite chippings	1
Granite blocks	3
Grease (in casks)	3
Grain (see p. 423)	......
Gravel	1
Guano	3
Gypsum	3
Hay and straw (press-packed)	4
Hay (unpressed bales)	5
Hemp (press-packed)	3
Hides or kips (in bundles)	4
Horns and hoofs	5
Iron, pig (in part cargoes)	3
Iron, pig (in full cargoes, see p. 423)	......
Iron and steel billets (coastwise)	1
Iron and steel (package rate):	
Wire (in coils)	
Rails	
Bars and rods	
Fishplates	3
Heavy scrap	
Girders	
Billets (foreign)	
Iron sheets and plates (package rate)	4
Iron pipes (package rate)	4
Lead (pig or sheet)	3
Locust beans	4
Macadam	2
Marble chippings	1
Marble (handled at owner's risk only)	5
Nitrate of soda	3
Oakum (press-packed)	3
Ocher	3
Oil (olive and palm)	5
Oil (in casks, not otherwise specified)	3
Oil cake and linseed cake	4
Ores:	
Bog	
Copper	
Iron	2
Manganese	
Pyrites	
Paper (in packages)	4
Patent fuel	4
Phosphate rock	3
Pipe clay	1
Pitch (see p. 424)	......
Potatoes (old)	3
Potatoes (new)	4
Pyrites (see Ores)	......
Rags (in press-packed bales)	4
Resin	3
Rice	3
Sandstone (rough lump)	1
Sand	1
Salt cake	3
Salt (manufactured lump)	3
Salt (see p. 424)	......
Seeds (not otherwise specified)	4
Shale (package rate)	3
Shumac	3
Silk waste	4
Slates (see special schedule)	......
Soda	3
Spelter (package rate)	3
Spirits and wines (in cases and casks)	5
Starch (in boxes)	4
Starch (in bags)	3
Stone sets	1
Stone flags	3
Sugar (in bags and casks)	3
Sugar (in boxes)	4
Sugar (in loaves)	5
Sulphate of ammonia	3
Sulphur	3
Tar (in casks)	3
Tea (in boxes)	5

Classification of traffic, for purposes of loading and discharging only—Continued.

Articles.	Class.	Articles.	Class.	Articles.	Class.
Tin (in boxes)	3	Tobacco (in cases)	5	Wood pulp	3
Tinplate bars (coastwise)	1	Turpentine	4	Wool (press packed)	3
Tinplate bars (foreign)	3	Waste cotton (in unpressed bales)	5		
Tobacco (in casks)	4	Whiting	1		

Class 6.—Mixed general cargo, including machinery. Unpacked or insecurely protected machinery and iron castings are only handled at class 6 rates when at owner's risk. At canal company's risk 50 per cent extra will be charged. Unless otherwise instructed, they will be handled and charged for at owner's risk.

Class 7.—For traffic not otherwise specified.

The class rate will apply to any one description of article in classes 1 and 2 when forming not less than one-half an entire cargo discharged; also to any article in class 3 when the parcel discharged weighs not less than 100 tons.

If any one description of article in classes 1 and 2 is less than half the entire cargo discharged, but 100 tons and upward, class 3 package rate will apply.

Articles in class 1, 2, or 3 when in lots weighing less than 100 tons will be charged at the mixed general cargo rate.

The services covered by the undermentioned rates are:

Discharging goods in full cargoes (no one weight exceeding 30 hundredweight) direct to quay, stage alongside shed, railway wagon, road vehicle (see clause below re road vehicles), or barge alongside when practicable, including use of cranes when available, but steamers must provide derricks, winches, winch gear, and drivers if and when required. (See p. 424 for extra services, etc.)

Loading goods in full cargoes (no one weight exceeding 30 hundredweight) direct from quay, stage alongside shed, railway wagon, road vehicle (see clause below re road vehicles), or barge alongside when practicable, and delivering in the vessel's hold, including use of cranes when available, but steamers must provide derricks, winches, winch gear, and drivers if and when required. (See p. 424 for extra services, etc.)

Stowing cargo.—Goods will be stowed to the instructions of the ship's officers, and the canal company will not be responsible for damage of any description to goods, whether from improper stowage or otherwise, unless the attention of the company's officials is immediately called to such damage or improper stowage and a written complaint is at once given to the dock traffic superintendent.

Rates for loading and discharging in ordinary working hours.

[For overtime see p. 424.]

Class of traffic.	At per ton actual gross weight of 2,240 pounds.	
	Discharging.	Loading and trimming or stowing.[1]
	s. d.	*s. d.*
Class No. 1 in bulk	0 7½	0 11
Class No. 2 in bulk	8	11
Class No. 3, in packages	9	1 0
Class No. 3, in bulk	1 0	1 3
Class No. 4, in packages	1 0	1 3
Class No. 4, in bulk	1 3	1 6
Class No. 5, in packages	1 3	1 6
Class No. 5, in bulk	1 6	1 9
Class No. 6, mixed general cargo	1 0	1 6
Class No. 7, traffic not otherwise specified	(2)	(2)

[1] See also minimum period of employment clause, p. 419.

[2] By arrangement.

Lifts over 30 hundredweight and under 5 tons, 6d. per ton extra; lifts over 5 tons and under 7 tons, 1s. per ton extra when practicable to discharge or load by portable steam cranes. If the 30-ton crane is used, the rates chargeable for that crane will apply. (See pp. 426–427.)

The charge for receiving (exclusive of weighing) from road vehicles and railway wagons and stowing back on quay or in shed mixed general goods (lifts not exceeding 30 hundredweight each) is 6d. per ton. Lifts over 30 hundredweight and under 7 tons, when practicable to discharge by portable steam crane, 3d. per ton extra. Articles to be lifted exceeding 1 ton per lift must have the exact weight marked thereon.

Unpacked or insecurely protected machinery and iron castings are only handled at the ordinary "receiving to platform or quay" rates at owner's risk; at canal company's risk, 50 per cent extra will be charged. Unless otherwise instructed, they will be handled and charged for at owner's risk.

In order to avoid delay, shipowners are requested to give notice in writing to the dock traffic superintendent prior to the arrival of road vehicles or railway wagons containing goods requiring the use of cranes for heavy lifts.

Traffic is only discharged direct to road vehicles from ship or received from road vehicles into ship direct, when the canal company consider the work of the ship will not thereby be delayed, and subject to the persons in charge of the vehicles slinging or unslinging and stowing or unstowing the goods in their vehicles at their own risk, and on condition that if the company assist in doing such work liability for any accident arising therefrom to workmen, horses, lurries, or other vehicles, or damage to the goods, shall not attach to the company.

Traffic is only loaded to or discharged from barges on the understanding that the bargemen assist in slinging or unslinging and stowing or unstowing the goods in the barges at their own risk, and on condition that if the canal company assist in doing such work liability for any accident arising therefrom to workmen, barges, or damage to the goods, shall not attach to the company.

WOOD GOODS.

Discharging full cargoes over side or through bow ports on to quay or barge alongside when practicable, including use of cranes when available; but steamers must provide derricks, winches, winch gear, and drivers if and when required. (See p. 424 for extra services.)

	s.	d.
Spruce, fir, and hemlock:		
Deals and battens (2½ by 7 inches and over 9 feet up), at per St. Petersburg standard	[1] 3	0
Deal ends (8 feet and under), at per St. Petersburg standard	[1] 3	6
Scantlings and scantling ends (3 by 6 inches and under), at per St. Petersburg standard	4	0
Boards and board ends, at per St. Petersburg standard	4	0
NOTE.—16 per cent is allowed off the nominal measure of boards planed on both sides; 8 per cent for boards planed on one side.		
Slating laths, palings, pickets, spoolwork, fir squares, and box boards or shooks, in bundles, at per St. Petersburg standard.	4	0
Pitch pine, birch, ash, oak, elm, mahogany, cedar, and other hard or furniture woods, in planks, deals, boards, and scantlings, at per St. Petersburg standard	4	6
Sleepers or sleeper blocks, at per St. Petersburg standard	3	0
Sleepers or sleeper blocks, creosoted, at per St. Petersburg standard	3	6
Fir staves, loose, at per St. Petersburg standard	7	6
Fir staves, in bundles, at per St. Petersburg standard	5	0
Memel oak staves, at per reduced mille	28	0
Pulp wood, at per fathom of 216 cubic feet (framed)	3	3
Firewood and dunnage wood, at per fathom of 216 cubic feet (framed)	5	0
Lath wood, at per fathom of 216 cubic feet (framed)	4	6
Plaster laths in bundles (containing not more than 400 lineal feet per bundle), at per 100 bundles	2	0
Dyewoods (except logwood roots), boxwood, lignum vitæ, and ebony, at per ton, actual weight	1	0
Logwood roots, at per ton, actual weight	1	3
Mining timber, poles, and rickers, at per load of 50 cubic feet	1	3
Pit props, at per load (according to scale)	1	3
Square or waney logs and large poles:		
Ash, oak, mahogany, teak, karri, jarrah, blackbutt, and greenheart, at per load of 40 cubic feet	1	3
Pitch pine, Quebec pine, Oregon pine, fir, elm, birch, aspen, or poplar, at per load of 50 cubic feet	1	0
Logs or poles weighing each more than 3 tons or loads, 50 per cent extra to above rates.		

[1] 6d. per standard extra in sections A and B.

PIT WOOD.

Mining timber can be landed at Ellesmere Port, Runcorn, the Haydock Wharf, Acton Grange, Warrington Wharf, Eccles Wharves, or Manchester.

GRAIN.

Grain in vessels arriving at the Manchester docks will be discharged direct into the canal company's grain elevator, except (*a*) East Indian wheat, which the canal company only discharges into the quay sheds; and (*b*) when the canal company prescribes that it shall be otherwise dealt with.

The charges for discharging, including use of portable elevators or cranes when available, ships providing use of derricks, winches, winch gear, and drivers if and when required, are as follows:

	Wheat, maize, etc. (per ton).	(Oats (per ton).
Grain imported in bulk:		
When discharged direct from ship's hold into marine tower of elevator	*s. d.* 0 6½	*s. d.* 0 7½
When discharged by portable elevators, cranes, or ship's gear direct over side into barges or on to stage alongside quay shed	9	11
Grain imported in bags:		
Full cargoes, when discharged by ship's steam winches only, direct over side into barges	6½	7½
Full cargoes, when discharged entirely by canal company's cranes or partially by company's cranes and partially by ship's steam winches	8	9½
Full or part cargoes (the other portion being in bulk and [or] other merchandise) when discharged by cranes or by ship's steam winches	9	11
Full or part cargoes shipped into bulk and discharged direct from ship's hold into marine tower of elevator, or by portable elevator over side	9	11
NOTE.—For discharging full cargoes of grain in bulk or in bags direct over side vessel at Runcorn Lay-bye, in section A of the canal, to barges for lighterage to the Manchester docks	9	11
EXTRA SERVICES.		
When more than one parcel of grain in bulk is stowed in one hatch, separated by mats, etc., and requiring special care in separating and extra trimming, the additional charges for discharging the parcels so stowed will be	1½	2
For clearing dunnage and shifting boards, discharging fore peaks, etc	Will be charged for at cost plus 12½ per cent, which includes risk under the workmen's compensation act, 1906, or any other act, except in the case of accidents for which the shipowners themselves may be liable at common law.	
Repairing bags, riddling, and cleaning loose		
Separating damaged cargo and discharging same over side to barge and [or] incasing grain in damaged bags into new bags to be landed		

When a barge is required to lay alongside ship to receive damaged grain, the canal company will supply such barge at a charge varying from £1 1s. to £4 4s. per day or part of a day, according to size, for the use of the barge only.

Wet or badly damaged grain can not be taken into the elevator in quantities over 5 tons until a special requisition has been lodged with the company, either by shipowner or importer, authorizing the immediate treatment of the damaged grain through the dryer, as the storage bins can not be used to store damaged grain

GRAIN SHIPPED OUTWARD FROM THE MANCHESTER DOCKS BY COASTING STEAMERS.

The following charges will be made for the services of trimming or stowing the grain on board coasting steamer, viz:

Grain in bulk:
- Ex inward steamer direct over side to coasting vessel, 3d. per ton.
- Ex quay or grain elevator to coasting vessel, 3d. per ton.

Grain in bags:
- Ex inward steamer direct over side to coasting vessel, 6d. per ton.
- Ex quay or grain elevator to coasting vessel, 7d. per ton.

PIG IRON, EX-COASTWISE VESSELS.

Discharging, full cargoes, 6d. per ton.

SALT.

Loading (common fishery, small rock, or bag), and trimming or stowing in ship's hold:

In 100-ton lots and upwards, 7d. per ton.
In lesser quantities, 10d. per ton.

Bearing off to be undertaken by salt suppliers' bargemen.

PITCH SHIPMENTS.

Loading and trimming pitch in full cargoes:

From road vehicles, railway wagons, or barges:
November to April, 10d. per ton.
May to October, 1s. per ton.

An extra charge of 3d. per ton will be made to shipowner for loosening pitch which may have become set in barge's hold or on the quay.

When pitch arrives at the Manchester Docks per railway for shipment, instructions for disposal should be handed to the canal company on or before the arrival of the traffic, otherwise in order to avoid incurring demurrage on the railway wagons it may be cast out of the wagons on to the quay, the charge for such service being cost, plus 12½ per cent.

Should the company be unable to unload the wagons at the vessel's loading berth the additional cost of subsequently removing the pitch from where deposited to the vessel's side will also be charged.

BALLAST.

Ballast is delivered alongside ship at crane berth in the Manchester Docks, and also at Runcorn Lay-bye and Eastham, and put on board at 2s. per ton, exclusive of trimming.

At least 48 hours' notice should be given in writing to the canal company for ballast required to be delivered alongside ship.

OVERTIME.

Overtime between the hours of 6 p. m. and 8 a. m., and on Saturdays after 5 p. m. and up to 10 p. m., is charged for at 4½d. per hour per man employed in addition to the fixed tonnage, etc., rates, with the exception of timber (in full cargoes), when the rate of 5d. per hour per man will be charged.

On Saturdays after 10 p. m., Sundays, Christmas Day, Good Friday, bank and special holidays, 9d. per hour per man is charged in addition to the fixed tonnage, etc., rates, in all cases except on timber (in full cargoes), when the rate of 10d. per hour per man will be charged.

When men are requisitioned to work during their meal hours the overtime rate will be charged for such hours and any longer period the men may continue to work without a break.

Requisitions for overtime must be lodged before 3 p. m. Mondays and Fridays, and on Saturdays before 12 noon.

EXTRA SERVICES.

All services not specified, and extra labor in case of damaged cargoes, repairing, and coopering to make goods merchantable, getting or breaking out goods in an adhesive state, and loading or discharging cargo from peaks, bunkers, cabins, tanks, lazarettes, sorting cargo, etc., is charged for at actual cost of labor and superintendence plus 12½ per cent, which will also cover liability for accident under the workmen's compensation act, 1906, or any other act except in the case of accidents for which the shipowners themselves may be liable at common law.

Checking cargo.—The rates charged for loading and discharging do not include the service of sorting or checking the cargo loaded or discharged, the responsibility for which rests entirely with the shipowner.

When import goods (timber excepted) are landed to quay, and the canal company make a charge for quay porterage, the goods are counted by the company at time of delivery from the quay, the service being covered by the quay porterage charge.

When goods are delivered direct ex-ship to railway companies' wagons for forwarding at the canal company's through railway rates, the goods so delivered are checked by the company, but the company take no responsibility whatsoever with respect to goods discharged overside ship direct to barge, road vehicle, or to ship canal railway wagons when for haulage over the dock estate or to or from and over the Trafford Park estate, except for the due performance of any service they may undertake by arrangement in connection therewith.

DISCHARGING AND LOADING BY SHIP'S CREW.

When arrangements are made with the canal company to allow the cargo to be discharged or loaded by the ship's crew, the crew shall work in accordance with the company's regulations, and shall land the cargo upon the quay clear of and beyond the railway lines, or upon road vehicle, railway wagon, or barge alongside ship, as may be required; and in the case of wood goods the crew shall, in addition, properly pile such cargo upon the quay, clear of and beyond the railway lines, and at such places and in such a manner as may be required by the company.

Vessels are not allowed to occupy crane berths when the loading or discharging services are allowed to be done by the ship's crew, unless the canal company's cranes are hired and overtime is worked if required by the company.

The master or agent of any vessel may requisition from the canal company the services of men at cost, plus 10 per cent (see p. 419), to assist his crew in discharging or loading his vessel. When men are requisitioned at cost, plus 10 per cent, they will not be under the supervision or control of the company's foremen, and therefore are only supplied at cost, plus 10 per cent, subject to the hirer agreeing to indemnify the company from the consequences of any accident that may occur to any of the men supplied, and to reimburse the company any sum they may have to pay in respect to any such accident, as compensation under the workmen's compensation act, 1906, or any other act.

FRESH WATER FOR SHIP'S USE.

Fresh water can be obtained at the Manchester Docks (including the grain elevator by vessels discharging there), Eccles Wharf, and the Latchford and Eastham Locks, the charges being as follows:

For boilers, 2s. 6d. per 1,000 gallons.
For drinking (minimum charge not less than as for 100 gallons), 7d. per 100 gallons.
Charge for turncock's attendance, 1s. for each supply.

These charges will also be made without overtime for turncock's attendance for water supplied to vessels at the Manchester Docks and Eccles Wharf during the night.

LIGHTS.

Shipowners are requested to provide their own lights and attendance thereto on board ship. The canal company only supply lights on board at the expense and risk of shipowners in every respect; and if lights supplied are objected to, written notice must be given to the dock traffic superintendent.

When lights are supplied by the canal company, the following charges will be made:

Oil lamps, 2d. per lamp per hour.
Gas lamps, 6d. per light per hour.
Lampman in attendance, 8d. per hour.
Minimum charge as for 4 hours each.

NOTE.—When more than one light is used with one gas machine, 50 per cent additional will be charged for each extra light.

Naked lights are not to be used either in loading or discharging.

Electric light or gas lamps supplied at grain elevator, on dock quays, or in sheds, 5s. per hatch per night; minimum charge, 2s. 6d. per hatch.

NOTE.—Electric lights and gas lamps supplied at grain elevator, on dock quays, or in sheds are only charged for when overtime is worked.

REGULATIONS AND RATES FOR THE HIRE AND USE OF CRANES.

Regulations.

1. Application for the use of cranes and deposits to cover charges for their use must be made at the dock office.

2. When a crane is required to lift a weight exceeding 20 hundredweight, the application must state the maximum capacity of the crane required. In the event of a greater weight than stated in the application

being tendered for lifting, and being lifted, the hirer of the crane will be liable for the consequence should any accident arise therefrom.

3. The exact weight of every article to be lifted, if over 1 ton, must be marked thereon.

4. If two or more requisitions be lodged for the use of a particular crane for the same time, the dock traffic superintendent shall decide which requisition shall have priority.

5. When a vessel is in possession of a crane berth, whether she is working or not, and such berth is otherwise required, she shall vacate the same if instructed to do so by the dock traffic superintendent.

6. The full rate of hire will be charged according to the schedule for any crane from the time the crane is ready for use until a notification be given to the dock traffic superintendent that the crane is no longer required.

7. After steam has been got up on a crane, and while under steam, or after a hydraulic or electric crane has been placed in position, should notice be given that it is not required, a charge of 5s. per hour will be made in respect of the 30-ton crane, and 2s. 6d. per hour in respect of other cranes, with a minimum charge of 15s. and 7s. 6d., respectively, in lieu of the charges scheduled.

8. Cranes may be hired from the canal company at the rates fixed per hour, but in such cases the hirer of the crane takes the risk of, and is liable for, the consequences of all accidents arising from and during the hire of such crane, at per regulation No. 9, or the company will undertake to provide cranage, labor, and gear at a tonnage rate which covers such risk.

9. When a crane is hired per the hour, the hirer is responsible for the consequences of any accident that may occur from whatever cause arising to any person or plant by the use of such crane during the hire of same, as though the crane was the property of the hirer.

10. Where the canal company undertakes the cranage at a tonnage rate, and the weight of the article to be lifted is correctly declared (see regulation No. 3), the risk of accidents arising from the use of the crane is accepted by the company, unless the person who has requisitioned the crane, by his own or his servant's act, has contributed to the accident.

11. The canal company do not hold themselves responsible for any delays which may arise in supplying cranes by the time requisitioned, or through the breakdown of any crane while on hire.

Rates for hire and use of cranes.

	s.	*d.*
Portable steam cranes:		
Not exceeding 30 hundredweight lifting capacity—		
Minimum charge	10	0
For any period exceeding 4 hours, per hour	2	6
Exceeding 30 hundredweight and up to 7 tons lifting capacity—		
Minimum charge	12	6
For any period exceeding 3 hours, per hour	3	6
Hydraulic cranes:		
Not exceeding 30 hundredweight lifting capacity—		
Minimum charge	10	0
For any period exceeding 4 hours, per hour	2	6
Electric cranes:		
10 hundredweight lifting capacity—		
Minimum charge	7	6
For any period exceeding 4 hours, per hour	2	0
30 hundredweight lifting capacity—		
Minimum charge	10	0
For any period exceeding 4 hours, per hour	2	6

When the distant control gear for cranes is requisitioned, an additional charge of 1s. per hour will be made for the use of the crane.

The before-mentioned rates cover only the use of the crane and driver to work it.

Rates for use of 30-ton crane.

	£	s.	d.
Rate per hour:			
Minimum charge	1	10	0
For any period exceeding 3 hours, per hour		10	0

These rates cover only the use of the crane and driver to work it.

Tonnage rates:
- For lifts not exceeding 10 tons, 2s. 6d. per ton; minimum charge £1 5s.
- For lifts over and not exceeding 15 tons, 3s. 6d. per ton;
- For lifts over 15 and not exceeding 20 tons, 4s. 6d. per ton.
- For lifts over 20 and not exceeding 25 tons, 5s. per ton.
- For lifts over 25 and not exceeding 30 tons, 5s. 6d. per ton.

These rates cover cranage, labor, and use of the necessary gear for lifting direct from railway wagon or road vehicle (or barge alongside when practicable), and putting on board vessel, or vice versa.

For each additional lift of the same article while the crane is under steam 50 per cent of the above rates will be charged, but if steam has to be specially raised the full rates will apply.

When any crane is hired to work by time, the foregoing rates cover the service only during the ordinary working hours. For overtime, see "Overtime clause," page 424.

Further information as respects labor charges may be obtained from the dock traffic superintendent, at the offices, Trafford Road, Salford.

CHARGES AND REGULATIONS FOR THE HIRE OF THE CANAL COMPANY'S ELECTRIC SHEER LEGS AT EASTHAM LAYBYE FOR LIFTING AND REPLACING TOPS OF FUNNELS OR MASTS.

Charges.

For first hour or part of same	£5
Each addditional hour or part of an hour	1

REGULATIONS.

1. Requisitions for the hire of the electric sheer legs at Eastham Laybye and deposits to cover charges for hire, must be lodged either at the dock office, at the canal superintendent's office at Eastham Locks or Runcorn, or at the canal company's office, 18 Chapel Street, Liverpool, at least 12 hours before the sheer legs are required, and not later than 5 p. m.

2. The company will not be responsible for any delay that may arise in getting the sheer legs ready for work by the time requisitioned, or for any breakdown of the appliances while on hire, or from any other cause whatsoever.

3. The sheer legs are capable of lifting 15 tons to a height of 105 feet above water level. In the event of a greater weight being tendered for lifting, and being lifted, the hirer will be liable for the consequences should any accident arise therefrom.

4. If two or more requisitions be lodged for the hire of the sheer legs for the same time, the canal superintendent at Runcorn shall decide which requisition shall have priority.

5. When a vessel is in possession of the sheer legs berth, and such berth is otherwise required, she shall vacate the same if instructed to do so by the canal superintendent at Runcorn.

6. The canal company only provide labor to work the sheer legs, and the hirer must provide any other labor, and also gear, that may be required.

7. The hirer will be responsible for the consequences of any accident that may occur, from whatever cause arising, to any person or plant by the use of the sheer legs during the hire of same as though the sheer legs were the property of the hirer.

CHARGES AND ARRANGEMENTS FOR COAL SHIPMENTS.

Vessels entering the ship canal in ballast to load coal are charged only one-half ship dues. (See differential ship dues, clause 2, p. 413.)

Coal can be obtained at the following shipping places upon the Manchester Ship Canal:

Partington coal basin.—Partington is the nearest shipping port for the South Yorkshire collieries and only 8 miles from the nearest Lancashire colliery, and coal from all collieries can be received there by railway. Six hydraulic tips (erected by Messrs. Sir W. G. Armstrong, Mitchell & Co. and Messrs. Glenfield & Kennedy) are in use, and vessels obtain coal with the best possible dispatch.

The railway rates from the collieries upon coal for shipment include conveyance over the railway of the Manchester Ship Canal Co. to the tips, and tipping, the only charge in addition to ship dues against the ship, being for trimming or other service that may be requisitioned.

Trimming charges (per ton) applicable to nonself-trimming vessels:

	d.
Cargo coal—	
Ordinary trimming	3
When any hold of a vessel is only partially filled with coal and the canal company are required to level such coal throughout to enable other cargo to be placed thereon, the extra labor incurred by such leveling over that covered by the company's ordinary trimming rate will be charged for at the rate of 3d. per ton upon one-third of the quantity of coal loaded in that particular hold.	
Bunker coal—	
Ordinary trimming	6
Ordinary trimming, oil-tank steamers	7½

Applicable to self-trimming vessels:

	d.
Cargo coal	1½
Bunker coal (maximum weight, 80 tons)	1½

NOTE.—If more than 80 tons of bunker coal are loaded, the trimming charges applicable to nonself-trimming vessels will apply to the total weight of bunker coal.

Vessels must provide men to regulate the self-trimming chutes; otherwise the canal company will charge the nonself-trimming rates.

The trimming of surplus bunker coal after bunkers are filled is charged for as under (per ton):

	d.
When loaded in the vessel's hold proper to be charged at the cargo rate of	3
When loaded into temporary bunkers, bulkheaded off from the hold or in between decks	4½

Extra services: When bunker coal requires to be thrown into the bunkers beyond a distance of 21 feet from the hatchway, or wheeled into the bunkers, such coal will be charged 4d. per ton in addition to the ordinary trimming rate to cover the cost of the wheeling or double throwing of the coal into the bunkers.

No charge is made for the weighing of loaded and taring of empty trucks.

Manchester docks.—The large and constantly increasing demands upon the quay space and railways at the docks for the importation and shipment of merchandise compels the canal company to restrict the bunkering of steamers and loading of cargo coal from railway trucks except as noted below:

At Pomona.—Coal for bunkering only when consigned to a specific steamer or line of steamers and not sent to the docks more than seven days in advance of the day of bunkering.

Charges:

Shipped from railway wagons by the canal company's steam cranes, including trimming, 1s. per ton.

When baskets or barrows have to be used for conveying the coal to the bunkers, 3d. per ton extra will be charged.

At Weaste.—With a view to providing better facilities for the shipment of cargo and bunker coal at Manchester, the company have made arrangements with Messrs. Tannet, Walker & Co., of Leeds, for the erection by them of a hydraulic coaling crane on the site recently occupied by the steam coaling crane of Messrs. Andrew Knowles & Sons at Weaste, just below Mode Wheel Locks.

The new crane will be completed and ready for work at an early date. An announcement as to the definite date will be made later, when particulars of the rates and conditions applicable will be given.

Coal by barges.—Loading of bunker or cargo coal from barges can be effected in any of the Manchester docks, the canal company's rates for the service being as under, viz:

When in bulk in the barges, filling, trimming, and use of appliances, ships providing steam and winches when required, 1s. 3d. per ton.

When in boxes in the barges, including use of cranes and trimming, but not including the cost of hooking the boxes on to the crane, 6d. per ton for cargo coal; 1s. per ton for bunker coal.

Coal by barges can be obtained from collieries on the Bridgewater, Bolton and Bury Leeds and Liverpool, and North Staffordshire (Trent and Mersey) Canals.

Haulage of coal over the dock railways.—Haulage of coal (including weighing) when not covered by railway company's through rate, 6d. per ton.

Unsold coal will not be received by the canal company on their railways at the docks.

Trimming charges on cargo or bunker coal are payable by the shipowners.

Ship canal toll on coal shipped in the canal (payable by merchants unless otherwise provided and arranged for with the canal company):

In section C of the canal, 6d. per ton.

In sections A and B of the canal, 4d. per ton.

The canal company do not undertake to load cargo or bunker coal during the time steamers are loading or discharging merchandise, except when the service can be done without interfering with the said loading or discharging.

Weight certificates.—Coal weight certificates may be obtained from the canal company at the following charge per certificate per consignment:

	s.	*d.*
For quantities not exceeding 50 tons	1	0
Above 50 and not exceeding 75 tons	1	6
Above 75 and not exceeding 100 tons	2	0
Above 100 and not exceeding 500 tons	2	6
Above 500 and not exceeding 1,000 tons	5	0
Above 1,000 and not exceeding 2,000 tons	7	6
Above 2,000 tons and upward	10	0

Runcorn.—Coal is received here by railway from collieries and by lighter from collieries on the Bridgewater, Bolton and Bury, Leeds and Liverpool, and North Staffordshire (Trent and Mersey) Canals. It is shipped by balance tips in the Runcorn docks and by tip in the ship canal and also direct ex railway wagon or barge at the lay-by.

Charges:

For loading at the lay-by in the canal:

Bunker coal, 1s. per ton direct ex railway wagon (3d. per ton extra if baskets or wheelbarrows are used); 1s. 3d. per ton when ex barge.

Cargo coal, 1s. per ton ex railway wagon or barge.

These rates include ordinary trimming.

For loading at the tip in the canal:

Bunker coal, 6d. per ton for tipping and ordinary trimming.

Cargo coal, 4d. per ton for tipping and ordinary trimming.

If overtime is worked at either the tip or the lay-by, the following extra charges will be payable:

On cargo coal, 3d. per hour per man.

On bunker coal, 50 per cent extra on the scheduled rates, with a minimum as for 20 tons.

Working hours are:

Summer, 6 a. m. to 5.30 p. m.

Winter, daylight to dark.

For Runcorn Dock charges application should be made to the Runcorn agent of the Bridgewater department, Mr. J. Evans, Runcorn Docks.

Haydock Wharf, Acton Grange.—Coal is received here by railway from the collieries of Messrs. Richard Evans & Co. (Ltd.), the wagon boxes being lifted and tipped by steam crane.

Messrs. Evans & Co. make their own charges for shipping the coal. Their address is, Colliery Proprietors, Haydock, St. Helens, Lancashire.

Ellesmere Port.—Coal is received here by railway from all collieries, and is loaded by the Shropshire Union Canal Co. by means of their hydraulic tip (erected by Messrs. Tannet, Walker & Co.) in the ship canal. They make their own charges for the service.

Further information on matters generally may be obtained upon application at the various offices of the canal company, viz:

Head office, 41, Spring Gardens, Manchester. Telegraphic address, "Canal, Manchester." National Telephone, No. 6224 city (5 lines).

Dock office, Trafford Road, Manchester. Telegraphic address, "Waterway, Manchester." For railway rates department only, "Facility, Manchester." For tolls department only, "Indoor, Manchester." National Telephone, No. 6481 central (5 lines). For forwarding department only, No. 4118 central.

Dock traffic and railway offices, Trafford Road, Salford. Telegraphic addresses: For dock traffic department only, "Outdoor, Manchester." For railway department only, "Tracks, Manchester." National Telephone (for either dock traffic department, railway, police, or stores department), No. 5916 central (6 lines).

Grain elevator, Trafford Wharf, Manchester. Telegraphic address, "Waterway, Manchester." National Telephone, Nos. 4117 and 4940 central.

Liverpool: 18 Chapel Street, Liverpool. Telegraphic address, "Waterway, Liverpool." National Telephone, No. 5517 central.

London: 9 and 11, Fenchurch Avenue, London. Telegraphic address, "Chiusa, London." National Telephone, No. 2824, Avenue Exchange.

Runcorn: Bridgewater office, Runcorn. Telegraphic address, "Docks, Runcorn." National Telephone, No. 43, Runcorn.

Partington coal office: Telegraphic address, "Coal, Cadishead." National Telephones, Nos. 54 and 64, Urmston.

Toronto (Canada): R. Dawson Harling, 28, Wellington Street East and Board of Trade, Toronto. Telegraphic address, "Harling, Toronto."

New York (United States): Gloster Armstrong, Exchange Floor, Produce Exchange Building, New York City. Telegraphic address: "Waybill, New York."

E. LATIMER, *General Superintendent.*

DOCK OFFICE, MANCHESTER, *September 30, 1911.*

APPENDIX VII.

MANCHESTER CANAL: "TOLLS" ON MERCHANDISE AND OTHER CHARGES PAYABLE BY MERCHANTS.

APPENDIX VII.

MANCHESTER CANAL: "TOLLS" ON MERCHANDISE AND OTHER CHARGES PAYABLE BY MERCHANTS.

[This schedule cancels all previous schedules, and operates on and from Jan. 1, 1912, until further notice.]

PORT OF MANCHESTER.

SCHEDULE OF RATES OF TOLL AND WHARFAGE, QUAY PORTERAGE RATES, AND OTHER CHARGES PAYABLE BY MERCHANTS TO THE MANCHESTER SHIP CANAL CO., ALSO RULES AND REGULATIONS RELATING TO TRAFFIC DEALT WITH AT THE MANCHESTER DOCKS.

NOTE.—The rates set out in this schedule for quay porterage, warehousing, and rent are the same as those in operation up to December 31, 1911, but from the 1st day of January, 1912, and thereafter until further notice, an additional charge of 10 per cent will be made owing to higher rates of wages and other increased working expenses.

That is to say, beginning on the 1st day of January, 1912, and thereafter until further notice, 10 per cent will be added to all the within mentioned rates for quay porterage, warehousing, and rent.

DOCK OFFICE, *Manchester, December 30, 1911.*

INDEX.

Manchester Ship Canal.

The port of Manchester was opened for traffic on January 1, 1894.

There is direct railway communication between the quays and warehouses of the Manchester docks and the lines of the various railway companies serving Manchester, and the canal company quote through rates for traffic to be forwarded direct by railway from or to the docks to or from any part of Great Britain. For further particulars, see pages 462–464.

The canal company's Bridgewater (carrying) department, the Anderton Co. (Ltd.), Messrs. Fellows, Morton & Clayton (Ltd.), the Leeds & Liverpool Canal Co., the Mersey, Weaver & Ship Canal Carrying Co., the Rochdale Canal Co., Messrs. Simpson Davies & Sons, Messrs. T. G. Statter & Co., as well as other canal carriers will convey traffic between the docks and various places on the several canals in the district and others connected therewith by which water conveyance is practicable between the docks and sundry towns in Lancashire, Yorkshire, Cheshire, Staffordshire, East Worcestershire, and Nottinghamshire. (For complete list of water carriers see p. 464.)

Traffic requiring warehousing or storage in the open can be warehoused or yarded by the canal company at the docks, rates for which can be obtained on application at the dock office, or dock traffic offices, Trafford Road, Salford.

Warrants are issued by the canal company in respect of traffic stored upon their premises.

If required, the Bridgewater department will also arrange for cartage to and from the docks or for warehousing at the company's town warehouses, and inquiries with regard thereto should be addressed to the superintendent of that department, Mr. J. Oldfield, Bridgewater offices, Chester Road, Manchester. National telephone No. 5307 Central and 1780 City.

There are also a number of private team owners who lay themselves out for carting traffic from and to the docks, but traders must make direct arrangements with them for any cartage services they may require.

Further information on matters generally may be obtained upon application at the various offices of the canal company, viz:

Head office, 41 Spring Gardens, Manchester. Telegraphic address, "Canal, Manchester;" National telephone No. 6224 City (5 lines).

Dock office, Trafford Road, Manchester. Telegraphic address, "Waterway, Manchester." For railway rates department only, "Facility, Manchester." For tolls department only, "Indoor, Manchester." National telephone No. 6481 Central (5 lines). For forwarding department only, No. 4118 Central.

Dock traffic offices, Trafford Road, Salford. Telegraphic addresses: For dock traffic department only, "Outdoor, Manchester;" for railway department only, "Tracks, Manchester;" National telephone (for either dock traffic department, railway, police, or stores department), No. 5916 Central (6 lines).

Grain elevator, Trafford Wharf, Manchester. Telegraphic address, "Waterway, Manchester." National telephone Nos. 4117 and 4940 Central.

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The Manchester Docks and their Equipment.

The area of the Manchester Dock estate above Mode Wheel Locks is 406½ acres, of which 286½ acres are land and 120 acres water space.

There are 6½ miles of quay berthing, on a large portion of which transit sheds, some five floored, have been erected.

The equipment includes 53 hydraulic, 61 steam, and 93 electric cranes, varying in radius from 16 to 40 feet, with a lifting capacity of from 1 to 7 tons to a height from rail level of from 13 to 59 feet; a 30-ton steam crane; 30 hydraulic and 16 electric capstans; 46 locomotives; 6 floating pontoons of a dead-weight carrying capacity of 800 tons each; and all modern appliances for giving vessels quick dispatch.

There is also a pontoon sheers, capable of dealing with weights up to 250 tons, with a lift of 21 feet.

The docks, quays, transit sheds, and warehouses are lighted by electricity.

Protection against fire at the docks.—The Gamewell fire-alarm system is maintained at the docks, by means of which the Manchester and Salford fire brigades are immediately advised of any outbreak of fire at any point on the dock estate. The canal company also maintain on the docks an efficient and fully-equipped fire brigade.

There is also a powerful steam fire and salvage boat for the protection of property, the two fire pumps being each capable of delivering 2,000 gallons per minute, and the two salvage pumps 2,500 gallons each per minute.

The boat is berthed in the docks, is self-propelling, with steam always kept up, so that she can proceed to any point of the canal at short notice and be available immediately for either fire or salvage work.

There is a grain elevator, with a storage capacity of 40,000 tons (or 1,500,000 bushels), and containing 268 separate bins, on Trafford Wharf.

The following operations can be performed simultaneously:

(*a*) Discharging from vessels at the rate of 350 tons per hour.

(*b*) Weighing in the tower at the water's edge.

(*c*) Conveying to the house, and distributing into any of the 268 bins.

(*d*) Moving grain about within the house for changing bins or for delivery, and weighing in bulk, at the rate of 500 tons per hour.

(*e*) Sacking grain, weighing, and delivering sacks to 40 railway wagons and 10 carts simultaneously.

(*f*) There is a barge dock alongside the elevator to accommodate barges and (or) coasters loading grain for conveyance to premises on inland canals or to coastwise ports, and delivery can be effected by means of two delivery conveyors at the rate of 450 tons per hour if in bulk, or, if bagged, 120 tons (1,075 sacks) per hour.

An important feature in the elevator is Metcalf's patent dryer, which gives most satisfactory results. The dryer is capable of drying 50 tons of grain at each operation, and grain can be moved to or from the dryer from or to any bin in the house.

A powerful pneumatic apparatus, capable of discharging 200 tons per hour from ship into the elevator, is provided to supplement the foregoing appliances.

Portable grain elevators.—The canal company have provided a number of these for the discharge of grain from ships when necessary.

The docks are equipped with transit sheds (viz, 13 single-floor, 1 two-floor, 6 three-floor, 5 four-floor, and 12 five-floor) fitted with the most modern appliances, including a cold chamber for the sorting of frozen meat and other perishable produce.

There are also ranges of warehouses on the docks specially built for the warehousing of merchandise. A number of the warehouses are alloted exclusively for the storage of Egyptian, Surats, Brazilian, and East African cotton in hard pressed-packed bales, and others for provisions, breadstuffs, leather, fruits, corn, and seeds, the remainder being used for general merchandise, including American and other cotton.

The canal company also have a large warehouse fronting Trafford Wharf Road. It is divided into four parts, each division measuring 300 by 100 feet, fitted with overhead traveling cranes worked by electricity.

Lines of railway have been laid on all the dock quays, and are in direct communication with all the railways of Great Britain. The docks are also connected with the whole of the inland canal system

Conditions of Application of the Company's Charges.

Import traffic.—The purchaser of merchandise on "c. i. f." (cost, insurance, and freight) terms pays the ship canal toll, wharfage, and charges on such merchandise.

The seller of merchandise "ex quay," "ex warehouse," or "f. o. r." (free on rail) pays the ship canal toll, wharfage, and charges on such merchandise.

(See also par. 4, p. 453.)

Export traffic.—The purchaser of merchandise "f. a. s." (free alongside ship) pays the ship canal toll, wharfage, and charges on such merchandise.

The seller of merchandise "f. o. b." (free on board) pays the ship canal toll, wharfage, and charges on such merchandise.

The payment of all charges on export traffic is due before shipment, and to avoid delays and inconvenience, suppliers or shippers of f. o. b. merchandise should so arrange with their shipping agents.

(See also third paragraph under "Export traffic" on p. 459.)

All charges are made upon the gross weight of 2,240 pounds to the ton, unless otherwise stated.

MANCHESTER SHIP CANAL.

Schedule of rates of toll and wharfage operating from January 1, 1912, until further notice, payable in respect of passengers, animals, merchandise, and minerals, embarked or landed, shipped or unshipped, transshipped, or otherwise using the ship canal.

Passengers.—Passenger tolls are usually included in the fares charged by the shipowner. Toll between Manchester docks and Eastham (single journey), 1s. per passenger.

Animals, merchandise, and minerals.—Toll and wharfage in respect of animals, merchandise, and minerals are a charge upon the traffic conveyed, and not upon the vessel conveying the same, and are payable by the owners of the goods unless included in the freight by special contract between the merchant and the shipowner.

For the purposes of toll charges, the ship canal is divided into the three following sections:

	Section.
Eastham to Runcorn Swing Bridge	A.
Runcorn Swing Bridge to Entrance to Latchford Locks	B.
Latchford Locks to Woden Street Bridge, Manchester	C.

The amounts set out in the following schedule are the rates of toll and wharfage payable on the respective sections, as follows:

Cargo on board vessels entering or leaving the ship canal through any of the locks to the estuary of the River Mersey and passing over any portion of the canal between—

	Section.
Eastham and Runcorn Swing Bridge	A.
Eastham and places beyond Runcorn Swing Bridge up to the entrance to Latchford Locks	B.
Eastham and Latchford Locks (including locks), and places beyond up to Woden Street Bridge, Manchester	C.

Local traffic.—Canal tolls and wharfage rates will be quoted specially on application to the dock office for traffic not entering or leaving the ship canal by the estuary of the River Mersey. Also when for, or from, either of the docks at Widnes when using the Runcorn Lock only.

NOTE.—Where any rate of toll—either sectional or local—is fixed to apply to an article, the use of which is defined, a declaration that such article will not be otherwise used must be supplied if and when required by the canal company.

Traffic discharged upon one section of the ship canal and afterwards conveyed by barge to another section within 12 months from the date of importation without having left the canal premises in the meantime (except where otherwise provided by the canal company) is only charged the toll and wharfage rate of the section last used; and in the case of goods for export received by barge, the toll and wharfage rate applicable to the section in which the traffic originates is only charged.

NOTE.—Claims for the return of any canal toll overpaid in respect of traffic landed in one section of the canal and subsequently barged back to another section, must be lodged at the dock office within three months from the date of the transaction, or the claim will not be recognized by the company.

Traffic from foreign or coastwise ports outside the River Mersey may be reshipped from one seagoing vessel to another in the ship canal on payment of ship canal toll and wharfage at the same rates and upon the same terms as are now in force for the transshipment or reshipment of merchandise in the docks of the Mersey docks and harbor board.

[Tolls for articles marked with an asterisk (thus *) are inclusive of a charge for wharfage. Where there is no asterisk the rates are for toll only, but the use of the canal company's wharves is free subject to the company's regulations.]

Animals.		Tolls. A.	Tolls. B.	Tolls. C.
		s. d.	s. d.	s. d.
*Bulls, cows, oxen, mules, and asses	each	0 6	0 8	1 0
*Calves, goats, lambs, sheep, and pigs	per score	1 11	2 5	3 6
Poultry	per package	0 3	0 4	0 6
*Dogs	each	0 4	0 5	0 7
*Ponies	do	0 8	0 11	1 3
*Horses	do	1 1	1 5	2 1

Merchandise and minerals (per ton of 2,240 pounds gross).

NOTE.—Quay porterage rates: Ten per cent will be charged in addition to the rates set out herein.

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate[1] (see p.454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Acetate of lime (see Lime, acetate of).					
Acids:					
Acetic or wood (in casks or carboys)	1 10	2 5	4 0	1 3	....
Arsenic (solid) in casks or iron drums	2 0	3 0	5 0	1 3	....
Boracic (in casks)	2 0	3 0	5 0	1 1	....
Butyric (for use in tanning) (as extracts for tanners use (e.o.h.p).					
Carbolic (in casks or iron drums)	2 0	2 5	4 0	1 3	....
Chromic (in carboys)	1 4	1 10	3 0	1 6	....
Chromic (in bottles packed in cases)	1 4	1 10	3 0	1 3	....
Chromic (in casks or drums)	1 4	1 10	3 0	1 3	....
Citric (in casks or cases)	2 9	3 8	6 0	1 3	....
Cresylic (in casks or iron drums)	2 0	2 5	4 0	1 3	....
Muriatic (in carboys)	1 4	1 10	3 0	1 6	....
Muriatic (in bottles packed in cases or hampers)	1 4	1 10	3 0	1 3	....
Nitric or aqua fortis	2 0	3 0	4 0	1 6	....
Oleic (in casks)	2 9	3 8	6 0	1 3	....
Oxalic (in casks or cases)	2 4	3 6	5 10	1 3	....
Phosphoric (in casks)	2 0	3 0	5 0	1 3	....
Sulphuric or oil of vitriol	1 9	2 3	3 0	1 6	....
Tannic (in casks)	1 8	2 6	4 0	1 4	....
Tartaric	2 4	3 6	5 10	1 3	....
Aerated waters (in casks or cases)	2 0	2 5	4 0	[2] 1 0 [3] 1 3	....
Agricultural machines and implements:					
Complete or in parts, loose	2 0	3 0	5 0	2 6	....
In parts (packed in cases)	1 7	2 5	4 0	2 0	....
Agricultural seeds (see Seeds, agriculture).					
*Alabaster stone (in slabs)	1 7	2 0	2 10	1 6	....

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate[1] (see p.454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
*Alabaster stone (in blocks in the rough)	1 7	2 0	2 10	1 3	....
Alabaster stone, in lumps (unground)	0 10	1 3	2 0	....	0 10
Alabaster, figures, casts or ornaments	3 6	5 0	8 0	2 6	....
*Albumen	3 4	4 6	6 10	1 6	....
Alder poles in crates under 30 hundredweight	1 9	2 6	4 0	1 3	....
Ale and porter in casks, kegs, or bottled when in cases or casks	2 0	2 5	4 0	[2] 1 0 [3] 1 3	....
Algerian fiber (as fibers).					
Alizarine (as dye extracts and dyes).					
Alkaline earth, or strontia	1 0	1 6	2 6	1 0	....
Alkanet root	2 4	3 6	5 10	1 6	....
Almonds (see Fruit, dried).					
Alum and alum cake	1 0	1 9	2 6	1 0	....
Alum waste	1 0	1 9	2 6	1 0	....
Alum liquor (mordant)	1 10	2 5	4 0	1 0	....
Alumina, acetate of	2 0	3 0	5 0	1 3	....
Alumina, hydrate of, or bauxite (see Bauxite).					
Alumina, sulphate of (see Sulphates).					
*Aluminum (e.o.h.p.)	3 6	4 8	7 0	2 6	....
Aluminum bars, ingots, plates, rods, wire, and sheets	2 4	3 6	5 10	1 6	....
Aluminoferric	1 0	1 9	2 6	1 0	....
Aluminosilic	1 0	1 9	2 6	1 0	....
Alumite (from Australia)	0 9	1 0	1 8	1 0	0 10
Alundum ore (see Ores).					
Amber (rough)	3 6	4 10	8 0	1 0	....
American cloth (as drapery, heavy).					
Ammonia, muriate of	1 8	2 5	4 0	1 0	....

[1] Minimum charge for quay porterage, 9d. [2] Casks. [3] Cases.

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and—			Quay porterage rate (see p. 454).	
	Runcorn.	Latchford.	Manchester.	Packed.	Bulk.
	Sections.				
	A.	B.	C.		
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Ammonia, sulphate of (see Manure, packed).					
Ammoniacal liquor	0 10	1 3	2 0	1 0	....
Anchors (see Iron or steel).					
Angelica root	2 4	3 6	5 10	2 0	....
Angle barsor plates (see Iron or steel).					
Aniline colors (as dye extracts and dyes).					
Aniline oil (see Oils).					
Aniline, salts of (as Dye extracts and dyes).					
Annatto or annotto (in casks)	2 0	3 0	5 0	1 6	....
Antifouling composition not giving off inflammable vapor at less than 73° F	2 4	3 6	5 10	1 0	....
Antifriction metal	2 4	3 6	5 10	1 5	....
Antimonine (in casks) (as dye extracts and dyes)	....	....	....	1 0	....
Antimony ore (see Ores).					
Antimony ore waste	1 0	1 3	2 0	1 0	0 10
Antimony regulus	1 6	2 3	3 9	1 0	....
Antimony salts	1 8	2 6	4 2	1 0	....
Apitizo grains (patent food) in cases	1 3	1 10	3 0	1 9	....
Apples (raw and dried) (see Fruit).					
Argols or tartars	2 0	3 0	5 0	1 3	....
Arrowroot	2 4	3 0	5 0	2 0	....
Arsenic	1 6	1 10	3 0	1 3	....
Asafoetida (as drugs).					
Ashestic slates or slabs	1 6	2 3	3 0	1 6	....
Asbestine (in bags)	1 6	1 10	3 0	1 1	....
Asbestos (crude)	1 6	1 10	3 0	1 0	....
Asbestos (ground), in casks or bags	1 10	2 5	4 0	1 0	....
Asbestos for steam-pipe covering	2 0	3 0	5 0	1 6	....
Ashes, Russian (pot or pearl)	1 6	2 3	3 9	1 0	....
Asphalt, paving (in blocks)	0 10	1 3	2 0	....	0 10
Asphalt, compressed	1 3	1 10	3 0	1 0	....
Asphalt pipes (conduits for electric wires) (see Pipes, asphalt).					
Asphalt powder (in bags) (as asphaltum).					
Asphaltum	1 3	1 10	3 0	1 0	0 10
Automobiles, in parts (packed in cases) (as motors)	....	....	....	2 6	....
Bacon and hams, cured (packed)	2 0	3 0	5 0	1 3	....
Baggage or luggage	2 10	4 3	7 0	2 6	....
Bagging (for paper making) (as paper-making material).					
Bags or sacks (in bales)	2 0	2 5	4 0	1 2	....
Baking powder	2 2	3 0	5 0	1 6	....
Balsam (as drugs).					

Articles.	Tolls between Eastham and—			Quay porterage rate (see p. 454).	
	Runcorn.	Latchford.	Manchester.	Packed.	Bulk.
	Sections.				
	A.	B.	C.		
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Bananas (see Fruits, green).					
Barilla	1 8	2 5	4 0	1 0	....
Bark, for dyeing or tanning (chopped, packed in bags, or hydraulic pressed)	1 6	1 10	3 0	1 6	....
Bark for dyeing or tanning, not otherwise defined (in casks)	1 8	2 6	4 2	1 3	....
Bark (in other packages)	1 8	2 6	4 2	1 6	....
Bark (loose)	1 8	2 6	4 2	....	2 0
*Bark, ground (in bags)	2 5	3 3	4 11	1 6	....
Bark, spent	1 0	1 3	2 0	....	2 0
Barrels, folding (new), folded in bundles or nested	2 0	3 0	5 0	2 0	....
Bars, angle (see Iron or steel).					
Barytes, raw (in bulk)	0 10	1 2	2 0	....	0 10
*Barytes (in casks or bags)	1 4	1 8	2 6	1 0	....
Basic slag (unground and in bulk)	0 5	0 8	1 0	....	0 10
Basic slag (ground, packed)	0 9	1 0	1 8	1 0	....
Baskets and basket ware, osier or twig	2 10	4 3	7 0	2 6	....
Baskets and basket ware, of spale, or spale swills, or chip, coarse (in bundles)	2 6	3 8	6 0	2 6	....
Bass or bast	2 0	3 0	5 0	2 6	....
Baths	2 4	3 6	5 10	2 0	....
Battledores (common) wood	2 0	3 0	4 0	1 6	....
Bauxite or hydrate of alumina (e. o. h. p.)	1 0	1 3	1 8	....	0 10
Bauxite, low class, from Ireland	....	....	1 0	....	0 10
*Beads (in packages)	3 6	4 4	6 0	2 0	....
Beams (iron or steel) (see Iron or steel).					
Beamstone, ground, in bags (for concreting purposes)	1 5	1 10	3 0	1 0	....
*Beans, haricot	2 0	2 6	4 0	1 3	....
Bearers (iron or steel) (see Iron or steel).					
Bedsteads (iron or other metallic) (as hardware).					
Beef (in brine)	2 0	3 0	5 0	1 6	....
Beer, spruce (as ale).					
Beeswax	2 4	3 0	5 0	1 3	....
*Berries, bay, juniper, and yellow	2 9	4 0	6 0	1 9	....
Betel nuts	2 0	3 0	5 0	2 0	....
Bicarbonate of soda (in casks) (see Soda, bicarbonate of).					
Bichromate of potash (see Potash, bichromate of).					
Bichromate of soda (in casks) (see Soda, bichromate of).					
Bicycles	3 3	4 10	8 0	2 6	....
Bicycles (in parts), packed	3 0	3 8	6 0	2 6	....
Billets, blooms or ingots (see Iron or steel).					

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and—			Quay porterage rate (see p. 454).	
	Runcorn.	Latchford.	Manchester.	Packed.	Bulk.
	Sections.				
	A.	B.	C.		
	s. d.	s. d.	s. d.	s. d.	s. d.
Binders (iron or steel) (see Iron or steel).					
Binder boards (as millboards).					
Biscuits	2 0	3 0	5 0	1 6	....
Bitumen (in bags or barrels)	1 3	1 10	3 0	1 0	....
Blacking	1 8	2 6	4 0	1 0	....
Black lead	2 0	3 0	5 0	1 0	....
*Blanc-fixe waste	1 4	1 8	2 6	1 0	....
Bleaching powder	1 3	1 10	3 0	1 0	....
Blind rollers and cornice poles, in the rough (wood)	2 0	2 5	4 0	1 6	....
Blood for manure (see Manures).					
Blood (dried) in cases	2 4	3 6	5 0	1 6	....
Blood (e. o. h. p.) (in casks or iron drums)	1 6	2 3	3 9	1 3	....
Bluestone (as sulphate of copper).					
Boards, composition (see Composition boards).					
Boards, three-ply	1 5	1 10	3 0	2 0	....
Bobbins (in bags)	2 0	3 0	5 0	1 3	....
Bobbin blocks	1 6	1 10	3 0	1 3	....
Bog ore (for gas purifying) (see Ores).					
Boilers, iron or steel (see Iron or steel).					
Boiler composition for preventing incrustation	2 0	2 5	4 0	1 6	....
Boiler for retaining heat	1 6	1 10	3 0	1 6	....
Boiler fitting (not accompanying boiler) (see Iron or steel).					
Bone ash	0 10	1 1	2 0	1 0	1 9
Bones for size	1 6	1 10	3 0	1 3	2 0
Bones for manure (see Manure).					
*Books (in packages)	3 6	4 4	6 0	2 0	....
Boot dressing (in bottles, in cases) not giving off inflammable vapor at less than 73° F	1 8	2 6	4 0	2 0	....
Boots, shoes, and slippers	2 0	3 0	5 0	2 3	....
Boracic acid (see Acid).					
Boracite	1 5	1 10	3 0	1 0	....
Borate of lime (see Lime, borate of).					
Borate of soda (see Soda, borate of).					
Borax	1 10	2 5	4 0	1 0	....
Borocalcite	1 5	1 10	3 0	1 0	....
Bottles and jars (earthenware or stoneware)	1 8	2 5	4 0	2 0	....
Boulinikon (see Floorcloth).					
Box boards (in bundles)	1 5	1 10	3 0	....	1 3
Bran (in sacks or bags)	1 3	1 10	3 0	2 3	....
Bran (in press-packed packages)	1 3	1 10	3 0	1 8	....

Articles.	Tolls between Eastham and—			Quay porterage rate (see p. 454).	
	Runcorn.	Latchford.	Manchester.	Packed.	Bulk.
	Sections.				
	A.	B.	C.		
	s. d.	s. d.	s. d.	s. d.	s. d.
Bran when for export by steamer direct from Manchester to places outside the River Mersey	....	....	1 0	....	....
Brass	2 3	3 0	5 0	1 3	....
Brass manufactures (as hardware).					
Brass wire (in cases)	2 3	3 0	5 0	1 3	....
Brattice cloth	2 0	2 5	4 0	1 6	....
Bricks, bath	1 5	1 10	3 0	....	1 6
Bricks (clay, common, and fire)	0 9	1 0	1 6	1 0	1 3
Bricks (enameled or glazed)	0 11	1 3	1 10	1 3	....
Brimstone (crude or manufactured) (as sulphur).					
Briquettes (patent coal fuel)	0 4	0 4	0 6	....	....
Briquettes (patent peat fuel)	0 5	0 8	1 0	1 3	1 0
Briquettes, iron ore (see Iron-ore briquettes).					
Bristles (in boxes, cases, or casks)	2 4	3 0	5 0	1 3	....
British gum or dextrin (see Dextrin).					
Broom and brush heads and blocks	1 8	2 5	4 0	1 6	2 6
Brooms and brushes	2 10	3 8	6 0	2 6	....
Bungs or shives, wood (in barrels)	1 8	2 5	4 0	1 3	....
Butter (in casks, firkins, baskets, or boxes, or in tubs or cools with wooden lids)	2 0	3 0	5 0	1 6	....
Burnt ore (see Ores).					
Cables, telegraphic, telephonic, and electric (in coils or drums)	2 0	3 0	5 0	1 6	....
Cables, chain	1 5	1 10	3 0	1 9	....
Cables, rope	2 0	3 0	5 0	2 0	....
Cake (for cattle feeding)	1 5	1 10	3 0	1 0	1 6
*Camel hair (press-packed) (see Hair).					
Candied peel (see Peel).					
*Candles, carbon (for electric lighting)	2 6	3 7	5 0	1 5	....
Candles (paraffin, tallow, and stearin)	1 9	2 5	4 0	1 9	....
*Canes and rattans (in bundles)	3 0	4 4	6 0	2 6	....
Canvas, not oily (in bales or boxes)	2 0	2 5	4 0	1 3	....
Caps (in boxes or cases)	3 0	3 8	6 0	2 6	....
Carbide of silicon (packed)	1 9	2 5	4 0	1 0	....
Carbolic acid (see Acids).					
*Carbon plugs (as candles, carbon).					
Carbonate of zinc (see Zinc, carbonate of).					
Carbon, gas, from gas retorts	1 0	1 6	2 0	....	1 0
Carborundum fire sand (packed), for use by brass and iron founders	1 5	1 10	3 0	1 0	....
Carboys, empty (see Empties).					
*Cardamoms	3 6	5 0	7 0	1 6	....

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Cardboard	1 8	2 5	4 0	1 3	....
Carpets and carpeting (e. o. h. p.)	2 4	3 6	5 10	1 6	....
Cars, motor (see Motors).					
Casein	1 8	2 5	4 0	1 3	....
Castor beans	1 5	1 10	3 0	1 6	....
*Castings, light (iron or steel) (see Iron or steel).					
Casts of busts, statues, or figures, in plaster	3 6	4 10	8 0	2 6	....
Casts, plaster (common), for ornamenting ceilings	3 0	3 8	6 0	2 0	....
*Cattle food (surplus), when landed at mode wheel lairages, for use of cattle landed	....	....	Free.	....	....
Cattle food (surplus), when landed at the docks	....	....	1 6	1 6	....
Caustic soda (see Soda, caustic).					
Cement (e. o. h. p.)	1 0	1 3	2 0	1 0	....
Cement (metallic) in blocks	1 5	1 10	3 0	1 0	....
Cement (metal) in slabs, packed	2 0	3 0	4 0	1 0	....
Cement (cycle) in boxes, not giving off inflammable vapor at less than 73° F	3 0	4 6	6 0	2 6	....
Chairs, common (not stuffed)	2 4	3 6	5 10	2 6	....
Chairs and seats (garden) in parts, packed in cases	2 0	3 0	4 0	1 6	....
Chair bottoms, wood (in the rough) and chair wood	1 6	1 10	3 0	1 6	....
Chairs, railway (iron or steel) (see Iron or steel).					
Chalk (in the rough), for agricultural, disinfecting, and smelting purposes	0 9	1 0	1 6	1 0	....
Chalk, ground	1 0	1 3	2 0	1 0	....
*Chalk, French	3 0	4 0	6 0	1 0	....
Charcoal	1 5	1 10	3 0	1 3	....
Charubs or locust beans (see Locust beans or charubs).					
Cheese (in boxes, cases, and casks)	2 0	3 0	5 0	1 6	....
Chestnuts (see Fruit, green).					
Chicory, ground	2 0	3 0	5 0	1 6	....
Chicory, root	1 10	2 5	4 0	1 6	....
Chloride of iron (see Iron liquor).					
Chloride of magnesium (in casks and drums)	1 6	2 3	3 0	1 3	....
Chloride of sulphur (in carboys)	3 0	4 6	6 0	1 6	....
Chocolate	2 0	3 0	5 0	2 0	....
Chinaware	2 3	3 0	5 0	3 0	....
China clay (see Clay).					
China-stone	0 6	1 3	2 0	....	0 10
Chrome alum, for sizing purposes	1 6	2 3	3 0	1 0	....
Chrome ore (see Ores).					

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Cider (as ale).					
Cigars and cigarettes	3 6	4 10	8 0	4 0	....
Cinders (tap or furnace), for lots of 100 tons and upward at a time	0 6	0 6	0 9	....	0 10
Citron peel (in brine) (see Peel).					
Clay base	1 0	1 3	2 0	1 0	....
Clay figures (in cases)	3 6	4 10	8 0	2 6	....
Clay:					
Black, blue, cutty, cambrian, fire, pipe, and common clay	0 6	0 11	1 6	....	0 10
China clay	0 6	1 3	2 0	....	0 10
Clocks	3 6	5 0	8 0	2 6	....
Clogs (as drapery, heavy).					
Clog and last blocks (rough)	1 5	1 10	3 0	1 6	1 6
*Cloth, brattice (see Brattice cloth).					
Clothes pegs	2 0	3 0	5 0	2 0	....
Cloth wrapping (old) from rolls of tobacco	2 0	2 5	4 0	1 3	....
*Cloves	4 0	5 8	8 0	2 0	....
Cobalt	2 10	4 3	7 0	1 3	....
*Cobalt ore	2 1	2 11	4 7	1 0	....
Coal (cargo or bunkering) (see coal schedule)	0 4	0 4	0 6	....	....
Cocoa	2 0	3 0	5 0	1 6	....
Cocoa (or coker) nuts (see Fruit, green).					
Cochineal	3 6	4 10	8 0	2 0	....
Coffee	2 0	3 0	5 0	1 6	....
Coir rope and coir junk	2 0	3 0	5 0	1 3	....
Coke (e. o. h. p.)	0 4	0 4	0 6	....	....
Coke made from pitch and petroleum	0 9	1 0	1 6	....	....
Coke (granulated or metallurgical) in bags	0 9	1 0	1 6	....	....
Coloritan	2 6	3 9	5 0	1 6	....
Colors and paints (pigments)	1 8	2 5	4 0	1 0	....
Colors, earth	1 5	2 3	3 0	1 0	....
Composition boards, i. e., strips of wood secured between strong cardboard (packed in case)	1 9	2 5	4 0	2 0	....
Composition rollers, old, and to be broken up	1 6	2 3	3 0	2 0	....
Conduits (earthenware)	1 8	2 5	4 0	2 0	....
Confectionery	2 0	3 0	5 0	1 6	....
Copper ingots	2 3	3 0	5 0	1 1	....
Copper sheets	2 0	3 0	5 0	1 5	....
Copper wire, insulated	3 6	5 3	7 0	1 6	....
Copper wire (in cases)	2 3	3 0	5 0	1 3	....
Copper ore (see Ores).					
Copper barilla and regulus	1 8	2 5	4 0	1 1	1 1

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and—			Quay porterage rate (see p. 454).	
	Runcorn.	Latchford.	Manchester.	Packed.	Bulk.
	Sections.				
	A.	B.	C.		
	s. d.	s. d.	s. d.	s. d.	s. d.
Copper, sulphate of (see Sulphates).					
Copper oxide or copper scale	1 9	2 5	4 0	1 0	....
Copperas (e. o. h. p.)	1 8	2 5	4 0	1 0	0 10
Copperas, green (in bulk)	0 10	1 3	2 0	....	0 10
Copperas, green (packed)	1 4	1 10	3 0	1 0	....
Copperas, waste	0 10	1 3	2 0	....	0 10
Copra	1 8	2 5	4 0	1 3	1 9
Coquilla nuts	2 0	3 0	5 0	2 0	....
Core compound or core gum	1 3	1 10	3 0	1 0	....
Corn (see Grain).					
*Corn flour (patent)	2 6	3 2	4 8	1 0	....
Corks and cork bungs	2 10	4 3	7 0	2 6	....
Corkwood	2 4	3 6	5 10	1 6	2 3
*Cork waste	2 4	3 6	5 10	1 3	....
Corozo (or ivory) nuts	2 0	3 0	5 0	2 0	....
Corset steels (in cases)	2 6	3 9	5 0	1 5	....
*Corundum ore (see Ores).					
Corundum (as emery).					
Cottolene (a substitute for lard) (as lard).					
Cotton and linen thread (see Thread).					
*Cotton and linen goods (in bales, boxes, cases, packs, or trusses) (e. o. h. p.)	2 6	3 0	4 0	1 6	....
Cotton seed in bags (for oil crushing) (see Seeds, cotton).					
*Cotton, raw, (in press-packed bales) (see cotton schedule)	2 6	3 7	5 0	....	....
Cotton thread (see Thread).					
Cotton warps (see Warps).					
Cotton yarns (see Yarns).					
Cotton waste	1 6	1 10	3 0	1 3	....
Crayons (in cases) (as stationery).					
Cream of tartar	2 4	3 6	5 10	1 3	....
Creosote (packed)	1 0	1 3	2 0	1 0	....
Creosote (in bulk)	....	....	1 6	....	....
Creosote oil (see Oil).					
Creosote salts	1 0	1 3	2 0	1 0	....
Crucibles, plumbago (in packages under 9 cwt.)	2 0	3 0	5 0	2 0	....
Crucibles, plumbago (in packages over 9 cwt.)	2 0	3 0	5 0	1 6	....
Crude soap glycerin, or concentrated soap lyes (see Soap lyes, concentrated).					
Crude tar salts, or refuse from gas tar distilling (see Tar salts).					
*Currants (see Fruit, dried).					
Curtains, lace	2 0	3 0	5 0	2 6	....

Articles.	Tolls between Eastham and—			Quay porterage rate (see p. 454).	
	Runcorn.	Latchford.	Manchester.	Packed.	Bulk.
	Sections.				
	A.	B.	C.		
	s. d.	s. d.	s. d.	s. d.	s. d.
Cutlery	2 4	3 6	5 10	2 6	....
Cutch	1 5	1 10	3 0	1 3	....
Cycles, motor (see Motors).					
Dates (see Fruit, dried).					
Dextrine, or British gum (in bags)	1 3	1 10	3 0	1 0	....
Desks (as furniture).					
Divi-divi	1 5	1 10	3 0	1 6	2 0
Djetoetoeng	2 0	3 0	5 0	1 6	....
Dowels, American birchwood in the rough	2 0	3 0	5 0	1 6	....
Drain pipes, glazed (see Pipes, drain).					
Draining pipes and tiles, common, for agricultural draining	1 0	1 3	2 0	....	1 9
Drapery, heavy (as per general railway classification) (e. o. h. p.)	2 0	2 5	4 0	1 6	....
Drugs (in boxes, casks, bags, bales, hampers, or crates)	2 4	3 6	5 10	2 6	....
Drysalteries (e. o. h. p.) (as drugs).					
Dunnage mats (in bundles)	2 0	3 0	4 0	1 3	....
Dunnage wood (see wood goods schedule)	0 9	1 0	1 8	....	....
Dye extracts and dyes (irrespective of how packed) (e. o. h. p.)	2 6	3 9	5 0	1 4	....
Dyewoods (in the rough)	1 5	1 10	3 0	....	....
Dyewoods (in bags)	1 6	2 3	3 9	1 6	....
Dynamos (in cases)	1 7	2 5	4 0	2 0	....
Earth, black (in bags)	1 5	2 3	3 0	1 0	....
Earth, infusorial (see Infusorial earth).					
Earthenware (in casks, crates, or cases) (e. o. h. p.)	1 8	2 5	4 0	2 0	....
Earthenware conduits (see Conduits).					
*Eggs (in boxes, cases, or crates)	3 0	4 4	6 0	2 6	....
Eggs (liquid), in tins and cases (as eggs)	....	....	....	1 6	....
Electrical accumulators	2 8	3 5	5 0	2 6	....
Electrical machines and machinery (other than accumulators), packed or unpacked (e. o. h. p.)	1 7	2 5	4 0	2 0	....
Electric meters	3 0	4 6	6 0	2 0	....
Electric wire casings (wood)	2 0	3 0	5 0	2 6	....
Emery cloth or paper	2 0	3 0	5 0	1 3	....
Emery and emery dust	1 9	2 5	4 0	1 0	....
Emery stone	1 5	1 10	3 0	1 0	0 10
Emery wheels and rollers	2 0	3 0	5 0	1 6	....
Empties—cases, casks, crates, hampers, and other empties (e. o. h. p.)	2 0	3 0	5 0	2 6	....
Empties (returned) (e. o. h. p.)	0 10	1 3	2 0	2 6	....
Empty jam glasses, packed	1 8	2 5	4 0	2 6	....
*Engines and tenders, locomotive (by special arrangement)	2 6	3 4	5 0	....	....

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Epsom salts (as sulphate of magnesia).					
Esparto grass (loose)	1 8	2 6	4 2	....	2 6
Esparto grass (in press-packed bales)	1 6	1 10	3 0	1 3	....
Extracts of meat	3 0	3 8	6 0	1 6	....
Extracts for tanners' use (e. o. b. p.)	1 5	1 10	3 0	1 4	....
Fancy goods (photo and picture frames, etc.)	3 0	4 6	6 0	2 6	....
Farina (not calcined)	1 3	1 10	3 0	1 0	....
Feathers (in bags)	3 6	5 3	8 0	2 6	....
Feldspar, unground (in bulk)	0 6	1 0	1 8	....	0 10
Feldspar, ground (packed)	1 0	1 6	2 0	1 0	....
Felt, for roofing	1 9	2 5	4 0	1 6	....
Felt hat bodies	3 0	4 0	6 0	2 6	....
Ferrochrome and ferrosilicon (in bulk)	1 0	1 6	2 0	....	1 3
Ferrochrome and ferrosilicon (packed)	1 6	2 3	3 0	1 0	....
Ferromanganese (in bulk)	0 6	0 11	1 6	....	1 3
Ferromanganese (packed)	1 5	1 10	3 0	1 0	....
Ferrotungsten (in cases)	3 0	4 6	6 0	1 0	....
Ferrozone	1 0	1 9	2 6	1 0	....
Fibers (press-packed) (e. o. h. p.)	2 0	2 5	4 0	1 1	....
Fibers (not press-packed) (e. o. h. p.)	2 0	2 5	4 0	1 5	....
Fiber roving cans (parts of machines) (as machinery).					
Figs (see Fruit, dried).					
Filters	2 4	3 6	5 10	2 6	....
Fire bricks (see Bricks).					
Fire clay (see Clay).					
Fire extinguishers (in cases)	3 0	4 6	6 0	2 6	....
Fish:					
Cod, dried	1 9	2 5	4 0	2 0	....
Fresh	2 6	3 7	6 0	1 6	....
Herrings, red	1 9	2 5	4 0	1 6	....
Fish glue (as glue).					
Flagstones (paving)	0 9	1 0	1 3	....	1 0
Flaked wheat (see Wheat, flaked).					
Flavine (as dye extracts and dyes).					
Flax (in bales)	1 9	2 5	4 0	1 3	....
Flints (loose)	0 6	1 0	1 8	....	0 10
Flints (pulverized)	1 0	1 6	2 0	1 0	....
Floorcloth (including oilcloth, boulinikon, kamptulicon, and linoleum)	2 0	2 5	4 0	2 0	....
*Flooring blocks and boards, wood (parquetry)	2 6	3 6	5 6	2 0	....
Flooring boards (wood), maple, etc. (see wood goods schedule).					

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Flour	1 3	1 10	3 0	1 0	....
Flour when for export by steamer direct from Manchester to places outside the River Mersey	....	....	1 0	....	....
Flower of sulphur (see Sulphur, manufactured).					
FRUIT.					
Dried:					
Almonds (in bags or barrels)	2 4	3 6	5 10	1 6	....
Almonds (in boxes or half barrels)	2 4	3 6	5 10	2 0	....
Apples	1 8	2 5	4 0	1 6	....
Apricots	2 0	3 0	5 0	1 6	....
*Currants (in cases)	2 6	3 6	5 0	2 0	....
*Currants (in smaller packages)	2 6	3 6	5 0	2 3	....
*Currants (in casks or barrels)	2 6	3 6	5 0	1 4½	....
Dates (in bags, etc.)	2 0	3 2	5 0	2 0	....
Figs (in cases, mats, bags, etc.)	2 0	3 0	5 0	2 3	....
Figs (in casks or barrels)	2 0	3 0	5 0	1 3	....
Plums, dried or preserved (in boxes)	2 0	3 0	5 0	1 6	....
Raisins	2 6	3 6	5 0	2 3	....
Green:					
Apples, in boxes or baskets not exceeding 56 pounds each	....	....	[1] 0 1	2 6	....
Apples, in half barrels, over 56 pounds and not exceeding 84 pounds each	....	....	[2] 0 1½	1 9	....
Apples, in barrels not exceeding 1 cwt. 2 qrs. 14 lbs. each	....	....	[3] 0 3	1 3	....
Apples in barrels of greater weight	....	....	[3] 0 4	1 3	....
Apples (e. o. h. p.)	1 8	2 5	4 0	1 6	....
Bananas	2 0	3 0	5 0	....	....
Cranberries	2 0	3 0	5 0	2 0	....
Fruits in own juice or fruits tinned of all kinds (in boxes, cases, or casks)	2 0	3 0	5 0	1 6	....
Grapes, in barrels	....	....	....	1 3	....
In boxes or baskets not exceeding 28 pounds each	2 4	3 6	5 10	2 6	....
Exceeding 28 pounds and not exceeding 84 pounds each	....	....	....	1 9	....
Exceeding 84 pounds each	....	....	....	1 3	....
Lemons (in cases)	2 0	3 0	5 0	1 3	....
Mandarins, in packages not exceeding 28 pounds (per package)	....	....	0 ½	2 6	....
Exceeding 28 pounds and not exceeding 56 pounds (per package)	....	....	0 1	1 9	....
Exceeding 56 pounds and not exceeding 112 pounds (per package)	....	....	0 2	1 6	....
Exceeding 112 pounds (per package)	....	....	0 4	1 3	....

[1] Per box or basket. [2] Per half barrel. [3] Per barrel.

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
FRUIT—continued.					
Green—Continued.					
Melons (in cases)	2 0	3 0	5 0	1 3	....
Nuts:					
Chestnuts	1 8	2 5	4 0	1 5	....
Coker or cocoa (in bags)	1 10	2 5	4 0	1 6	....
Coker (in bulk)	1 10	2 5	4 0	....	[1]3 0
Peanuts (in bags)	2 0	3 0	5 0	1 3	....
Walnuts	2 0	3 0	5 0	2 0	....
Onions (in cases)	....	....	....	1 3	....
Onions (in bags not exceeding 112 pounds each)	1 5	1 10	3 0	1 10	....
Onions (in bags exceeding 112 pounds each)	....	....	....	1 6	....
Oranges (in cases)	2 0	3 0	5 0	1 3	....
Pears in boxes or baskets not exceeding 28 pounds each	....	....	....	2 6	....
Exceeding 28 pounds and not exceeding 84 pounds each	1 8	2 5	4 0	1 9	....
Exceeding 84 pounds each	....	....	....	1 3	....
Pineapples (not hothouse)	2 4	3 6	5 10	1 6	....
Pomegranates (in packages) not exceeding 28 pounds each	2 0	3 0	5 0	2 6	....
Exceeding 28 pounds but not exceeding 84 pounds each	....	....	....	1 9	....
Exceeding 84 pounds each	....	....	....	1 3	....
Tomatoes, in packages not exceeding 28 pounds each	....	....	....	2 6	....
Exceeding 28 pounds and not exceeding 84 pounds each	2 0	3 0	5 0	1 9	....
Exceeding 84 pounds each	....	....	....	1 3	....
Force (in cases)	1 3	1 10	3 0	1 9	....
Fuller's earth	1 3	1 10	3 0	1 0	....
Furmentine (in bags) (as farina).					
Furniture (including office furniture fitted up)	3 6	5 0	8 0	2 6	....
Furniture stock, or knocked down goods, i. e., furniture in parts, in the rough for making up	2 4	3 0	5 0	1 10	....
Furniture vans (empty)	2 0	3 0	5 0	2 0	....
Fustic liquor (in casks)	2 0	2 5	4 0	1 0	....
Galls or gall nuts	2 0	3 0	5 0	2 0	....
Galvanized iron (see Iron or steel).					
Gambier and gambree	1 6	1 10	3 0	1 6	....
Gas meters (see Meters).					
Gas purifying refuse or gas lime	0 6	0 8	1 0	....	1 0
Gas water or tar water	1 0	1 3	2 0	1 0	....
Gelatine	2 4	3 6	5 10	1 6	....

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Germ (of grain) (as grain).					
*Ginger	3 0	4 0	6 0	2 0	....
Ginger, preserved	2 10	4 3	7 0	1 6	....
Girders and girder bars, iron and steel (see Iron or steel).					
Glass (e.o.h.p.)	2 8	3 8	6 0	2 6	....
Glass crushed or powdered	1 6	2 3	3 0	1 0	....
Glass and glassware (common), window, flint, and molded, including bottles and bottle stoppers, also plate glass, both "rough" and "not silvered"	1 8	2 5	4 0	2 6	....
Glass refuse or waste (ground)	1 0	1 6	2 6	1 0	0 10
Glass sand (see Sand).					
Glass siphons (mineral water)	2 6	3 9	5 0	2 6	....
Glauber salts (as sulphate of soda).					
Glucose or grape sugar (see Special circular):					
In casks					
In bags	1 8	2 5	4 0	....	....
Other packages					
Glue	1 10	2 5	4 0	1 3	....
Glutrin for use by brass, iron, and steel founders	1 5	1 10	3 0	1 0	....
Glycerine:					
In cases	2 8	3 8	6 0	1 6	....
In carboys	2 8	3 8	6 0	2 6	....
In casks or iron drums	2 3	3 0	5 0	1 3	....
Crude soap, in casks or iron drums (see Soap lyes, concentrated).					
Glyco metal (as antifriction metal).					
Grain—Barley, beans, buckwheat, dari, dills, Indian corn, maize (e.o.h.p.), oats, peas, rye, and wheat (see grain schedule)	1 3	1 10	3 0	....	....
Grain offal, when for export by steamer—direct from Manchester to places outside the River Mersey	....	....	1 0	....	....
Granite (crushed or in chippings)	0 6	0 9	1 0	1 0	0 7
Granite (in blocks, rough or undressed)	0 10	1 3	2 0	....	1 3
Granite (polished or dressed, or partly dressed) in blocks or slabs, exceeding 2 inches in thickness	1 9	2 5	4 0	2 0	....
Granite (polished or dressed, or partly dressed) (e.o.h.p.)	2 0	3 0	5 0	2 6	....
Grape nuts	1 3	1 10	3 0	1 9	....
Grapes (see Fruit, green).					
Grass seed cleanings (not grass seed)	1 3	1 10	3 0	1 3	....
Gravel	0 6	0 9	1 0	....	0 7
Grease (in casks)	1 8	2 5	4 0	1 0	....
Greaves	1 8	2 5	4 0	1 0	....

[1] Per 1,000.

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Run-corn. Sections. A.	Latch-ford. B.	Man-chester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Green copperas (see Copperas).					
Grits (brewers' and corn meal), in bags..	1 3	1 10	3 0	1 0	....
Grit in bags for sawing stone............	1 0	1 9	2 6	1 0	....
Groats (in sacks)........................	1 3	1 10	3 0	1 3	....
Guano (see Manure, packed).					
Gums.....................................	2 0	3 0	5 0	1 6	....
Guns (not machine), in cases.............	3 6	5 3	7 0	2 0	....
Gutta-percha goods (manufactured) (as india-rubber goods).					
Gypsum...................................	0 10	1 3	2 0	1 0	1 3
Hair—Hog's, horse, camel, or cow (press-packed)................................	2 0	3 0	5 0	1 3	....
Hams (see Bacon).					
Handles, wood and bone...................	1 8	2 5	4 0	1 6	....
*Handles, iron...........................	2 0	2 10	4 0	1 3	....
Hardening powder.........................	2 6	3 9	5 0	1 0	....
Hardware (as per general railway classification)................................	2 4	3 0	5 0	1 5	....
*Haricot beans...........................	2 0	2 6	4 0	1 3	....
Hats—Felt, not soft (in cases or boxes)..	2 6	3 8	6 0	3 6	....
Hats, soft (in boxes or cases)...........	2 6	3 8	6 0	3 0	....
Hatters' wool (as wool, raw).					
Hay, press packed........................	1 3	1 6	2 6	....	1 4½
Hay, not press packed....................	1 3	1 6	2 6	....	1 10
Hay, loose...............................	1 3	1 6	2 6	....	2 6
Heath for brushes (press packed).........	2 0	2 5	4 0	1 6	....
Heath for brushes (not press packed).....	2 0	2 5	4 0	2 6	....
Heavy drapery (see Drapery, heavy).					
Hemp (in bales)..........................	1 9	2 5	4 0	1 3	....
Herbs (dried):					
Press packed.............................	2 4	3 6	5 10	2 0	....
Not press packed.........................	2 4	3 6	5 10	2 6	....
Hessians (see Jute goods).					
Hides, salted or dry (in bales or bundles).	1 8	2 5	4 0	1 9	....
Hides, dry (loose).......................	1 8	2 5	4 0	....	2 6
Hide cuttings (in bales).................	1 8	2 5	4 0	1 3	....
"Ho" (in cases)..........................	1 3	1 10	3 0	1 9	....
Hollow ware (as hardware).					
*Honey...................................	3 0	4 4	6 0	1 9	....
Hoofs of cattle..........................	2 0	2 3	3 9	1 6	2 0
Hoops, wooden............................	1 8	2 6	4 0	2 6	....
*Hops....................................	3 0	4 5	6 0	2 6	....
Horns and horn tips......................	2 0	2 5	4 0	1 6	2 0

Articles.	Tolls between Eastham and— Run-corn. Sections. A.	Latch-ford. B.	Man-chester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Hurdles, and standards for (iron or steel) (see Iron or steel).					
Hydrate of alumina (see Bauxite).					
Ice......................................	1 3	1 6	2 6	1 6	....
India-rubber goods (packed in cases other than boots or shoes and tires)..........	2 0	3 0	5 0	2 6	....
India rubber, waste, in bags, and reclaimed scrap rubber, in bags.........	2 0	2 5	4 0	1 6	....
India rubber, raw........................	2 4	3 6	5 10	1 8	....
Indian corn (see Grain).					
Indigo (as dye extract and dyes).					
Indigo paste (as dye extracts and dyes).					
Infusorial earth, in the crude state, unmanufactured and unrefined..........	0 9	1 2	2 0	1 0	0 10
Infusorial earth, manufactured or refined.	1 2	1 9	3 0	1 0	0 10
Ingots (iron or steel) (see Iron or steel).					
Ink (printer's)..........................	2 0	3 0	5 0	1 6	....
Ink, writing (in boxes, casks, crates, or cases)................................	2 0	3 0	5 0	2 0	....
Instruments, musical (in cases)..........	3 6	4 10	8 0	2 6	....
Iron ore (see Ores).					
Iron ore briquets (as Iron ore).					
Iron pyrites (see Ores).					
Iron or steel:					
Anchors..................................	1 5	1 10	3 0	....	1 0
Angle bars, plates, or sheets............	1 5	1 10	3 0	....	1 3
Beams, bearers, and binders (as girders)...................................	1 5	1 10	3 0	....	1 0
Billets, blooms, and ingots, foreign..	1 0	1 3	2 0	....	1 0
Billets, not foreign.....................	0 7	1 0	1 8	....	1 0
Boilers, not exceeding 30 feet in length	1 9	2 5	4 0	(1)	(1)
Boiler, exceeding 30 feet................	2 0	3 0	5 0	(1)	(1)
Boiler fittings, not accompanying boiler....................................	2 0	3 0	5 0	1 6	....
Cannon balls and shot and shells, not charged..................................	1 0	1 3	2 0	1 0	....
*Castings, light, in boxes, cases, crates, casks, or hampers..........	2 0	2 10	4 0	2 0	....
Chain cables.............................	1 5	1 10	3 0	1 9	....
Cotton tie clips.........................	1 5	1 10	3 0	1 3	....
Cotton bale hoops, old, not bona fide scrap iron...............................	1 6	2 3	3 0	1 6	....
*Fireproof sheets, in crates [2].........	2 8	3 0	4 0	1 6	....
Forgings, iron or steel, in the rough [2].	1 5	1 10	3 0	2 0	....
Galvanized iron..........................	1 5	1 10	3 0	1 3	....
Girders and girder bars..................	1 5	1 10	3 0	....	1 0

[1] By special arrangement.
[2] The quay porterage charge on these articles is subject to special arrangement when of unusual length, bulk, or weight, or of exceptional bulk in proportion to weight.

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Iron or steel—Continued.					
Hurdles, and standards for	1 5	1 10	3 0	1 6	....
Nails	1 5	1 10	3 0	0 11	....
Netting (wire)	2 8	3 0	4 4	1 6	....
Nuts and bolts	1 5	1 10	3 0	1 0	....
Pig iron (see pig iron schedule)	0 6	0 11	1 6	....	....
Pipes, gas, water (except rain water), air, or steam	1 5	1 10	3 0	1 6	....
*Pipes (rain water), cast iron, for spouting, eaves-troughs, or eaves-channels and their connections	2 0	2 10	4 0	2 0	2 0
Puddled bars	0 10	1 3	2 0	....	1 0
Railway chairs	1 3	1 9	2 6	....	1 0
Railway rails (straight)	1 5	1 10	3 0	....	1 0
Railway or tramway materials other than chairs and straight rails	1 5	1 10	3 0	....	1 6
*Sanitary castings	2 8	3 0	4 4	2 0	....
Scrap (heavy)	0 6	0 11	1 6	....	1 0
Scrap (light)	0 6	0 11	1 6	....	1 6
Shot (cannon)	1 0	1 3	2 0	1 0	....
Shot, steel (small) in casks or bags	1 9	2 5	4 0	1 0	....
Spiegel iron (English), in pigs (as pig iron)	....	....	....	....	0 10
Spiegeleisen (in bulk), (as pig iron)	....	....	....	....	0 10
Spiegeleisen (e. o. h. p.)	1 5	1 10	3 0	1 0	....
Springs, railway wagon	2 0	2 10	4 0	1 6	....
Steel (in bars and bundles)	2 0	3 0	5 0	1 0	....
Steel, band or hoop	1 5	1 10	3 0	1 6	....
Steel bars and castiings (in cases) e. o. h. p.	2 0	2 10	4 0	1 6	....
Steel bars, for nut and bolt making	1 5	1 10	3 0	1 6	....
Steel bars (unfinished) for driving mill wheels	1 5	1 10	3 0	1 6	....
Steel sheet bars	1 5	1 10	3 0	....	1 0
Steel poles (cast)	2 0	2 10	4 0	1 6 1 3	(1)
Steel sheets, embossed, for ceiling or other decoration (in cases)	2 4	3 0	5 0	2 0	....
Tin plates	1 5	1 10	3 0	1 0	....
Wire (in coils) and wire rods	1 5	1 10	3 0	1 0	....
Wire for fencing (barbed or plain)	1 5	1 10	3 0	1 3	....
Wire for fencing (barbed or plain) when for export by steamer direct from Manchester to places outside the River Mersey	....	....	2 6	....	....
Wire ropes	2 0	3 0	5 0	1 0	....
Wrought-iron tubes (not packed)	1 6	2 3	3 0	....	1 6
Other iron and steel, in Class "C" of the general railway classification	1 5	1 10	3 0	1 6	....

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Iron liquor, or muriate of iron, or chloride of iron (in casks or iron drums)	2 0	2 5	4 0	1 0	....
Ironstone	0 6	0 8	1 0	....	0 10
Istle, for brush making	2 0	2 5	4 0	1 1	....
Ivory	3 6	4 10	8 0	2 6	....
Ivory, vegetable	2 0	3 0	5 0	2 0	....
Ivory waste or dust	2 0	3 0	5 0	2 0	....
Ivory (or corozo) nuts (see Corozo nuts).					
Jars and bottles (earthenware or stoneware)	1 8	2 5	4 0	2 0	....
Jelly or grease (petroleum) (not vaseline), in casks or iron drums	1 8	2 5	4 0	1 0	....
Joiners' work (common wood), beadings and moldings (not gilt, lacquered, or varnished), doors and door frames, fittings and fixtures for building staircases, balusters, and handrails, window sashes and frames and shutters, panels, drawers (in parts), sanitary fittings, and trelliswork	2 4	3 0	5 0	1 10	....
Juice: Currant, lemon, lime, licorice, and orange (in cases, casks, or pipes)	2 4	3 0	5 0	[2] 1 6 [3] 1 0	....
Juniper berries (see Berries).					
Junk (old rope)	1 5	1 10	3 0	1 6	....
Jute	2 0	2 5	4 0	1 3	....
Jute goods, including cloth, yarns, hessians, bagging, sacking, and carpeting	2 0	2 5	4 0	1 3	....
Kainit (in bulk)	0 10	1 3	2 0	....	0 10
Kainit (packed)	1 5	1 10	3 0	1 0	....
Kamptulicon (see Floorcloth).					
Kartavert	2 0	2 5	4 0	2 0	....
Kentledge (as pig iron).					
Kieserite (in bulk)	0 10	1 3	2 0	....	0 10
Kieserite (packed)	1 5	1 10	3 0	1 0	....
Lac	2 0	3 0	5 0	1 6	....
Lacrosses (in cases)	3 6	5 3	7 0	2 6	....
Lactarine	1 8	2 5	4 0	1 3	....
Ladder rungs (wood)	2 0	3 0	5 0	1 6	....
*Lampblack	2 11	4 0	6 0	1 3	....
Lard:					
In pails, boxes, tubs, and blocks (not exceeding 84 pounds each), and in half barrels and firkins (exceeding 84 pounds and not exceeding 130 pounds each)	2 0	3 0	5 0	1 6	....
In tierces or casks (exceeding 400 pounds each)	1 8	2 5	4 0	1 0	....
Lardine and cottolene (as lard).					
Last blocks (as clog blocks).					
Lavatory fittings (iron), packed (as sanitary castings) (see Iron or Steel).					

[1] Exclusive of weighing. [2] Cases. [3] Casks or pipes.

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Run-corn. Sections. A.	Latch-ford. B.	Man-chester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Lead, old or scrap	1 5	1 10	3 0	......	1 3
*Lead, red and white	2 0	2 9	4 0	1 0	......
Lead, pig	1 5	1 10	3 0	......	1 0
*Lead, sheet or piping	2 0	2 8	4 0	1 3	......
Leather belting	3 0	3 6	5 10	1 6	......
Leather boards and leatheroid	1 5	1 10	3 0	1 6	......
Leather, dressed, unmanufactured, or scrap	2 6	3 0	5 0	1 6	......
Leaves, palm	2 0	3 0	5 0	2 6	......
Lemons (see Fruit, green).					
Lemon juice (in cases, casks, or pipes) (see Juice).					
Lemon, orange, and citron peel (in brine)	1 8	2 5	4 0	1 0	......
Lentils (in sacks or bags)	1 3	1 10	3 0	1 0	......
Lime	0 10	1 3	2 0	1 0	......
Lime, acetate of	1 0	1 6	2 6	1 3	......
Lime, borate of	1 5	1 10	3 0	1 0	......
Lime, gas or gas purifying refuse	0 6	0 8	1 0	......	1 0
Lime juice (see Juice).					
Lime, metal acid of (in casks)	2 0	2 5	4 0	1 3	......
Limestone (in bulk)	0 6	0 8	1 0	......	0 10
Limestone (polished or dressed)	1 5	1 10	3 0	2 0	......
Linen goods (in bales, boxes, cases, packs, or trusses)	2 6	3 0	4 0	1 6	......
Linen thread (see Thread).					
Linen yarns (see Yarns).					
Linseed (in sacks or bags) (see Seeds, linseed).					
Linseed-oil skimmings	1 6	2 3	3 0	1 0	......
Litter (moss or peat)	1 0	1 5	2 0	1 3	......
Liquors, mordant (including alum liquor, dunging liquor, and red liquor)	1 10	2 5	4 0	1 0	......
Liquor (logwood)	1 10	2 5	4 0	1 4	......
*Licorice root	3 0	4 1	6 0	1 9	......
Licorice juice (see Juice).					
*Locomotive engines and tenders (see Engines).					
Locust beans or charubs (in packages)	1 3	1 10	3 0	1 6	......
Locust beans or charubs (in bulk)	1 3	1 10	3 0	......	1 10
Locust seed or kernels (see Seeds, locust).					
Logwood extract, wet or dry	1 10	2 5	4 0	1 4	......
Logwood tar (see Tar, logwood).					
Logwood liquor (see Liquor, logwood).					
Looms (in cases) and loom sides and rails, when the two latter are sent together	1 10	2 5	4 0	2 0	......
*Looms, complete (not packed)	2 10	3 9	5 7	3 0	......
Luggage or baggage	2 10	4 3	7 0	2 6	......

Articles.	Tolls between Eastham and— Run-corn. Sections. A.	Latch-ford. B.	Man-chester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Machinery and machines (packed or unpacked), in classes 1 and 2 of the general railway classification	1 7	2 5	4 0	2 0	......
Machinery, electrical (see Electrical machinery).					
Magnesia (carbonate of), for manufacturing purposes	2 6	3 9	5 0	1 0	......
Magnesia (carbonate of), for drug purposes (as drugs).					
Magnesite ore (see Ores).					
Magnesite ore (calcined)	1 0	1 3	2 0	1 0	......
Maize (as Indian corn).					
Maize (flaked)	1 3	1 10	3 0	1 6	......
Maize meal (packed)	1 3	1 10	3 0	1 3	......
Maize meal (prepared) cerealine	2 0	2 9	4 0	1 3	......
Malt	1 3	1 10	3 0	1 0	......
Malta Vita (in cases)	1 3	1 10	3 0	1 9	......
Manganese ore (see Ores).					
Manganiferous iron ore (see Ores).					
Manure (packed), viz:					
Blood for manure				1 0	......
Bones for manure				1 3	2 0
Guano				1 0	......
Nitrate of soda for manure	1 0	1 6	2 0	1 0	......
Sulphate of ammonia				1 0	......
Artificial manure				1 0	......
Marble slabs:					
*In cases, not exceeding 30 hundredweight each	2 0	2 8	4 0	1 6	......
*When roughly sawn and cemented together, and not exceeding 30 superficial feet in measurement or 1 ton in weight per single package	2 0	2 8	4 0	1 6	......
*When roughly sawn and in single slabs from ¾ inch to 2 inches thick and not exceeding 30 hundredweight each	2 0	2 8	4 0	1 6	......
Marble blocks (rough):					
*Not exceeding 30 hundredweight each	2 0	2 8	4 0	1 3	......
*Exceeding 30 hundredweight but not exceeding 2 tons each	2 0	2 8	4 0	1 9	......
*Exceeding 2 tons but not exceeding 10 tons each	2 0	2 8	4 0	2 3	......
Marble (worked), consisting of mural tablets, headstones, crosses, monuments, chimney pieces, door posts, steps, clock cases, etc., in cases, not exceeding 30 hundredweight each	2 6	3 8	6 0	1 9	......
In cases, exceeding 30 hundredweight but not exceeding 5 tons each	2 6	3 8	6 0	2 3	......
*Marble scantlings (rough), 2 inches and upward in thickness	2 0	2 8	4 0	1 6	......
Marble statues (in cases), not exceeding 20 hundredweight each	3 6	4 10	8 0	5 0	......

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Marble chips	1 3	1 10	3 0	1 0	1 0
Marble refuse (in bags)	1 3	1 10	3 0	1 0	....
Marble refuse (in bulk), 20-ton lots and upward	1 0	1 3	2 0	....	0 10
Margarin (as butter).					
Mats, skin	2 10	3 8	6 0	2 6	....
Meal (in sacks or bags)	1 3	1 10	3 0	1 2	....
Meat, extract of	3 0	4 6	6 0	1 6	....
Meat, fresh and frozen	2 6	3 8	6 0	....	....
Meat preserves (in boxes, cases, and casks) (see Preserves).					
Metal polish (paste or powder)	2 6	3 9	5 0	2 0	....
*Meters, gas or water	3 0	4 0	6 0	2 6	....
Meters, electric (see Electric meters).					
*Mica (e. o. h. p.)	3 4	4 2	5 10	1 6	....
Mica, ground from sheet mica cuttings	1 8	2 6	4 2	1 1	....
Middlings (as meal).					
Middlings, when for export by steamer direct from Manchester to places outside the River Mersey	....	....	1 0	....	....
Milk (condensed) in casks, boxes, or cases	2 0	2 5	4 0	[1]	[1]
Millboards	1 5	1 10	3 0	1 6	....
Millboard rollers or tubes (for winding paper on)	1 8	2 5	4 0	2 0	....
Millet (in sacks or bags)	1 3	1 10	3 0	1 0	....
Mineral white	1 5	1 10	3 0	1 0	....
Mistletoe	2 10	4 3	7 0	2 6	....
Mohair (in bales)	2 6	3 9	5 0	1 6	....
Molasses for human consumption	1 8	2 5	4 0	1 3	....
Molasses residuum (used in the manufacture of cattle food)	1 6	2 3	3 0	1 3	....
Molasses for manufacturing or other purposes	1 6	2 3	3 0	1 3	....
Moloweat	1 5	1 10	3 0	1 3	....
Mordant liquors (including alum liquor, dunging liquor, and red liquor) (see Liquors, mordant).					
Mother Oats (in cases)	1 3	1 10	3 0	1 9	....
Motors, cars, carriages, and cycles uncharged with gas, oil, or other inflammable liquid or vapor	4 0	4 10	8 0	[1]	[1]
*Moldings (packed in boxes)	3 0	4 0	6 0	2 6	....
Moldings (loose or in bundles) (see Joiners' work).					
Muriate of ammonia (see Ammonia).					
Muriate of iron or iron liquor or chloride of iron (in casks or iron drums)	2 0	2 5	4 0	1 0	....
Muriate of potash (see Potash).					
Musical instruments (in cases)	3 6	4 10	8 0	2 6	....

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Mustard (in casks)	2 6	3 9	5 0	1 3	....
Myrabolams	1 5	1 10	3 0	1 6	....
Nails, iron and steel (see Iron or steel).					
Naphthol } Naphthol salts } Naphthol bitm }	2 4	3 0	5 0		
Naphtha alpha	2 4	3 6	5 10	[2] 1 0 [3] 1 3	....
Naphtha soda } Naphthionate } Naphthylamine }	2 4	3 0	5 0		
Naphthaline, crude, wet, dry, or pressed	1 0	1 3	2 0	1 0	....
Netting, wire (see Iron or steel).					
Newspapers (old), when for export by steamer direct from Manchester to places outside the River Mersey	....	....	2 6	....	....
Nickel (in casks)	2 4	3 6	5 10	1 3	....
Nickel ore (see Ores).					
Nightsoil	0 6	0 8	1 0	....	....
Nitrite-nitrate sodium (by-product from making calcium nitrate for manure)	1 5	1 10	3 0	1 0	....
Nuts—Chestnuts, cocoa (or coker), peanuts, and walnuts (see Fruit, green).					
Oakum	2 0	3 0	5 0	1 0	1 6
Oatmeal (in bags)	1 3	1 10	3 0	1 3	....
Oats (e. o. h. p.) (see Grain).					
Oats (Mother) (see Mother Oats).					
Oats (Quaker) (see Quaker Oats).					
Ocher	1 0	1 3	2 0	1 0	....
Oils (not giving off inflammable vapor at less than 73° F. when tested in the manner set forth in the Petroleum act, 1879, and otherwise not dangerous):					
In tank steamers	1 5	1 10	3 0	....	....
In packages, cases, casks, or iron drums (except as below)	1 10	2 5	4 0	[4] 1 6 [5] 1 0	....
*Oil, aniline	3 0	3 6	5 0	1 0	....
Oil, castor, for lubricating machinery, in tins packed in wooden cases	1 8	2 5	4 0	1 6	....
Oil, castor, for lubricating machinery, in casks or iron drums	1 8	2 5	4 0	1 0	....
Oil, castor, e. o. h. p. (in boxes)	2 0	3 0	5 0	1 6	....
Oil, coker nut	1 10	2 5	4 0	1 3	....
Oil, cottonseed	1 10	2 5	4 0	1 3	....
Oil, creosote	1 5	1 10	3 0	1 0	....
*Oil, essential	4 0	5 10	8 0	2 6	....
Oil, fish (in barrels)	1 10	2 5	4 0	1 0	....
Oil, lard	1 10	2 5	4 0	1 0	....

[1] See special circular. [2] In bags. [3] In casks. [4] In packages in cases. [5] In casks or iron drums.

Merchandise and minerals per ton (of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Runcorn.	Latchford.	Manchester.	Quay porterage rate (see p. 454). Packed.	Bulk.
	Sections. A.	B.	C.		
Oils—Continued.	s. d.	s. d.	s. d.	s. d.	s. d.
In packages, etc.—Continued.					
*Oil, neatsfoot or fish (in cases or tins)	2 6	3 7	5 0	1 6	....
Oil, oleine (in casks or iron drums)	1 10	2 5	4 0	1 0	....
Oil, olive (in iron drums and casks)	2 0	3 0	5 0	1 3	....
Oil, olive (e. o. h. p.)	2 0	3 0	5 0	1 6	....
Oil, rosin	1 10	2 5	4 0	1 0	....
*Oil, solidified (in casks)	2 6	3 4	5 0	1 6	....
Oil, tar, mineral (in casks or iron drums)	1 5	1 10	3 0	1 0	....
*Oil, toluidine	3 0	3 6	5 0	1 0	....
Oil cake	1 5	1 10	3 0	1 0	1 6
Oilcloth (see Floorcloth).					
Oleine (in casks or iron drums)	1 10	2 5	4 0	1 0	....
Onions (see Fruit, green).					
Opalite	2 0	3 0	5 0	2 6	....
Oranges (see Fruit, green).					
Orchilla weed	2 0	3 0	5 0	1 6	....
Ores:					
Antimony	1 6	1 10	3 0	1 0	0 10
Bog (for gas purifying)	0 9	1 0	1 8	....	0 10
Chrome (in bulk)	0 9	1 0	1 8	....	0 10
*Cobalt	2 1	2 11	4 7	1 0	....
Copper	1 6	1 10	3 0	....	0 10
*Corundum or alundum (in bags)	1 9	2 6	4 0	1 0	....
Iron (in bulk)	0 5	0 8	1 0	....	0 10
Magnesite	0 9	1 0	1 8	1 0	0 10
Manganese	1 0	1 3	2 0	1 0	0 10
Manganiferous iron	1 0	1 3	2 0	1 0	0 10
*Nickel	2 1	2 11	4 7	....	1 0
Purple or burnt (in bulk)	0 5	0 8	1 0	....	0 10
Pyrites, iron (in bulk)	0 5	0 8	1 0	....	0 10
Pyrites, sulphur (in bulk)	0 10	1 3	2 0	....	0 10
Wolfram	1 5	1 10	3 0	1 6	....
Zinc	0 10	1 3	2 0	1 0	1 3
Osiers, twigs, and willows	2 0	3 0	5 0	2 6	....
Oysters (in barrels)	2 0	3 0	5 0	2 0	....
Oyster shells (crushed), in bags	1 6	2 3	3 0	1 3	....
Paints and colors (pigments) (see Colors and paints).					
Palmetto grass, hydraulic or steam press packed	1 6	1 10	3 0	1 3	....
Palm leaves (see Leaves).					
*Palm nuts and kernels	2 4	3 2	4 10	1 6	2 0

Articles.	Tolls between Eastham and— Runcorn.	Latchford.	Manchester.	Quay porterage rate (see p. 454). Packed.	Bulk.
	Sections. A.	B.	C.		
Palmyra fiber (see Fibers).	s. d.	s. d.	s. d.	s. d.	s. d.
Paper hangings	2 0	2 5	4 0	1 6	....
Paper (in bales, bundles, and in rolls) and wrappering paper (in cases)	1 8	2 5	4 0	1 6	....
Paper (insulating) in cases	2 4	3 6	5 0	1 9	....
*Paper, other than wrappering (in cases)	2 4	3 6	5 0	1 6	....
Paper bags, printed or not	1 8	2 5	4 0	1 6	....
Paper, waste (including old newspapers), when for paper making	1 5	1 10	3 0	1 6	....
Paper, waste (including old newspapers), not for paper making, in bales, bundles, or bags	1 8	2 5	4 0	1 6	....
Paper, waste (old newspapers), when for export by steamer direct from Manchester to places outside the River Mersey	....	....	2 6	....	....
Paper cones (see Pulp-board cones).					
Paper, sand (in bundles)	2 0	3 0	5 0	1 3	....
Paper-making materials	1 5	1 10	3 0	1 6	....
Paraffin scale or wax	1 8	2 5	4 0	1 0	....
Pastry boards (common wood)	2 0	3 0	4 0	1 6	....
Paving flagstones	0 9	1 0	1 3	....	1 0
Peanuts (see Fruit, green).					
Pears (see Fruit, green).					
Peas, split (in sacks or bags)	1 3	1 10	3 0	1 0	....
Peel, candied	2 0	3 0	5 0	2 0	....
Peel, citron, lemon, and orange (in brine)	1 8	2 5	4 0	1 0	....
Petroleum residuum (in casks)	1 8	2 5	4 0	1 0	....
Petroleum hard oil (as jelly, petroleum).					
Petroleum grease or jelly (not vaseline) (see Jelly or grease, petroleum).					
Petroleum oil (see Oils).					
Phonolith rock, crushed, for bottle making	0 8	0 11	1 6	1 0	0 7
Phosphate of lime (e. o. h. p.)	1 3	1 10	3 0	1 3	....
Phosphate of lime, precipitated	1 6	2 3	3 9	1 3	....
Phosphate rock, unground	0 5	0 8	1 0	....	0 10
Phosphate, ground (packed)	0 10	1 3	2 0	1 0	....
Pianos (see Musical instruments).					
Pickles (in boxes, cases, and casks)	2 4	3 0	5 0	1 6	....
Pig iron (see Iron or steel).					
Pig lead (see Lead).					
Pipes, asphalt (conduits for electric wires)	1 6	2 3	3 0	....	1 9
Pipes and tiles, draining, common (for agricultural draining)	1 0	1 3	2 0	....	1 9
Pipes, cast-iron rain-water (see Iron or steel).					
Pipes, drain (glazed)	1 6	1 10	3 0	2 0	2 0
Pipes, gas, water, air, or steam (iron or steel) (see Iron or steel).					

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Run-corn. Sections. A.	Latch-ford. B.	Man-chester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Pitch, coal-tar (in bulk)	0 8	0 11	1 6	....	0 10
Pitch, coal-tar (packed)	1 0	1 6	2 0	1 0	....
Pitch (e. o. h. p.)	1 5	1 10	3 0	1 0	....
Plaster of Paris	1 5	1 10	3 0	1 0	....
Plumbago (as black lead).					
Polarite for purifying sewage	1 3	1 10	2 6	1 0	....
Pollards or sharps (in bags or sacks)	1 3	1 10	3 0	1 8	....
Pollards or sharps when for export by steamer direct from Manchester to places outside the River Mersey	....	....	1 0	....	....
Porter (see Ale).					
Potatoes (e. o. h. p.)	1 5	1 10	3 0	1 0	1 0
*Potatoes (new), from 1st April to 30th June	1 9	2 6	4 0	1 0	....
Potash:					
*Bichromate of	2 0	2 9	4 0	1 0	....
Muriate of	1 5	1 10	3 0	1 0	....
*Prussiate and chlorate of	2 6	3 5	5 0	1 0	....
Sulphate of	0 10	1 3	2 0	1 0	....
Poultry, dead	3 0	4 3	7 0	1 5	....
Poultry food (in bags or sacks)	1 5	1 10	3 0	1 2	....
Powder, toilet	2 4	3 6	5 10	2 6	....
Preserves—Fish, fruit, meat, provisions, and vegetables (in boxes, cases, or casks)	2 0	3 0	5 0	1 6	....
Pulleys and pulley blocks	1 7	2 5	4 0	1 4	....
Pulp boards (see Wood-pulp boards).					
Pulp-board cones or paper cones, in crates	3 0	4 6	6 0	2 0	....
Pumice gravel for use in making concrete slabs (as gravel).					
Pumice stone	1 8	2 5	4 0	1 0	....
Purple ore (see Ores).					
Pyrites. iron (in bulk) (see Ores).					
Pyrites, sulphur (in bulk) (see Ores).					
Pyridine (as dye extracts and dyes).					
Quails (live)	4 0	6 0	8 0	2 6	....
Quaker Oats (in cases)	1 3	1 10	3 0	1 9	....
Quartz, powdered or crushed (in bags and casks)	1 0	1 6	2 0	1 0	....
Quartz, rock, in bulk	0 9	1 0	1 8	....	0 10
Quebracho extract, solidified, in bags (as extracts for tanners' use, e. o. h. p.).					
Rabbits (frozen)	2 10	4 3	7 0	1 5	....
*Raffia	2 6	3 4	5 0	2 0	....
Rags (not oily)	1 8	2 5	4 0	1 3	....
Rails (railway) iron or steel (see Iron or steel).					

Articles.	Tolls between Eastham and— Run-corn. Sections. A.	Latch-ford. B.	Man-chester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Railway chairs, iron or steel (see Iron or steel).					
Rattans (see Canes).					
Red lead (see Lead, red and white).					
Registers, cash	4 0	6 0	8 0	2 6	....
Rennet	2 6	3 9	5 0	1 6	....
Resin	1 5	1 10	3 0	1 0	....
Rice (e. o. h. p.)	1 3	1 10	3 0	1 0	....
Rice, puffed	2 6	3 3	4 9	1 6	....
Rice, Quaker (patent food), in cases	1 3	1 10	3 0	1 3	....
Road repairing materials (undressed)	0 6	0 9	1 0	....	0 7
Roadoleum, in barrels	1 3	1 10	3 0	1 0	....
Rock spar, in lump (see "Spar, rock").					
Rollers (wringing machine)	1 9	2 5	4 0	1 6	....
Rope (other than coir, wire, and straw)	1 9	2 5	4 0	1 3	....
Rope, coir (see Coir rope and coir junk).					
Rope, straw	2 0	3 0	4 0	2 6	....
Rope, wire	2 0	3 0	5 0	1 0	....
Rope, wood, wool core	2 0	3 0	5 0	2 6	....
Rosin (as resin).					
Rosin oil (see Oils).					
Rubber tubing (as india-rubber goods).					
Sago and semolina	1 9	2 5	4 0	1 3	....
Sago flour	1 3	1 10	3 0	1 0	....
Salt, common (in bulk or in bags)	0 6	0 8	1 0	[1]	[1]
Salt, rock	0 6	0 8	1 0	....	0 10
Salt, cake	0 10	1 3	2 0	1 0	1 6
Salt (table), packed in cases or bags	1 3	1 10	3 0	1 6	....
Saltpeter	1 8	2 5	4 0	1 0	....
Salts, glauber (as sulphate of soda.)					
*Sanitary castings (iron or steel) (see Iron or steel.)					
Sand, asbestos or asbestic	0 8	0 11	1 6	1 0	0 10
Sand, glass and silver	0 8	0 11	1 6	1 0	0 10
Sand (e. o. h. p.)	0 6	0 9	1 0	....	0 7
Sardines (see Preserves).					
Sash weights (cast-iron) when for export by steamer direct from Manchester to places outside the River Mersey	....	....	2 6	....	....
Scrap iron or steel (see Iron or steel).					
Seeds, agricultural	2 0	3 0	5 0	1 3	....
Seeds, linseed (in sacks or bags)	1 3	1 10	3 0	1 3	....
Seeds, locust	1 3	1 10	3 0	1 1	....

[1] See ship's charges schedule.

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and—			Quay porterage rate (see p. 454).	
	Runcorn.	Latchford.	Manchester.	Packed.	Bulk.
	Sections.				
	A.	B.	C.		
	s. d.	s. d.	s. d.	s. d.	s. d.
Seeds, for crushing for oil	1 3	1 10	3 0	1 3	......
Seeds, cotton, for oil crushing:					
In bags	1 3	1 10	3 0	1 1	......
In bulk	1 3	1 10	3 0	......	1 6
*Sewing machines (fitted up)	2 10	3 9	5 7	2 6	......
Sewing machines, in parts (packed)	1 7	2 5	4 0	2 0	......
Shale from Swedish ports	......	......	1 0	......	0 10
Sharps or pollards (in bags or sacks) (see Pollards or sharps).					
Shellac	2 0	3 0	5 0	1 6	......
Shells (e. o. h. p.)	2 0	3 0	5 0	1 3	......
Shoe or rubber solution, not giving off inflammable vapor at less than 73° F	3 0	4 6	6 0	2 6	......
Shoes (see Boots).					
Shoe pegs (in barrels)	2 0	3 0	5 0	1 3	......
Shot:					
Lead	1 9	2 5	4 0	1 0	......
Iron (cannon) (see Iron or steel).					
Steel, small (in casks or bags) (see Iron or steel).					
Shredded wheat (see Wheat, shredded)					
Shudes (in sacks or bags)	1 3	1 10	3 0	2 3	......
Shudes (in press-packed packages)	1 3	1 10	3 0	1 8	......
Shumac	1 8	2 6	4 0	1 4	......
Silica refuse	0 9	1 0	1 8	1 0	......
Silica stone (for manufacture of emery paper)	1 0	1 6	2 0	1 0	......
Silk (raw)	3 6	4 10	8 0	1 6	......
Silk (manufactured)	3 6	4 10	8 0	2 0	......
Silk waste (undressed)	2 10	3 8	6 0	1 6	......
Size	1 8	2 5	4 0	1 3	......
Size, gold (in casks or iron drums)	2 4	3 6	5 10	1 3	......
Size, resin (in barrels)	1 5	1 10	3 0	1 0	......
Skewers (wooden), common, packed	1 3	1 10	3 0	1 6	......
Skins, sheep	1 10	2 5	4 0	1 6	2 6
Slag, unground (in bulk)	0 5	0 8	1 0	......	0 10
Slag, ground (packed)	0 9	1 0	1 8	1 0	......
Slate beds for billiard tables	2 0	3 8	6 0	1 9	......
Slates, common	0 5	0 8	1 0	[1]	[1]
Slates, writing	2 0	3 0	5 0	2 0	......
Slates, and slate slab (other than common slates)	1 3	1 10	3 0	2 0	......
Slippers. (See Boots).					
Soap and soap powder	1 8	2 5	4 0	1 0	......
Soap lyes (not concentrated)	1 6	1 10	3 0	1 0	......
Soap lyes (concentrated) or crude soap glycerine	1 8	2 5	4 0	1 3	......

Articles.	Tolls between Eastham and—			Quay porterage rate (see p. 454).	
	Runcorn.	Latchford.	Manchester.	Packed.	Bulk.
	Sections.				
	A.	B.	C.		
	s. d.	s. d.	s. d.	s. d.	s. d.
Soapstone	1 5	1 10	3 0	1 0	......
Soda, bicarbonate of (in casks)	1 5	1 10	3 0	1 0	......
Soda, bichromate of (in casks)	2 0	3 0	4 0	1 0	......
Soda, borate of	1 7	2 1	3 6	1 0	......
Soda, soda ash, caustic soda, and soda crystals	1 3	1 10	3 0	1 0	......
Soda, nitrate of, for manure (see Manure).					
Soda, nitrate of (e. o. h. p.)	1 5	1 10	3 0	1 0	......
Soda, nitrate of, in full cargoes	1 0	......	......	......	......
Soda, nitrite of	1 10	2 5	4 0	1 0	......
Soda, sulphate of	0 10	1 3	2 0	1 0	......
Spar, rock (in lump)	0 9	1 0	1 6	0 10	......
Spar, crushed for garden walks, concreting, etc. (as gravel).					
Spelter (in plates or ingots)	1 5	1 10	3 0	......	1 0
*Spelter dross (not spelter), 25-ton lots, when for export by steamer direct from Manchester to places outside the River Mersey	......	......	2 3	......	1 0
Spent oxide from gas purifiers	0 6	0 8	1 0	.. ..	1 0
Spiegel iron, in pigs (see Iron or steel).					
Spindles, old (packed in cases or casks for export)	1 7	2 5	4 0	2 0	......
*Spirits (in cases or casks)	3 0	4 2	6 0	2 6	......
Splints (wood) for matches (see Wood splints for matches).					
Sponge waste	3 6	5 0	8 0	1 3	......
Sponge cloth waste, not oily (as cotton waste).					
Standards for hurdles. (See Iron or steel).					
Starch, in casks, cases, boxes, or bags, for domestic purposes	2 0	3 0	5 0	1 3	......
Starch, in casks or bags for manufacturing purposes	1 3	1 10	3 0	1 0	......
Stationery	2 0	3 0	5 0	1 6	......
Stavewood (not staves	1 3	1 10	3 0	......	1 3
Staves, oak or fir	1 5	1 10	3 0	......	1 3
Stearine	1 8	2 5	4 0	1 0	......
Steel, in bars and bundles (see Iron or steel).					
Steel sheets (see Iron or steel).					
Stone, broken (for repairing roads)	0 6	0 9	1 0	......	0 7
Stone, rubble (for filling up in concrete work)	0 6	0 9	1 0	......	0 7
Stone and granite sets for paving	0 6	0 9	1 0	......	0 7
Stone in the rough, building, pitching, paving, (e. o. h. p.), and curb	0 10	1 3	2 0	......	1 0
Stone, china (see China stone).					
Stone, emery (see Emery stone).					
Stone, flag (for paving)	0 9	1 0	1 3	......	1 0

[1] See slate schedule.

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Run-corn. Sections A.	Latch-ford. B.	Man-chester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Stones, lithographic	2 10	4 3	7 0	1 9	....
Stoves (other than common), cast iron	2 8	3 8	6 0	2 6	....
Stoves (common), cast	2 0	2 7	4 3	2 0	....
*Straw (press-packed)	1 2	1 6	2 4	1 5	....
Straw boards	1 5	1 10	3 0	1 6	....
Straw envelopes	1 9	2 5	4 0	1 6	....
Straw rope (see Rope, straw).					
Strontia or alkaline earth	1 0	1 6	2 6	1 0	....
Suet Cota (as Lard)	2 0	3 0	5 0	1 6	....
*Sugar (in bags, cases, or casks)	2 0	2 10	4 0	[1]	[1]
*Sugar, in loaves	2 6	3 7	5 0	[1]	[1]
Sulphate of alumina	1 8	1 9	2 6	1 0	....
Sulphate of ammonia (see manure, packed).					
Sulphate of copper	1 5	1 10	3 0	1 0	....
Sulphate of iron (as Copperas, green).					
Sulphate of magnesia	1 6	2 3	3 0	1 0	....
Sulphate of manganese (residue of after use)	1 0	1 6	2 0	1 0	....
Sulphate of lead	1 5	1 10	3 0	1 0	....
Sulphate of potash	0 10	1 3	2 0	1 0	....
Sulphate of soda (see Soda, sulphate of).					
Sulphate of zinc waste	1 5	1 10	3 0	1 0	....
Sulphite ore (from Australia)	1 0	1 3	2 0	1 0	....
Sulphuric acid, or oil of vitriol (see Acids).					
Sulphur pyrites (in bulk) (see ores).					
Sulphur (crude)	....	....	....	....	1 3
Sulphur (manufactured) including flower of sulphur	1 5	1 10	3 0	1 3	....
Swiss food, in cases	1 3	1 10	3 0	1 9	....
Sirup (not fruit sirup), in casks or in tins, packed in cases	1 8	2 5	4 0	1 3	....
Tallow	1 8	2 5	4 0	1 0	....
Tamarinds	2 0	3 0	5 0	1 6	....
Tannin	1 8	2 6	4 0	1 4	....
Tapioca	2 0	2 5	4 0	1 3	....
Tapioca flour	1 3	1 10	3 0	1 0	....
Tar (coal) in casks	0 10	1 3	2 0	1 0	....
Tar (logwood) in casks	1 3	1 10	3 0	1 6	....
Tar oil, mineral (in casks or iron drums) (see oils).					
Tar salts, crude or refuse, from gas-tar distilling	0 10	1 3	2 0	1 0	....
Tar water (see Gas water).					
Tarpaulins	2 0	3 0	5 0	2 0	....
Tartar, cream of	2 4	3 6	5 10	1 3	....
*Tea	3 0	4 0	6 0	2 0	....
Tenders, locomotive (see Engines).					
Terra japonica	1 6	1 10	3 0	1 3	....
Thirds, when for export by steamer direct from Manchester to places outside the River Mersey	....	....	1 0	....	....
Thread, cotton	2 0	2 5	4 0	1 6	....
*Thread, linen	2 0	3 9	4 0	1 6	....
Three-ply boards (see boards, threeply).					
Tiles, common, glazed (in cases)	1 6	2 3	3 0	2 6	....
Tiles, draining, garden, edging, roofing, paving, common	0 10	1 3	2 0	....	2 0
Timber (see Wood goods schedule).					
Tin, in blocks, cakes, or ingots	2 3	3 0	5 0	....	1 6
Tin plates, iron or steel	1 5	1 10	3 0	1 0	....
Tin scrap, in press-packed bundles	1 5	1 10	3 0	1 3	....
Tinware (as hardware).					
Tobacco leaf, unmanufactured, in hogsheads, tierces, cases, or bales	2 3	3 0	5 0	2 0	....
Tobacco, manufactured	2 10	4 3	7 0	2 6	....
Tomatoes (see Fruit, green).					
Toys	2 10	3 8	6 0	2 6	....
Tram cars (complete)	2 9	3 2	5 0	[2]	[2]
*Tram cars, electric, with appurtenances in parts packed, or otherwise protected.	2 0	3 0	4 0	[2]	[2]
Tramway bogies or underframes	1 5	1 10	3 0	1 6	....
Tramway lifeguards (packed in cases)	1 7	2 5	4 0	2 0	....
Trass (as cement).					
Treacle (as molasses).					
Tripoli powder or earth	1 9	2 5	4 0	1 0	....
Triscuit (in cases)	1 3	1 10	3 0	1 9	....
Turpentine, crude (in casks) not giving off inflammable vapor at less than 73° F	1 8	2 5	4 0	1 0	....
Turpentine, spirits of (in casks or iron drums), not giving off inflammable vapor at less than 73° F	2 0	3 0	5 0	1 3	....
Turmeric	2 0	3 0	5 0	1 3	....
Turned wood (in the rough, packed)	2 0	3 0	5 0	1 10	....
Turnery ware (e. o. h. p.) (as woodware and woodwork).					
Tutty powder (see Zinc dust).					
Twigs (see Osiers).					
Twine	1 9	2 5	4 0	1 10	....
Type metal	1 8	2 5	4 0	1 6	....
Typewriting machines, in parts (packed).	3 0	4 6	6 0	2 6	....
Typewriting machines, fitted (packed)	3 6	5 3	7 0	2 6	....
Ultramarine (as paints and colors).					

[1] See special circular.

[2] By special arrangement.

Merchandise and minerals (per ton of 2,240 pounds gross)—Continued.

Articles.	Tolls between Eastham and— Runcorn. Sections. A.	Latchford. B.	Manchester. C.	Quay porterage rate (see p. 454). Packed.	Bulk.
	s. d.	s. d.	s. d.	s. d.	s. d.
Umber	1 0	1 3	2 0	1 0	0 10
Umbrella sticks (bamboo in the rough)	2 6	3 9	5 0	2 0	....
Undressed materials for the repair of roads (see Road repairing material).					
Valonia	1 5	1 10	3 0	1 6	....
Varnish, black (in casks or iron drums), e. o. h. p., not giving off inflammable vapor at less than 73° F	1 8	2 5	4 0	1 0	....
Varnish (in casks or iron drums) not giving off inflammable vapor at less than 73° F	2 0	3 0	5 0	1 0	....
Vaseline (in casks or drums)	2 6	3 9	5 0	1 6	....
Vaseline (in cases)	3 0	4 6	6 0	1 6	....
Vegetable ivory (see Ivory).					
Vegetables in brine in casks (but not fruit in brine)	1 0	1 10	3 0	1 0	....
Veneer wood (common) in thin sheets, packed (for lining packing cases)	1 5	1 10	3 0	1 6	....
Verdigris (in casks)	2 4	3 0	5 0	1 3	....
Vermicelli	2 10	3 8	6 0	1 6	....
Vinegar (in casks)	1 8	2 5	4 0	1 0	....
Walnuts (see Fruit, green).					
Warps, cotton	2 0	2 4	4 0	1 6	....
Washing boards	2 4	3 0	5 0	1 6	....
Washing and wringing machines packed in boxes or crates	2 4	3 6	5 0	2 0	....
Washing and wringing machines (e. o. h. p.)	3 0	4 6	6 0	2 6	....
Waste salt, in bulk	0 10	1 3	2 0	....	0 10
Waste salt, in packages	1 5	1 10	3 0	1 0	....
Waste wool (see Wool waste).					
Waterine (phosphate of soda), in casks	1 5	1 10	3 0	1 0	....
Water meters (see Meters).					
*Whalebone	3 6	4 10	7 0	1 9	....
Wheat, shredded (in cases)	1 3	1 10	3 0	1 9	....
Wheat, flaked (in cases)	1 3	1 10	3 0	1 9	....
Wheelbarrows:					
In parts, packed	2 0	3 0	4 0	1 10	....
Complete	2 4	3 6	5 10	1 10	....
White lead (see Lead, red and white).					
Whiting or whitening	1 0	1 3	2 0	1 0	....
Whiting, refuse, for use for agricultural and disinfecting purposes	0 9	1 0	1 6	1 0	....
Willows (as osiers).					
Wick, cotton, lamp or candle (in bales or cases)	2 0	3 0	4 0	....	....
*Wines (in cases or casks)	3 0	4 2	6 0	2 6	....
*Wines, British (in casks)	2 6	3 6	5 0	2 6	....
Wire, aluminum (see Aluminum wire).					
Wire (iron or steel, in coils); wire iron (in rods or coils); wire ropes (see Iron or Steel).					
Wolfram ore (see Ores).					
Wood, boxwood, ebony, cherrywood, ironwood, lancewood, lignum-vitæ, persimmon, rosewood, stainwood, and other furniture or fancy woods not provided for in the separate schedule for "wood goods"	1 5	1 10	3 0	1 6	....
Wood acid (in casks or carboys)	1 10	2 5	4 0	1 3	....
Wood battledores, common (see Battledores).					
Wood blind rollers and cornice poles (in the rough)	2 0	2 5	4 0	1 6	....
Wood blocks (for street paving)	1 3	1 10	3 0	1 6	....
Wood fiber (as fibers).					
Wood-pulp boards	1 5	1 10	3 0	1 6	....
Wood pulp (dry)	1 5	1 10	3 0	1 0	....
Wood pulp, wet (containing not less than 50 per cent of moisture)	1 0	1 6	2 6	1 0	....
Wood shavings for upholstering purposes (in pressed-packed bales)	2 0	3 0	4 0	1 5	....
Wood splints for matches	2 6	3 9	5 0	2 0	....
Wood wheels, in the rough (unfinished)	1 5	1 10	3 0	1 10	....
Woodware and woodwork	2 0	3 0	5 0	1 10	....
Wood wool core rope (see Rope).					
Wool, raw	2 6	3 0	5 0	1 6	....
Wool waste	2 0	2 4	4 0	1 3	....
*Woolen and worsted goods (in bales, boxes, cases, packs, and trusses)	2 6	3 0	4 0	1 6	....
Woolen and worsted yarns (see Yarns).					
Yarns:					
Coir and tow—					
In bunches, dholls, or bundles	2 0	2 5	4 0	3 6	....
In bales and on beams	2 0	2 5	4 0	1 6	....
Cotton (in bales, boxes, cases, packs, and trusses)	1 10	2 5	4 0	1 6	....
Jute (see Jute goods).					
Linen, woolen, and worsted (in bales, boxes, cases, packs, and trusses)	2 0	2 5	4 0	1 6	....
Yeast	2 10	3 8	6 0	1 6	....
Yellow metal plates and sheathing	2 0	3 0	4 0	1 5	....
Zinc, carbonate of	1 6	1 10	3 0	1 0	....
*Zinc dross (in slabs)	1 0	1 5	2 3	1 0	....
Zinc dust or tutty powder	1 6	1 10	3 0	1 0	....
Zinc ingots	1 6	1 10	3 0	....	1 0
Zinc oxide	1 6	1 10	3 0	1 0	....
Zinc scrap	1 6	1 10	3 0	1 0	....
Zinc sheets (in casks)	1 6	1 10	3 0	1 0	....
*Zinc skimmings	1 0	1 5	2 3	1 0	....

General Schedule of Canal Tolls Applicable to Merchandise and Minerals not Provided for in the Foregoing List.

This general schedule follows the Board of Trade classification of merchandise and minerals (c. 5832/1892), except where the general railway classification for the time being may provide for articles being charged for at a lower class, in which case the latter will be adopted.

A copy of the Board of Trade classification is obtainable in Manchester from John Heywood (Ltd.), and a copy of the general railway classification from any railway company in the Kingdom, price 1s. in each case.

Description of merchandise.	Between Eastham and— Runcorn, per ton (a).	Latchford, per ton (b).	Manchester per ton (c).
	s. d.	*s. d.*	*s. d.*
Class A	0 6	0 9	1 0
Class B	1 0	1 6	2 0
Class C	1 6	2 3	3 0
Class 1	2 0	3 0	4 0
Class 2	2 6	3	5 0
Class 3	3 0	4 6	6 0
Class 4	3 6	5 3	7 0
Class 5	4 0	6 0	8 0

Rules and Regulations Applying to Merchandise and Minerals Discharged or Shipped in the Manchester Docks, except where Otherwise Stated.

CUSTODY OF AND REGULATIONS WITH REGARD TO GOODS WHILE LYING ON THE DOCK QUAYS OR IN THE TRANSIT SHEDS.

1. All goods laid down on, or passing over, the quays of the docks of the Ship Canal Co., or deposited in the quay sheds, are at the owner's sole risk in every respect; the company have no custody of such goods, and will not be responsible for leakage, loss of weight or measure, or for damage by fire, theft, strikes, combinations of workmen, weather, deterioration from natural causes, acts of God, the King's enemies, or otherwise howsoever.

2. Goods are not in the custody of the canal company until taken possession of by them as warehousemen, wharfingers, or railway carriers, but when the company have sent the owner of goods notice that the goods are taken into stock by them, the company accept the usual responsibility for their custody as warehousemen or wharfingers, except when the goods are lying on the quay or in the transit shed under conditions stated in clause 6.

3. The canal company's police patrol the Manchester docks, and their police superintendent will, upon receipt of a requisition to do so, place a special watch upon merchandise lying in the transit sheds or on the quays, for which service a charge of 5s. per day and 5s. per night is made, with a minimum charge of 5s. The service of watching merchandise will, however, only be undertaken on the express understanding that the company will not be responsible for, and that no liability shall attach to them in respect of, the safe custody of such merchandise.

4. The importer is responsible to the canal company for the canal tolls and quay charges upon his goods, and the person or firm in whose name the ship's delivery order for the goods is made out is held by the company to be the importer. All charges due upon the goods must be paid before their removal from the docks. In cases where the owners or agents of the vessel undertake for convenience of the owners of goods to pay the canal toll thereon, they must also pay any quay porterage that may be incurred on such goods.

5. The canal company are not bound to notify the importer when the goods are due for removal from the quay, and failure on their part to do so will not prevent their taking the goods into warehouse or store if not removed, nor relieve the importer from liability for warehousing or storage charges and rent when thus incurred.

6. If at the expiration of 72 hours after landing the goods have not been removed from the quays or transit sheds, the canal company may take possession of them as warehousemen or wharfingers, and remove them to

warehouse or storage ground to the order and at the risk and cost of the importer. If the company allow such goods to remain on the quay or in the transit shed, the warehousing or storage rate will be charged in lieu of the quay porterage rate, and the goods will remain on the quay or in the transit shed at the sole risk of the owner. If removed from the quay to warehouse or storage ground, the warehousing or storage rate will be payable in addition to the quay porterage rate; and, whether lying on quay or placed in warehouse or store, the goods will also be subject to rent from the expiration of the time allowed free on the quay.

7. When importers are in doubt as to when they will remove the traffic from the docks, they should give orders to warehouse or store the same 24 hours before ship's arrival at the docks, which course may sometimes avoid the quay porterage charge (see clauses headed "warehousing and storage charges" on p. 456).

QUAY PORTERAGE CHARGES.

Section 146 of the canal company's 1885 act provides that the company shall have the exclusive right to supply all the labor required for loading and discharging vessels, and the handling of the merchandise within the canal or docks, and that the company may charge for such services an amount equal to the actual cost of labor—minimum charge as for four hours per man employed—and a proportionate cost of the wages of foremen and of office expenses and material, and in addition a sum of 10 per cent on such amounts, and also a premium to cover liabilities for accidents and losses, which until further notice will be after the rate of 5 per cent; but in order that fixed rates may be available, the schedule on pages 437–452 has been prepared.

No quay porterage charge is incurred when merchandise is discharged from or to ship direct to or from railway wagon, road vehicle (see clause below re road vehicles), or barge alongside, and weighing, counting, sorting, checking, stowing, or unstowing in road vehicle, railway wagon, or barge, or other services are not required, except in the case of dangerous goods discharged to ship canal wagons and hauled to a place of safety on the dock estate, in which case porterage is always chargeable.

The company do not guarantee to discharge goods direct ex ship to railway wagon, barge, or road vehicle, but will endeavor to do so with the view to avoid quay porterage.

Traffic is only discharged direct to road vehicles from ship or received from road vehicles into ship direct when the canal company consider the work of the ship will not thereby be delayed, and subject to the persons in charge of the vehicles slinging or unslinging and stowing or unstowing the goods in their vehicles at their own risk, and on condition that, if the company assist in doing such work, liability for any accident arising therefrom to workmen, horses, lurries, or other vehicle, or damage to the goods, shall not under any circumstances attach to the company.

If in landing traffic from or delivering to road vehicles or barges to or from the dock quays or transit sheds the canal company allow their servants to voluntarily assist in the slinging or unslinging and stowing or unstowing of goods in the road vehicles or barges in order to facilitate the work, liability for any accident arising therefrom to workmen, horses, lurries, or other vehicle, or barges, or damage to the goods, shall not under any circumstances attach to the company.

The canal company take no responsibility whatsoever with respect to goods discharged overside ship direct to barge, road vehicle, or to ship canal railway wagons when for haulage over the dock estate or to or from and over the Trafford Park estate, except for the due performance of any service they may undertake by arrangement in connection therewith. The responsibility for the checking of cargo loaded or discharged overside ship direct to or from road vehicles, barges, or ship canal railway wagons for haulage over the dock estate or to or from and over the Trafford Park estate, rests entirely with the shipowner and importer.

The importer is also responsible for stowage of traffic in the canal company's railway wagons when for haulage over the dock estate or to or from and over the Trafford Park estate, but the company are prepared to undertake any or all of the services mentioned upon requisition and payment for the work done.

The canal company will not be responsible for, and no liability shall attach to them in consequence of, delay in loading off or otherwise dealing with goods from or to the quay, transit sheds, or vessels.

The quay porterage rate upon merchandise not of unusual length or bulk, or of exceptional bulk in proportion to weight, covers the undermentioned services:

For articles not exceeding 30 hundredweight per lift: Receiving from ship, weighing on landing or delivery, at canal company's option, such goods as are usually weighed [1] (3 pence per ton rebate if weighing not performed), ordinary marking, sorting to manifest marks, stowing on the quay, furnishing gross weight (on appli-

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[1] Some of the articles not usually weighed are: Butter (in casks or tubs), flour, farina, corn flour, pig lead, mineral white, and starch.

cation), counting, and delivery to but not stowage of the goods in road vehicle, railway wagon, or barge alongside, within 72 hours from the time of landing. All goods in bulk, including goods scheduled as in bulk column of quay porterage rates on pages 437–452 hereof are usually weighed over cart or railway weighbridge on delivery (1 penny per ton rebate allowed from scheduled rate if weighing not performed). For rates, see schedule on pages 437–452. Detailed weights can be obtained on application at the rate of 1s. per 100 weights. Minimum charge, 3d. per weight note.

For delivery to craft (but not stowage therein), when not berthed alongside where the goods lie, an additional charge of 6d. per ton is made.

Articles exceeding 30 hundredweight per lift, or when of unsual length or bulk, or of exceptional bulk in proportion to weight, are subject to special rates, charges, and arrangements for handling on the quay.

Articles to be lifted exceeding one ton per lift must have the exact weight marked thereon.

Unpacked or insecurely protected machinery and iron castings are only handled at the ordinary quay porterage rates at owner's risk. If at canal company's risk, 50 per cent extra will be charged. Unless the company be otherwise instructed, they will be handled and charged for at owner's risk.

Extra charges will be made for opening and taring (when required by H. M. customs or consignees of goods), coopering or mending, sampling, collecting loose, classifying damage, lotting for sale, and labeling (when required by consignee of goods.)

OVERTIME.

Overtime is charged for as follows:

On ordinary working days from 6 p. m. to 8 a. m., and on Saturdays from 5 p. m. to 10 p. m., 4½d. (timber 5d.) per hour per man in addition to schedule rates.

After 10 p. m. on Saturdays, and all day on Sundays, Christmas Day, Good Friday, and bank or special holidays, 9d. (timber 10d.) per hour per man in addition to schedule rates.

When men are requisitioned to work during their meal hours, the overtime rate will be charged for such hours, and any longer period the men may continue to work without a break.

Requisitions for overtime must be lodged before 3 p. m. Mondays to Fridays, and on Saturdays before 12 noon.

RAILWAY TRAFFIC (IMPORTS).

For conditions and other matters relating to traffic forwarded from the docks by the canal company as railway carriers, see pages 461, 462, and 463.

DANGEROUS GOODS.

Explosives of the various kinds described in the "special classification of explosives and other dangerous goods by merchandise trains" embodied in the general railway classification (with the single exception of safety small-arm cartridges) are not allowed to pass over the canal, nor are any of the inflammable liquids giving off vapor inflammable at less than 73° F., set forth in the same special classification.

Other dangerous articles but of a less dangerous character than those named above, which from time to time may be allowed specially to be imported or exported by means of the canal, must not be unloaded onto the dock quays, but must be discharged or shipped direct from or to vessel, to or from barge, road vehicle, or railway wagon alongside. If the traffic for any reason can not be discharged or shipped direct from or to vessel, the canal company will haul same to a place of safety at the expense of the owner of the goods, or the steamship owner as the case may be, and at his risk in all respects.

In the case of inflammable liquids not giving off vapor inflammable at less than 73° F., shippers or importers of the traffic must before shipment or unloading lodge at the dock office a declaration to this effect.

OBJECTIONABLE GOODS.

Articles which may be deemed objectionable by the canal company, and through contact with which other goods are liable to be damaged, such as chemicals, charcoal dust, soot, etc., will not be permitted to be placed inside the transit sheds except by special arrangement.

TRANSSHIPMENT CARGO.

Transshipment goods are hauled in railway wagons (or barged at canal company's option) on the conditions stated in the company's printed haulage requisition form from alongside ship to other vessels in any part of the docks at a charge of 6d. per ton (single articles over 5 tons and not exceeding 10 tons each, 9d. per ton), minimum charge as for 2 tons per wagon (except as per note [1] below), which does not include responsibility for loading, stowing, checking, counting, custody, or condition of goods; but the company will accept the usual liability of carriers either by railway or barge (at the company's option) at a rate of 1/6 per ton (no single article to exceed 10 tons in weight), with a minimum of 2/6 per wagon (except as per note [1] below), but both rates are exclusive of canal toll or charges for any labor that may be incurred in the handling of the goods. The company do not guarantee to discharge goods direct ex-ship to railway wagon or barge, but will endeavor to do so with the view to avoid quay porterage.

A requisition on the company's printed form for haulage must be filled up and lodged at the dock traffic offices, Trafford Road, Salford, previous to the service being required, and the rate to be charged inserted, to indicate whether the goods are to be hauled at the owner's risk or conveyed by the company as carriers.

WAREHOUSING AND STORAGE CHARGES (IMPORTS).

Traffic requiring warehousing or storage will, if consignees desire it, be warehoused or stored by the canal company at the docks, rates for which can be obtained on application at the dock office, or the dock traffic offices, Trafford Road, Salford.

The warehouses and storage grounds are open for delivery of "free" goods from 8 a. m. to 5 p. m.; Saturdays from 8 a. m. to 4 p. m. Bonded goods can only be obtained during customs hours.

The canal company, whilst acting as warehousemen or wharfingers, will not be responsible for the consequences of leakage, loss of weight or measure, or for deterioration from natural causes, or for the consequences of fire, strikes, combinations of workmen, the act of God, or the king's enemies.

If at the expiration of 72 hours after landing goods have not been removed by the owners, the canal company may take possession of them as warehousemen or wharfingers, and remove them to warehouse or store, and the "warehousing or storage rate" will be charged in addition to the "quay porterage rate." If in any special case the company should allow goods to remain where landed on the quay, or in a transit shed, the warehousing or storage rate will be substituted for the "quay porterage rate," and the goods will remain on the quay at the sole risk of the owner.

The rates quoted for warehousing include the following services, unless otherwise stated:

Receiving direct ex-ship (when practicable) or ex-quay into the company's railway wagons, haulage to warehouse, housing, counting, furnishing warehousing slips, unhousing, and delivery to railway wagons or road vehicles but not stowage therein. For delivery to craft (but not stowage therein), when not berthed alongside where goods lie, an additional charge of 6d. per ton is made.

If when goods are being delivered to road vehicles or barges the canal company allow their servants voluntarily to assist in the unslinging and stowage of the goods therein in order to facilitate delivery, liability for any accident arising therefrom to workmen, horses, lurries, or other vehicle or barges, or damage to the goods, shall not under any circumstances attach to the company.

The canal company will endeavor to avoid quay porterage (but do not guarantee to do so) if instructions to warehouse or store goods are lodged at the dock office 24 hours before the vessel arrives at the docks, for the purpose of enabling the company (if found practicable to deliver goods direct ex-ship, and if wagons are available) to place wagons alongside to receive the goods as discharged.

Other circumstances may, however, occur even when wagons are alongside to prevent discharging direct from ship to wagon, in which case the quay porterage rate in addition to the warehousing or storage rate will be charged.

STORAGE IN THE OPEN.

The canal company provides storage ground for traffic which can be stored in the open.

The rates quoted for storage in the open include the following services, unless otherwise stated:

Receiving direct ex-ship (when practicable) or ex-quay into the company's railway wagons, haulage to the storage ground, unloading to stock, and delivery to railway wagons or road vehicles, but not stowage therein. For delivery to craft (but not stowage therein) when not berthed alongside where goods lie, an additional charge of 6d. per ton is made.

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[1] The charge for haulage or conveyance of articles of unusual length, bulk, or weight, or of exceptional bulk in proportion to weight, will be by special arrangement.

WAREHOUSE AND STORAGE RENT.

Rent will be charged from the date goods are placed in the warehouse or on the storage ground, and part of a week will be charged for as a week.

SAMPLING, ETC., OF MERCHANDISE AT THE DOCKS.

Permits to sample goods lying in the canal company's warehouses or transit sheds can be obtained at the offices of the dock traffic superintendent, on presentation of a written sampling order from the owner of the goods, and no charge will be made for attendance of the company's servant during the operation, or for attendance while the merchant's representative is re-marking, examining contents, or turning over packages, but the canal company accept no responsibility for the condition in which the goods are left by the sampler or other representative of the owner.

If the canal company are requested to sample, a charge will be made for the service as follows:

Where no special rates are fixed for the sampling of the goods in question, the company will charge for sampling of merchandise in general the actual cost for the time incurred by the man occupied in taking the sample (plus 12½ per cent) and the value of material used in the operation, with a minimum charge of 9d.

DUTIABLE GOODS (EXCLUDING DRIED FRUIT, SUGAR, GLUCOSE, CONDENSED MILK, ETC.) LYING AT THE DOCKS PENDING PASSING CUSTOMS' ENTRY, EXAMINATION BY CUSTOMS, AND PAYMENT OF DUTY.

All dutiable goods while lying at the docks pending the passing of the entry of same through the customhouse, examination by customs officers, and payment of duty thereon, or the dispatch of the goods under bond elsewhere, are watched by the customs authorities at the cost of the importer, the charge for which service, however, does not cover responsibility for their safe custody while on the quays and, therefore, for the better protection of the goods, and to minimize the cost incurred by watching on the quay, the canal company have, with the approval of His Majesty's customs, set apart a portion of a building erected on No. 7 Dock East as a customs transit depot for the storage of dutiable goods while remaining at the docks.

Charges for placing alongside depot:

For conveyance of all dutiable goods to the depot, whether by railway truck over the dock lines or by cart, when direct ex-vessel not berthed alongside the depot, 1s. 6d. per ton (minimum charge, 9d.).

If the goods are landed on quay before being so conveyed, they will, in addition to the charge for conveyance, be liable to the quay porterage charge applicable to the particular class of goods landed. See quay porterage rates, this schedule.

In both cases the following rates for use of the depot will be payable in addition to the above-mentioned charges:

Charges for use of depot.

	For receiving into depot from railway wagon, cart, or barge, warehousing for the period mentioned after landing, and delivery to but not stowage in railway wagon, cart, or barge when the latter can be berthed alongside.[1]		Rent per week, or any part of a week, after the expiration of one week from time of warehousing.	
	Rate.	Minimum charge.	Rate.	Minimum charge.
	s. d.	s. d.	s. d.	s. d.
Wet goods (in stone jars or casks).[2]				
Packages not exceeding 1 gallon ... each	0 ¼	0 1	0 ¼	0 1
Packages exceeding 1 gallon and not exceeding 3 gallons ... do	0 ½	0 1	0 ½	0 1
Packages exceeding 3 gallons and not exceeding 10 gallons ... do	0 1½	0 2	0 1	0 2
Packages exceeding 10 gallons and not exceeding 30 gallons ... do	0 3	.. ..	0 1	0 2
Packages exceeding 30 gallons and not exceeding 70 gallons ... do	0 6	.. ..	0 2	.. ..
Packages exceeding 70 gallons and not exceeding 100 gallons ... do	0 9	.. ..	0 3	.. ..
Packages exceeding 100 gallons ... do	1 0	.. ..	0 6	.. ..

[1] [2] See footnotes on p. 458.

Charges for use of depot—Continued.

	For receiving into depot from railway wagon, cart, or barge, warehousing for the period mentioned after landing, and delivery to but not stowage in railway wagon, cart, or barge when the latter can be berthed alongside.[1]		Rent per week, or any part of a week, after the expiration of 72 hours from time of warehousing.	
	Rate.	Minimum charge.	Rate.	Minimum charge.
Dry goods (or wet goods in bottles packed in cases or casks).[2]	s. d.	s. d.	s. d.	s. d.
Packages not exceeding 1 cubic foot......each..	0 ½	0 1	0 ½	0 1
Packages exceeding 1 foot and not exceeding 3 cubic feet......do...	0 ½	0 1	0 ½	0 1
Packages exceeding 3 feet and not exceeding 10 cubic feet......do...	0 1½	0 2	0 1	0 2
Packages exceeding 10 feet and not exceeding 30 cubic feet......do...	0 5	.. ..	0 1½	0 2
Packages exceeding 30 feet and not exceeding 60 cubic feet......do...	0 9	.. ..	0 2	.. ..
Packages exceeding 60 feet and not exceeding 80 cubic feet......do...	1 2	.. ..	0 3	.. ..
Packages exceeding 80 feet and not exceeding 100 cubic feet......do...	1 9	.. ..	0 6	.. ..
For every 20 cubic feet or part of 20 feet above 100, additional......	0 9	.. ..	0 3	.. ..
Packages (empty when imported)......each..	0 1	.. ..	0 ½	0 1
Goods in bulk, or not in packages, per ton average......	6	.. ..	1 0	.. ..

[1] If the goods are discharged direct exship into depot the ordinary quay porterage rates and conditions will apply to them, but should they not be removed within 72 hours from time of landing the undermentioned charges will be substituted for the quay porterage rate.

[2] The foregoing charges do not apply to sugar, glucose, condensed milk, etc., for which see separate schedule. Neither do they apply to dried fruit, for which see below.

NOTE.—Fractions of a penny in a total will be charged for as a penny.

NOTE.—Importers may often avoid payment of the charges for the use of the depot by making arrangements with His Majesty's customs before the goods are landed to take delivery of them from the ship's discharging berth on the same day as they are landed, or the canal company will allow the goods to remain on the quay at the ship's discharging berth subject to the owners arranging before the landing of the goods with the customs authorities for the goods to be so dealt with.

DRIED FRUIT.

Customs entries.—If at the expiration of 72 hours after landing the owner of fruit has not passed customs entries for same, the canal company will pass a "warehousing entry," and after the goods have been weighed they may, by permission of the customs, remain on the quay at a quay rent charge of 6d. per ton per day, or they may at any time without notice, be received by the company as warehousemen, and removed to their bonded warehouses, in which case the fruit will be subject to the quay porterage and bonded warehousing charges, and also any quay rents that may have been incurred.

A charge of 2s. 6d. per consignment will be made for passing entry through customs.

NOTE.—Warehousing and rent rates. Ten per cent will be charged in addition to the rates set out herein.

BONDED WAREHOUSE.

By arrangement with the customs authorities, the canal company have set apart certain rooms in their warehouses north of No. 8 dock for the storage of dried fruit under bond, and the following are the charges made for placing currants and raisins in the bonded warehouse, viz:

For receiving from the quay in the company's railway wagons, stowage therein, and haulage to alongside the warehouse, receiving into warehouse, counting, furnishing warehousing slips, and delivery to but not stowage in railway wagon or road vehicle. For delivery to barge (but not stowing therein) an additional charge of 6d. per ton is made.

		s. d.	
Currants and raisins.	In cases......	2 0 per ton	In addition to the quay porterage rate.
	In smaller packages......	2 3 per ton	
	In casks or barrels......	1 6 per ton	

Rent in bonded warehouse from date of entry, 6d. per ton per week.

Opening, examining, repacking, or any other service required, is charged for extra, according to the labor and materials expended.

Other dry dutiable goods (except tobacco and saccharine) can also be warehoused. For charges, application should be made to the dock traffic superintendent at the canal company's dock traffic offices, Trafford Road, Salford.

The hours during which the customs transit shed and bonded warehouse are open for the conduct of business are regulated by the hours observed by the customs authority.

The canal company, whilst acting as warehousemen, will not hold themselves responsible for the consequences of leakage, loss of weight or measure, or for deterioration from natural causes, or for the consequences of fire, strikes, combinations of workmen, the act of God, or the King's enemies.

Note.—Warehousing and rent rates. Ten per cent will be charged in addition to the rates set out herein.

EXPORT TRAFFIC.

All goods laid down on or passing over the quays of the docks of the ship canal company, or deposited in the quay sheds, are at the owner's sole risk in every respect; the company have no custody of such goods, and will not be responsible for leakage, loss of weight or measure, or for damage by fire, theft, strikes, combinations of workmen, weather, deterioration from natural causes, acts of God, the King's enemies, or otherwise howsoever.

The rule at the Manchester docks in regard to exports is that when a loading berth is allocated to a particular line of vessel, or to a particular vessel, the shipowners will pay for receiving the merchandise into the quay shed, on to the quay, or into ship on the arrival of the merchandise at the docks.

Goods for export sent to a vessel's berth at the docks, and not intended for immediate shipment, will be allowed by the canal company to remain at the docks at the owner's sole risk for one calendar month free of rent, after which period the company may take the same into warehouse or store and redeliver to alongside the vessel when she is ready to receive the goods, charging the owner of the goods for the extra services performed at the company's scheduled rates plus rent (after the one month) in addition to the canal toll and wharfage.

If the canal company can allow goods to lie where first received beyond one calendar month from date of receipt they will charge the owners 1s. per ton, plus rent, for such accommodation in lieu of their usual warehousing or storage charge, plus rent, as above mentioned. The goods will, however, continue to remain at the owner's sole risk.

In addition to the above-named charges, the shipowner will be debited with the usual 6d. per ton for receiving to quay.

When pitch, bricks, gravel, scrap iron, and other rough traffic arrives at the Manchester docks per railway for shipment, if instructions for disposal are not in the possession of the canal company on or before the arrival of the traffic, and even if so if the steamer is not ready to receive the traffic on its arrival at the docks—in order to avoid incurring demurrage on the railway wagons—such traffic may be discharged from the wagons on to the quay, the charge for such service being cost, plus 12½ per cent. Should the company be unable to unload the wagons at the vessel's loading berth, the additional cost of subsequently removing the traffic from where deposited to the vessel's side will also be charged.

For instructions as to the method of consigning, and other matters relating to export traffic arriving at the docks per railway, see page 464.

REGULATIONS AND RATES FOR THE HIRE AND USE OF THE CANAL COMPANY'S CRANES.

Regulations.

1. Application for the use of cranes, and deposits to cover charges for their use, must be made at the dock office.

2. When a crane is required to lift a weight exceeding 20 hundredweight, the application must state the maximum capacity of the crane required. In the event of a greater weight than stated in the application being tendered for lifting, and being lifted, the hirer of the crane will be liable for the consequence should any accident arise therefrom.

3. The exact weight of every article to be lifted, if over 1 ton, must be marked thereon.

4. If two or more requisitions be lodged for the use of a particular Crane for the same time, the dock traffic superintendent shall decide which requisition shall have priority.

5. When a vessel is in possession of crane berth, whether she is working or not, and such berth is otherwise required, she shall vacate the same if instructed to do so by the dock traffic superintendent.

6. The full rate of hire will be charged according to the schedule for any crane from the time the crane is ready for use until a notification be given to the dock traffic superintendent that the crane is no longer required.

7. After steam has been got up on a crane, and while under steam, or after a hydraulic or electric crane has been placed in position, should notice be given that it is not required, a charge of 5s. per hour will be made in respect of the 30-ton crane and 2s. 6d. per hour in respect of other cranes, with a minimum charge of 15s. and 7s. 6d., respectively, in lieu of the charges scheduled.

8. Cranes may be hired from the canal company at the rates fixed per hour, but in such cases the hirer of the crane takes the risk of, and is liable for, the consequences of all accidents arising from and during the hire of such crane, as per Regulation No. 9, or the company will undertake to provide cranage, labor, and gear at a tonnage rate which covers such risk.

9. When a crane is hired per the hour, the hirer is responsible for the consequences of any accident that may occur from whatever cause arising to any person or plant by the use of such crane during the hire of same as though the crane was the property of the hirer.

10. Where the canal company undertake the cranage at a tonnage rate, and the weight of the article to be lifted is correctly declared (see Regulation No. 3), the risk of accidents arising from the use of the crane is accepted by the company, unless the person who has requisitioned the crane, by his own or his servant's act, has contributed to the accident.

11. The canal company do not hold themselves responsible for any delays which may arise in supplying cranes by the time requisitioned, or through the breakdown of any crane whilst on hire.

Rates for hire and use of the canal company's cranes.

	s.	*d.*
Portable steam cranes:		
Not exceeding 30 hundredweight lifting capacity—		
Minimum charge	10	0
For any period exceeding 4 hours, per hour	2	6
Exceeding 30 hundredweight and up to 7 tons lifting capacity—		
Minimum charge	12	6
For any period exceeding 3 hours, per hour	3	6
Hydraulic cranes:		
Not exceeding 30 hundredweight lifting capacity—		
Minimum charge	10	0
For any period exceeding 4 hours, per hour	2	6
Electric cranes:		
10 hundredweight lifting capacity—		
Minimum charge	7	6
For any period exceeding 4 hours, per hour	2	0
30 hundredweight lifting capacity—		
Minimum charge	10	0
For any period exceeding 4 hours, per hour	2	6

When the distant control gear for cranes is requisitioned, an additional charge of 1s. per hour will be made for the use of the crane.

The before-mentioned rates cover only the use of the crane and driver to work it.

Rates for use of 30-ton crane.

	£	*s.*	*d.*
Rate per hour:			
Minimum charge	1	10	0
For any period exceeding 3 hours, per hour	0	10	0

These rates cover only the use of the crane and driver to work it.

Tonnage rates:

For lifts not exceeding 10 tons, at 2s. 6d. per ton; minimum charge £1 5s

For lifts over 10 and not exceeding 15 tons, at 3s. 6d. per ton.

For lifts over 15 and not exceeding 20 tons, at 4s. 6d. per ton.

For lifts over 20 and not exceeding 25 tons, at 5s. per ton.

For lifts over 25 and not exceeding 30 tons, at 5s. 6d. per ton.

These rates cover cranage, labor, and use of the necessary gear for lifting direct from railway wagon or road vehicle (or barge alongside when practicable), and putting on board vessel, or vice versa.

For each additional lift of the same article, while the crane is under steam, 50 per cent of the above rate will be charged, but if steam has to be specially raised, the full rates will apply.

When any crane is hired to work by time, the foregoing rates cover the service only during the ordinary working hours. For overtime, see "overtime" clause, page 22.

Further information as respects labor charges may be obtained from the dock traffic superintendent, at the dock traffic offices, Trafford Road, Salford.

HAULAGE, OR CONVEYANCE AS CARRIERS, BY THE SHIP CANAL COMPANY OF TRAFFIC ON THEIR RAILWAY LINES FROM POINT TO POINT ON THEIR MANCHESTER DOCK ESTATE ABOVE MODE WHEEL LOCKS.

The canal company will undertake either of the above-named services on the undermentioned terms and conditions, which are printed on the back of their haulage or conveyance form of requisition, viz:

Haulage.—1. If the company are required to undertake the service of haulage only, their charge for the same only provides for the use of the company's wagons, their dock railways, and the haulage of the loaded and empty wagons between the respective points, and does not cover the service of loading or unloading the wagons, checking the goods into or out of the same, advising consignee of arrival, nor any risk to which the goods may be liable, nor any damage they may sustain while on the wagons, and it rests with the owner of the goods to make provision for all needful services outside that of haulage, and to give or take such receipt for goods so hauled as may be required by either consignee or sender from the other.

2. The company will also provide sheets to cover goods in wagons when applied for, without extra charge, and also ropes where necessary, but will not be responsible for damage to goods arising from any (latent) defect in the sheets or loose sheeting or roping.

3. It is not compulsory upon the company to undertake the service of haulage, and when undertaken it is subject to the company having wagons and sheets at liberty at the time required.

4. The company's charge for the service of haulage (as defined in clause 1) from point to point on their dock estate above Mode Wheel Locks is:

For general merchandise, no single piece of which is more than 5 tons in weight, 6d. per ton (minimum charge as for 2 tons); over 5 tons and not exceeding 10 tons, 9d. per ton.

Conveyance.—5. If the company are required to convey and undertake the risk of common carriers in lieu of that of haulers of the traffic, the charge will be 1/6 per ton (no single article to exceed 10 tons in weight), with a minimum of 2/6 per wagon for use of wagons, sheets (where necessary), and conveyance, but not labor in loading or unloading.

Stowing in wagons.—6. For the service of stowing in wagons of traffic placed therein at the docks the company's charge is: If the service can be done by one man, and the traffic is not of exceptional size or bulk, 2d. per ton.

Demurrage.—7. For detention of wagons or sheets longer than 24 hours in either loading or unloading, after arrival at either end, the company's charge is—

For ordinary wagons, 3s. each per day or part of a day.

For specially constructed wagons capable of carrying 15 tons and under 20 tons, 6s. each per day or part of a day; 20 tons and under 30 tons, 12s. each per day or part of a day; 30 tons and upward, 20s. each per day or part of a day; for sheets, 1s. each per day or part of a day.

If the wagons after being loaded are kept at the loading point by sender or consignee before being hauled or conveyed, the demurrage charge above named will apply both to wagons and sheets for the whole of the time the wagons and sheets are so detained.

Miscellaneous.—8. The haulage or conveyance of the traffic will be considered as commenced and terminated when the wagons, either singly or in a train, are placed at the time of haulage or conveyance as near as they can be to the point of loading or unloading, as the case may be.

9. If the goods are not unloaded within 24 hours after arrival at or as near to the destination as the wagon can be placed at the time of haulage or conveyance, the company may elect to either allow the goods to remain in the wagon, and claim demurrage from the firm or person requisitioning the service, or unload them at the cost and risk of the said firm or person; and in the event of any dispute as to liability for payment of the same, the company will detain the goods until all charges due upon them are paid.

10. Articles exceeding 10 tons in weight, or of unusual length or bulk, or of exceptional bulk in proportion to weight, or requiring a specially constructed wagon for conveyance, or a special train to deliver, can only be stowed in wagons and hauled or conveyed by special arrangement, and subject to the company having at their disposal the means necessary for handling the articles and for hauling or conveying same.

11. Persons or firms ordering wagons or sheets which they subsequently find they will not require, and failing to notify the company of the fact within 24 hours after lodgment of requisition for them, will be charged demurrage at the foregoing rates for the wagons or sheets so provided.

12. If the use of the company's engine should be required for any other purposes, a charge will be made for the same at the rate of 7s. per hour, with a minimum charge of 2s. 6d.

13. Haulage or conveyance to places below mode wheel locks will be subject to special arrangement.

14. No haulage or conveyance will be performed by the canal company except upon lodgment in the railway department at the dock traffic offices, Trafford Road, Salford, of one of the company's requisitions provided for this traffic duly filled up and signed by the party requiring the service and liable to payment for the same. In the event of the rate at which the service is required to be performed being omitted from the requisition by the party signing same, the canal company will only deal with the traffic as haulers at the haulage rate and under the haulage conditions.

NOTE.—The canal company claim the option to employ barges instead of railway wagons should it better suit their convenience to do so, but if barges are used no greater charge will be made for either the haulage or conveyance service than if railway wagons had been employed, except in the case of demurrage, the charges for which in respect of barges will be as follows:

For detention longer than 24 hours in loading or unloading: 1/ per hour, or £1 1s. per day for lighters carrying any weight up to 80 tons inclusive; 1/6 per hour, or £1 10s. per day for lighters carrying more than 80 tons.

The following is a print of the company's form of requisition, copies of which can be obtained either at the dock office or the dock traffic offices, Trafford Road, Salford.

MANCHESTER SHIP CANAL (RAILWAYS).

Order for haulage or conveyance.

———, 19—.

To the MANCHESTER SHIP CANAL CO.:

Please (haul) or (convey as carriers) the undermentioned traffic on the conditions named at the back hereof: From ———, to ——— debiting (me) (us) with the charge of ——— per ton for the service covered by that rate, as defined at the back hereof, and with all other charges (stowing in wagons or barges, demurrage, etc.) which may arise in connection therewith, and which (I) (we) hereby undertake to pay.

Name ——— ———,
Address ——— ———.
Signed ——— ———.

Date.	Wagon numbers.	Goods and marks.	Weight.	Remarks.

NOTE.—This requisition will not be acted upon unless signed by the person or firm liable to pay for the service.

Through rates by railway.—The following main line railways are in connection with the dock railways of the Manchester Ship Canal Co., viz:

The Cheshire Lines, Midland, Great Northern, and Great Central Railway Companies, via Bridgewater Junction (C. L. C.). The London & North Western Railway Co. at Weaste Junction. The Lancashire & Yorkshire Railway Co. at New Barns Junction, Salford.

There is direct railway communication by means of the above lines between the quays and warehouses of the Manchester docks and every railway station in Great Britain.

The canal company's "through rates" are all subject to the conditions and regulations of the general railway classification of goods and of the ship canal company's current schedule of rates of toll and wharfage, etc. Each through rate is made up of the railway rate between the docks and the inland station, the ship canal toll, and such labor charges at the docks as are incidental to the handling of traffic to or from railway wagons direct from or to alongside vessel.

The rate also includes collection or delivery by cart (within the ordinary cartage limit at the inland town) unless otherwise stated.

RAILWAY TRAFFIC (IMPORTS).

Conditions relating to traffic forwarded from the dock quays by the canal company as carriers by railway.

1. When merchandise is conveyed inland by railway by the canal company as carriers at their through rate, such portion of the quay porterage rate as may be incidental to conveyance is included in the rate (except articles of unusual length, bulk, or weight, or exceptional bulk in proportion to weight, or of a dangerous nature, and also subject to what is stated in clause 5 hereof), provided forwarding instructions and all other necessary documents, including particulars required on inward customs entry form, for passing through His Majesty's customs have been received 24 hours before the arrival of the ship at the docks, and such forwarding instructions are unconditional. and the dispatch of the goods is not delayed for any of the reasons detailed in clause 4 hereof.

2. Goods required to be forwarded direct ex-ship, instructions for which have not been received by the canal company 24 hours before the ship's arrival, the company will nevertheless endeavor to load direct from ship, and so avoid the quay porterage charge, provided wagons are available, but if the goods are landed the full scheduled quay porterage rate will be charged in addition to the through railway rate.

3. When the canal company have received absolutely unconditional orders to forward by railway to interior towns goods landed or to be landed on the dock quays, or that may be lying in the company's dock warehouses, they accept the carriers' responsibility (except when conveyed at owners' risk) for the safe conveyance of such goods, including the risk of fire, from the time they are quite ready and at the company's disposal to be forwarded until the goods are delivered to the railway company carrying them to destination.

4. The canal company, however, hereby give notice that they do not accept and are not responsible for any such risk as carriers by railway in respect of any such merchandise while by the order of the sender or consignee, or any person acting on behalf of either, the goods are being reweighed, sampled, picked, or repaired, or while the forwarding thereof is suspended by any other order, restriction, act, strike, combination of workmen, or by the default of the sender or consignee, or of any person acting on behalf of either, or by notice of lien made under the powers of any act of Parliament.

5. Notice is also hereby given that in cases where merchandise has been ordered forward by rail, but a restriction has been put on the forwarding because of inability on the part of the consignee to take delivery on arrival, and (or) of the inability of the railway company to deal with it at the destination pending the consignee's ability to take delivery, quay porterage, and other charges, in accordance with the terms of this schedule, will be payable for the period or periods during which the dispatch of the merchandise, or any portion thereof, is suspended by reason of such restriction, notwithstanding that such traffic has been ordered forward 24 hours before the ship's arrival at the docks.

If the traffic landed consists of any of the following: Asphalt paving (in blocks), bog ore, bricks (fire), clay, copperas (green in bulk), gravel, iron ore, scrap iron, stone in the rough (building, pitching, paving, kerb, or flag), and stone and undressed material for the repair of roads, a nominal extra charge of 3d. per ton (and rent when incurred) will be made upon such traffic, but upon any other traffic not named the full quay porterage rate (and warehousing or storage and rent charges when iucurred) as scheduled by the company to apply thereto will be charged.

6. The full scheduled quay porterage rates (and warehousing or storage and rent charges when incurred) will be charged upon all descriptions of goods landed if forwarding orders have not been given 24 hours before the arrival of the vessel at the docks.

7. When requested to weigh, or if the weight is not declared on the consignment note, and goods have to be landed on the quay for weighing, the quay porterage charge will be made in addition to the through rate. But if the goods are discharged ex ship direct to railway wagon, and the weight is ascertained over the railway weighbridge without the wagons being tared, no charge will be made. When wagons have to be tared, a charge of 1 penny per ton (minimum 3 tons per wagon) will be made, and if required a gross weight certificate given.

8. When no remittance for the amount due at the through rate has been made to the canal company before goods are forwarded, the same will be invoiced at the through rate (or through rate less canal toll, as the case may be), and such charges must be paid by the consignee to the Main Line Railway Co., the latter having no authority to release the goods except upon payment of such charges.

EXPORT TRAFFIC.

In order to obtain the advantage of the canal company's through rates, export traffic must be consigned "by rail direct to the Manchester docks for shipment per steamship ——— carriage forward," and to the order of the shipper if in Manchester, or his Manchester agent as the case may be, to whom the canal company will charge the through rate, as instructed, and pay the railway company for their conveyance of the traffic to the docks.

It is indispensable that all export traffic be thus consigned by rail direct to the Manchester docks, otherwise it may be sent to the railway company's Manchester town station, and then the shipper will have to pay for cartage to the docks and other additional expenses.

Where suppliers of goods contract to deliver the same f. o. b., Manchester docks, they should arrange with their shipping agents to pass the customs' specification and pay the f. o. b. charges on their behalf as the canal company will not collect such charges from suppliers.

All inquiries as to the canal company's through rates should be addressed to the Manchester Ship Canal Co., dock office, Manchester, and not to the railway companies, as the latter are not parties to the canal company's through rates.

CONVEYANCE OF GOODS BY CANAL CARRIERS.

There is water communication between the docks and the several canals in the district by which water conveyance is practicable between the docks and towns in Lancashire, Yorkshire, Cheshire, Staffordshire, East Worcestershire, and Nottinghamshire. The following is a list of the various canal carriers of traffic to and from the docks, with the districts served by them, from whom through rates for conveyance can be obtained on application:

Name and address canal carriers.	District served.
Manchester Ship Canal Co. (Bridgewater Department), John Oldfield, superintendent, Chester Road, Manchester.	All places on the Bridgewater Canal; also Warrington, Rochdale, Heywood, Ashton-under-Lyne, Stalybridge, Hollinwood Wharf (for Oldham). They will also barge traffic between the docks and waterside premises in and about Manchester.
The Anderton Co., Stoke-on-Trent. Manchester representatives: The Manchester Ship Canal Co., order office, 15 Cooper Street, Manchester.	All towns in the North Staffordshire potteries; also Newcastle-under-Lyme, Leek, Macclesfield, Congleton, etc.
Fellows, Morton & Clayton (Ltd.), Lower Fazeley Street, Birmingham. Manchester representative: Fred Morton, managing director, 8 Brazennose Street.	Birmingham, South Staffordshire, and East Worcestershire.
Fellows, Morton & Clayton (Ltd.), Wolverhampton	Wolverhampton, etc.
Fellows, Morton & Clayton (Ltd.), Dudley Port	Dudley Port, Tipton, etc.
Fellows, Morton & Clayton (Ltd.), Nottingham	Nottingham, Shardlow, etc.
Fellows, Morton & Clayton (Ltd.), Leicester	Leicester, Loughborough, etc.
Gandy, J. W., Bridgewater Wharf, Derby	Derby and Burton, Rugeley & Tamworth.
Leeds & Liverpool Canal Co., Pall Mall, Liverpool, 125 Chester Road, Manchester	Wigan, Blackburn, Chorley, Accrington, Leigh, Leeds, etc.
Mersey, Weaver & Ship Canal Carrying Co. (Ltd.), 312 Deansgate, Manchester	General carriers and lightermen to and from the docks.
Rochdale Canal Co., Dale Street, Manchester	Littleboro', Todmorden, Sowerby Bridge, Mytholmroyd, Halifax, and other Yorkshire towns.
Statter, T. G., & Co., Hulme Locks, Egerton Street, Manchester	Bolton, Bury, etc.
Simpson, Davies & Sons, Runcorn	General carriers to and from Manchester docks; on the Bridgewater. Rochdale, Ashton, Bolton and Bury, and Trent and Mersey Canals; the River Weaver; also Widnes and St. Helens.
Thomason, James, Manchester office, 6 Water Street; Liverpool office, 6 Water Street	To and from places on the Bridgewater and Ship Canals, and also the River Mersey.
Wood, Albert, head office, Sowerby Bridge. Manchester office, Ashton Canal Wharf, Ducie Street, Piccadilly.	Between Manchester, Dewsbury, Wakefield, Huddersfield, Sowerby Bridge, Halifax, Todmorden, Hull, Goole, Grimsby, etc.

E. LATIMER,
General Superintendent.

DOCK OFFICE, MANCHESTER, *December 30, 1911*

APPENDIX VIII.

THE PANAMA CANAL ACT.

THE PANAMA CANAL ACT.

[Public—No. 337.]

[H. R. 21969.]

An Act To provide for the opening, maintenance, protection, and operation of the Panama Canal, and the sanitation and government of the Canal Zone.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the zone of land and land under water of the width of ten miles extending to the distance of five miles on each side of the center line of the route of the canal now being constructed thereon, which zone begins in the Caribbean Sea three marine miles from mean low-water mark and extends to and across the Isthmus of Panama into the Pacific Ocean to the distance of three marine miles from mean low-water mark, excluding therefrom the cities of Panama and Colon and their adjacent harbors located within said zone, as excepted in the treaty with the Republic of Panama dated November eighteenth, nineteen hundred and three, but including all islands within said described zone, and in addition thereto the group of islands in the Bay of Panama named Perico, Naos, Culebra, and Flamenco, and any lands and waters outside of said limits above described which are necessary or convenient or from time to time may become necessary or convenient for the construction, maintenance, operation, sanitation, or protection of the said canal or of any auxiliary canals, lakes, or other works necessary or convenient for the construction, maintenance, operation, sanitation, or protection of said canal, the use, occupancy, or control whereof were granted to the United States by the treaty between the United States and the Republic of Panama, the ratifications of which were exchanged on the twenty-sixth day of February, nineteen hundred and four, shall be known and designated as the Canal Zone, and the canal now being constructed thereon shall hereafter be known and designated as the Panama Canal. The President is authorized, by treaty with the Republic of Panama, to acquire any additional land or land under water not already granted, or which was excepted from the grant, that he may deem necessary for the operation, maintenance, sanitation, or protection of the Panama Canal, and to exchange any land or land under water not deemed necessary for such purposes for other land or land under water which may be deemed necessary for such purposes, which additional land or land under water so acquired shall become part of the Canal Zone.

Sec. 2. That all laws, orders, regulations, and ordinances adopted and promulgated in the Canal Zone by order of the President for the government and sanitation of the Canal Zone and the construction of the Panama Canal are hereby ratified and confirmed as valid and binding until Congress shall otherwise provide. The existing courts established in the Canal Zone by Executive order are recognized and confirmed to continue in operation until the courts provided for in this Act shall be established.

Sec. 3. That the President is authorized to declare by Executive order that all land and land under water within the limits of the Canal Zone is necessary for the construction, maintenance, operation, sanitation, or protection of the Panama Canal, and to extinguish, by agreement when advisable, all claims and titles of adverse claimants and occupants. Upon failure to secure by agreement title to any such parcel of land or land under water the adverse claim or occupancy shall be disposed of and title thereto secured in the United States and compensation therefor fixed and paid in the manner provided in the aforesaid treaty with the Republic of Panama, or such modification of such treaty as may hereafter be made.

Sec. 4. That when in the judgment of the President the construction of the Panama Canal shall be sufficiently advanced toward completion to render the further services of the

Isthmian Canal Commission unnecessary the President is authorized by Executive order to discontinue the Isthmian Canal Commission, which, together with the present organization, shall then cease to exist; and the President is authorized thereafter to complete, govern, and operate the Panama Canal and govern the Canal Zone, or cause them to be completed, governed, and operated, through a governor of the Panama Canal and such other persons as he may deem competent to discharge the various duties connected with the completion, care, maintenance, sanitation, operation, government, and protection of the canal and Canal Zone. If any of the persons appointed or employed as aforesaid shall be persons in the military or naval service of the United States, the amount of the official salary paid to any such person shall be deducted from the amount of salary or compensation provided by or which shall be fixed under the terms of this Act. The governor of the Panama Canal shall be appointed by the President, by and with the advice and consent of the Senate, commissioned for a term of four years, and until his successor shall be appointed and qualified. He shall receive a salary of ten thousand dollars a year. All other persons necessary for the completion, care, management, maintenance, sanitation, government, operation, and protection of the Panama Canal and Canal Zone shall be appointed by the President, or by his authority, removable at his pleasure, and the compensation of such persons shall be fixed by the President, or by his authority, until such time as Congress may by law regulate the same, but salaries or compensation fixed hereunder by the President shall in no instance exceed by more than twenty-five per centum the salary or compensation paid for the same or similar services to persons employed by the Government in continental United States. That upon the completion of the Panama Canal the President shall cause the same to be officially and formally opened for use and operation.

Before the completion of the canal, the Commission of Arts may make report to the President of their recommendation regarding the artistic character of the structures of the canal, such report to be transmitted to Congress.

Sec. 5. That the President is hereby authorized to prescribe and from time to time change the tolls that shall be levied by the Government of the United States for the use of the Panama Canal: *Provided*, That no tolls, when prescribed as above, shall be changed, unless six months' notice thereof shall have been given by the President by proclamation. No tolls shall be levied upon vessels engaged in the coastwise trade of the United States. That section forty-one hundred and thirty-two of the Revised Statutes is hereby amended to read as follows:

"Sec. 4132. Vessels built within the United States and belonging wholly to citizens thereof; and vessels which may be captured in war by citizens of the United States and lawfully condemned as prize, or which may be adjudged to be forfeited for a breach of the laws of the United States; and seagoing vessels, whether steam or sail, which have been certified by the Steamboat-Inspection Service as safe to carry dry and perishable cargo, not more than five years old at the time they apply for registry, wherever built, which are to engage only in trade with foreign countries or with the Philippine Islands and the islands of Guam and Tutuila, being wholly owned by citizens of the United States or corporations organized and chartered under the laws of the United States or of any State thereof, the president and managing directors of which shall be citizens of the United States or corporations organized and chartered under the laws of the United States or of any State thereof, the president and managing directors of which shall be citizens of the United States, and no others, may be registered as directed in this title. Foreign-built vessels registered pursuant to this Act shall not engage in the coastwise trade: *Provided*, That a foreign-built yacht, pleasure boat, or vessel not used or intended to be used for trade admitted to American registry pursuant to this section shall not be exempt from the collection of ad valorem duty provided in section thirty-seven of the Act approved August fifth, nineteen hundred and nine, entitled 'An Act to provide revenue, equalize duties, and encourage the industries of the United States, and for other purposes.' That all materials of foreign production which may be necessary for the construction or repair of vessels built in the United States and all such materials necessary for the building or repair of their machinery and all articles necessary for their outfit and equipment may be imported into the United States free of duty under such regulations as the Secretary of the Treasury may prescribe: *Provided further,* That such vessels so admitted under the provisions of this section may contract with the Postmaster General under the Act of March third, eighteen hundred and ninety-one, entitled 'An Act to provide for ocean mail service between the United States and foreign ports, and to promote commerce,' so long as such vessels shall in all respects comply with the provisions and requirements of said Act."

Tolls may be based upon gross or net registered tonnage, displacement tonnage, or otherwise, and may be based on one form of tonnage for warships and another for ships of commerce. The rate of tolls may be lower upon vessels in ballast than upon vessels carrying passengers or cargo. When based upon net registered tonnage for ships of commerce the tolls shall not exceed one dollar and twenty-five cents per net registered ton, nor be less, other than for vessels of the United States and its citizens, than the estimated proportionate cost of the actual maintenance and operation of the canal subject, however, to the provisions of article nineteen of the convention between the United States and the Republic of Panama, entered into November eighteenth, nineteen hundred and three. If the tolls shall not be based upon net registered tonnage, they shall not exceed the equivalent of one dollar and twenty-five cents per net registered ton as nearly as the same may be determined, nor be less than the equivalent of seventy-five cents per net registered ton. The toll for each passenger shall not be more than one dollar and fifty cents. The President is authorized to make and from time to time amend regulations governing the operation of the Panama Canal, and the passage and control of vessels through the same or any part thereof, including the locks and approaches thereto, and all rules and regulations affecting pilots and pilotage in the canal or the approaches thereto through the adjacent waters.

Such regulations shall provide for prompt adjustment by agreement and immediate payment of claims for damages which may arise from injury to vessels, cargo, or passengers from the passing of vessels through the locks under the control of those operating them under such rules and regulations. In case of disagreement suit may be brought in the district court of the Canal Zone against the governor of the Panama Canal. The hearing and disposition of such cases shall be expedited and the judgment shall be immediately paid out of any moneys appropriated or allotted for canal operation.

The President shall provide a method for the determination and adjustment of all claims arising out of personal injuries to employees thereafter occurring while directly engaged in actual work in connection with the construction, maintenance, operation, or sanitation of the canal or of the Panama Railroad, or of any auxiliary canals, locks, or other works necessary and convenient for the construction, maintenance, operation, or sanitation of the canal, whether such injuries result in death or not, and prescribe a schedule of compensation therefor, and may revise and modify such method and schedule at any time; and such claims, to the extent they shall be allowed on such adjustment, if allowed at all, shall be paid out of the moneys hereafter appropriated for that purpose or out of the funds of the Panama Railroad Company, if said company was responsible for said injury, as the case may require. And after such method and schedule shall be provided by the President, the provisions of the Act entitled "An Act granting to certain employees of the United States the right to receive from it compensation for injuries sustained in the course of their employment," approved May thirtieth, nineteen hundred and eight, and of the Act entitled "An Act relating to injured employees on the Isthmian Canal," approved February twenty-fourth, nineteen hundred and nine, shall not apply to personal injuries thereafter received and claims for which are subject to determination and adjustment as provided in this section.

SEC. 6. That the President is authorized to cause to be erected, maintained, and operated, subject to the International Convention and the Act of Congress to regulate radio communication, at suitable places along the Panama Canal and the coast adjacent to its two terminals, in connection with the operation of said canal, such wireless telegraphic installations as he may deem necessary for the operation, maintenance, sanitation, and protection of said canal, and for other purposes. If it is found necessary to locate such installations upon territory of the Republic of Panama, the President is authorized to make such agreement with said Government as may be necessary, and also to provide for the acceptance and transmission, by said system, of all private and commercial messages, and those of the Government of Panama, on such terms and for such tolls as the President may prescribe: *Provided,* That the messages of the Government of the United States and the departments thereof, and the management of the Panama Canal, shall always be given precedence over all other messages. The President is also authorized, in his discretion, to enter into such operating agreements or leases with any private wireless company or companies as may best insure freedom from interference with the wireless telegraphic installations established by the United States. The President is also authorized to establish, maintain, and operate, through the Panama Railroad Company or otherwise, dry docks, repair shops, yards, docks, wharves, warehouses, storehouses, and other necessary facilities and appurtenances for the purpose of providing coal and other materials, labor, repairs, and supplies for vessels of the Government of the United States and, incidentally, for supplying such at reasonable prices to passing vessels, in accordance with appropriations hereby authorized to be made from time to time by Congress as a part of the maintenance and operation of the said canal. Moneys received from the conduct of said business may be expended and reinvested for such purposes without being covered into the Treasury of the United States; and such moneys are hereby appropriated for such purposes, but all deposits of such funds shall be subject to the provisions of existing law relating to the deposit of other public funds of the United States, and any net profits accruing from such business shall annually be covered into the Treasury of the United States. Monthly reports of such receipts and expenditures shall be made to the President by the persons in charge, and annual reports shall be made to the Congress.

Sec. 7. That the governor of the Panama Canal shall, in connection with the operation of such canal, have official control and jurisdiction over the Canal Zone and shall perform all duties in connection with the civil government of the Canal Zone, which is to be held, treated, and governed as an adjunct of such Panama Canal. Unless in this Act otherwise provided all existing laws of the Canal Zone referring to the civil governor or the civil administration of the Canal Zone shall be applicable to the governor of the Panama Canal, who shall perform all such executive and administrative duties required by existing law. The President is authorized to determine or cause to be determined what towns shall exist in the Canal Zone and subdivide and from time to time resubdivide said Canal Zone into subdivisions, to be designated by name or number, so that there shall be situated one town in each subdivision, and the boundaries of each subdivision shall be clearly defined. In each town there shall be a magistrate's court with exclusive original jurisdiction coextensive with the subdivision in which it is situated of all civil cases in which the principal sum claimed does not exceed three hundred dollars, and all criminal cases wherein the punishment that may be imposed shall not exceed a fine of one hundred dollars, or imprisonment not exceeding thirty days, or both, and all violations of police regulations and ordinances and all actions involving possession or title to personal property or the forcible entry and detainer of real estate. Such magistrates shall also hold preliminary investigations in charges of felony and offenses under section ten of this Act, and commit or bail in bailable cases to the district court. A sufficient number of magistrates and constables, who must be citizens of the United States, to conduct the business of such courts, shall be appointed by the governor of the Panama Canal for terms of four years and until their successors are appointed and qualified, and the compensation of such persons shall be fixed by the President, or by his authority, until such time as Congress may by law regulate the same. The rules governing said courts and prescribing the duties of said magistrates and constables, oaths and bonds, the times and places of holding such courts, the disposition of fines, costs, forfeitures, enforcements of judgments, providing for appeals therefrom to the district court, and the disposition, treatment, and pardon of convicts shall be established by order of the President. The governor of the Panama Canal shall appoint all notaries public, prescribe their powers and duties, their official seal, and the fees to be charged and collected by them.

SEC. 8. That there shall be in the Canal Zone one district court with two divisions, one including Balboa and the other including Cristobal; and one district judge of the said district, who shall hold his court in both divisions at such time as he may designate by order, at least once a month in each division. The rules of practice in such district court shall be prescribed or amended by order of the President. The said district court shall have original jurisdiction of all felony cases, of offenses arising under section ten of this Act, all causes in equity; admiralty and all cases at law involving principal sums exceeding three hundred dollars and all appeals from judgments rendered in magistrates' courts. The jurisdiction in admiralty herein conferred upon the district judge and the district court shall be the same that is exercised by the United States district judges and the United States district courts, and the procedure and practice shall also be the same. The district court or the judge thereof shall also have jurisdiction of all other matters and proceedings not herein provided for which are now within the jurisdiction of the Supreme Court of the Canal Zone, of the Circuit Court of the Canal Zone, the District Court of the Canal Zone, or the judges thereof. Said judge shall provide for the selection, summoning, serving, and compensation of jurors from among the citizens of the United States, to be subject to jury duty in either division of such district, and a jury shall be had in any criminal case or civil case at law originating in said court on the demand of either party. There shall be a district attorney and a marshal for said district. It shall be the duty of the district attorney to conduct all business, civil and criminal, for the Government, and to advise the governor of the Panama Canal on all legal questions touching the operation of the canal and the administration of civil affairs. It shall be the duty of the marshal to execute all process of the court, preserve order therein, and do all things incident to the office of marshal. The district judge, the district attorney, and the marshal shall be appointed by the President, by and with the advice and consent of the Senate, for terms of four years each, and until their successors are appointed and qualified, and during their terms of office shall reside within the Canal Zone, and shall hold no other office nor serve on any official board or commission nor receive any emoluments except their salaries. The district judge shall receive the same salary paid the district judges of the United States, and shall appoint the clerk of said court, and may appoint one assistant when necessary, who shall receive salaries to be fixed by the President. The district judge shall be entitled to six weeks' leave of absence each year with pay. During his absence or during any period of disability or disqualification from sickness or otherwise to discharge his duties the same shall be temporarily performed by any circuit or district judge of the United States who may be designated by the President, and who, during such service, shall receive the additional mileage and per diem allowed by law to district judges of the United States when holding court away from their homes. The district attorney and the marshal shall be paid each a salary of five thousand dollars per annum.

SEC. 9. That the records of the existing courts and all causes, proceedings, and criminal prosecutions pending therein as shown by the dockets thereof, except as herein otherwise provided, shall immediately upon the organization of the courts created by this Act be transferred to such new courts having jurisdiction of like cases, be entered upon the dockets thereof, and proceed as if they had originally been brought therein, whereupon all the existing courts, except the supreme court of the Canal Zone, shall cease to exist. The President may continue the supreme court of the Canal Zone and retain the judges thereof in office for such time as to him may seem necessary to determine finally any causes and proceedings which may be pending therein. All laws of the Canal Zone imposing duties upon the clerks or ministerial officers of existing courts shall apply and impose such duties upon the clerks and ministerial officers of the new courts created by this Act having jurisdiction of like cases, matters, and duties.

All existing laws in the Canal Zone governing practice and procedure in existing courts shall be applicable and adapted to the practice and procedure in the new courts.

The Circuit Court of Appeals of the Fifth Circuit of the United States shall have jurisdiction to review, revise, modify, reverse, or affirm the final judgments and decrees of the District Court of the Canal Zone and to render such judgments as in the opinion of the said appellate court should have been rendered by the trial court in all actions and proceedings in which the

Constitution, or any statute, treaty, title, right, or privilege of the United States, is involved and a right thereunder denied, and in cases in which the value in controversy exceeds one thousand dollars, to be ascertained by the oath of either party, or by other competent evidence, and also in criminal causes wherein the offense charged is punishable as a felony. And such appellate jurisdiction, subject to the right of review by or appeal to the Supreme Court of the United States as in other cases authorized by law, may be exercised by said circuit court of appeals in the same manner, under the same regulations, and by the same procedure as nearly as practicable as is done in reviewing the final judgments and decrees of the district courts of the United States.

Sec. 10. That after the Panama Canal shall have been completed and opened for operation the governor of the Panama Canal shall have the right to make such rules and regulations, subject to the approval of the President, touching the right of any person to remain upon or pass over any part of the Canal Zone as may be necessary. Any person violating any of such rules or regulations shall be guilty of a misdemeanor, and on conviction in the District Court of the Canal Zone shall be punished by a fine not exceeding five hundred dollars or by imprisonment not exceeding a year, or both, in the discretion of the court. It shall be unlawful for any person, by any means or in any way, to injure or obstruct, or attempt to injure or obstruct, any part of the Panama Canal or the locks thereof or the approaches thereto. Any person violating this provision shall be guilty of a felony, and on conviction in the District Court of the Canal Zone shall be punished by a fine not exceeding ten thousand dollars or by imprisonment not exceeding twenty years, or both, in the discretion of the court. If the act shall cause the death of any person within a year and a day thereafter, the person so convicted shall be guilty of murder and shall be punished accordingly.

Sec. 11. That section five of the Act to regulate commerce, approved February fourth, eighteen hundred and eighty-seven, as heretofore amended, is hereby amended by adding thereto a new paragraph at the end thereof, as follows:

"From and after the first day of July, nineteen hundred and fourteen, it shall be unlawful for any railroad company or other common carrier subject to the Act to regulate commerce to own, lease, operate, control, or have any interest whatsoever (by stock ownership or otherwise, either directly, indirectly, through any holding company, or by stockholders or directors in common, or in any other manner) in any common carrier by water operated through the Panama Canal or elsewhere with which said railroad or other carrier aforesaid does or may compete for traffic or any vessel carrying freight or passengers upon said water route or elsewhere with which said railroad or other carrier aforesaid does or may compete for traffic; and in case of the violation of this provision each day in which such violation continues shall be deemed a separate offense."

Jurisdiction is hereby conferred on the Interstate Commerce Commission to determine questions of fact as to the competition or possibility of competition, after full hearing, on the application of any railroad company or other carrier. Such application may be filed for the purpose of determining whether any existing service is in violation of this section and pray for an order permitting the continuance of any vessel or vessels already in operation, or for the purpose of asking an order to install new service not in conflict with the provisions of this paragraph. The commission may on its own motion or the application of any shipper institute proceedings to inquire into the operation of any vessel in use by any railroad or other carrier which has not applied to the commission and had the question of competition or the possibility of competition determined as herein provided. In all such cases the order of said commission shall be final.

If the Interstate Commerce Commission shall be of the opinion that any such existing specified service by water other than through the Panama Canal is being operated in the interest of the public and is of advantage to the convenience and commerce of the people, and that such extension will neither exclude, prevent, nor reduce competition on the route by water under consideration, the Interstate Commerce Commission may, by order, extend the time during which such service by water may continue to be operated beyond July first, nineteen hundred and fourteen. In every case of such extension the rates, schedules, and practices of such water carrier shall be filed with the Interstate Commerce Commission and shall be subject to the act to regulate commerce and all amendments thereto in the same manner and to the same extent as is the railroad or other common carrier controlling such water carrier or interested in any manner in its operation: *Provided,* Any application for extension under the terms of this provision filed with the Interstate Commerce Commission prior to July first, nineteen hundred and fourteen, but for any reason not heard and disposed of before said date, may be considered and granted thereafter.

No vessel permitted to engage in the coastwise or foreign trade of the United States shall be permitted to enter or pass through said canal if such ship is owned, chartered, operated, or controlled by any person or company which is doing business in violation of the provisions of the Act of Congress approved July second, eighteen hundred and ninety, entitled "An Act to protect trade and commerce against unlawful restraints and monopolies," or the provisions of sections seventy-three to seventy-seven, both inclusive, of an Act approved August twenty-seventh, eighteen hundred and ninety-four, entitled "An Act to reduce taxation, to provide revenue for the Government, and for other purposes," or the provisions of any other Act of Congress amending or supplementing the said Act of July second, eighteen hundred and ninety, commonly known as the Sherman Antitrust Act, and amendments thereto, or said sections of the Act of August twenty-seventh, eighteen hundred and ninety-four. The question of fact may be determined by the judgment of any court of the United States of competent jurisdiction in any cause pending before it to which the owners or operators of such ship are parties. Suit may be brought by any shipper or by the Attorney General of the United States.

That section six of said Act to regulate commerce, as heretofore amended, is hereby amended by adding a new paragraph at the end thereof, as follows:

"When property may be or is transported from point to point in the United States by rail and water through the Panama Canal or otherwise, the transportation being by a common carrier or carriers, and not entirely within the limits of a single State, the Interstate Commerce Commission shall have jurisdiction of such transportation and of the carriers, both by rail and by water, which may or do engage in the same, in the following particulars, in addition to the jurisdiction given by the Act to regulate commerce, as amended June eighteenth, nineteen hundred and ten:

"(a) To establish physical connection between the lines of the rail carrier and the dock of the water carrier by directing the rail carrier to make suitable connection between its line and a track or tracks which have been constructed from the dock to the limits of its right of way, or by directing either or both the rail and water carrier, individually or in connection with one another, to construct and connect with the lines of the rail carrier a spur track or tracks to the dock. This provision shall only apply where such connection is reasonably practicable, can be made with safety to the public, and where the amount of business to be handled is sufficient to justify the outlay.

"The commission shall have full authority to determine the terms and conditions upon which these connecting tracks, when constructed, shall be operated, and it may, either in the construction or the operation of such tracks, determine what sum shall be paid to or by either carrier. The provisions of this paragraph shall extend to cases where the dock is owned by other parties than the carrier involved.

"(b) To establish through routes and maximum joint rates between and over such rail and water lines, and to determine all the terms and conditions under which such lines shall be operated in the handling of the traffic embraced.

"(c) To establish maximum proportional rates by rail to and from the ports to which the traffic is brought, or from which it is taken by the water carrier, and to determine to what traffic and in connection with what vessels and upon what terms and conditions such rates shall apply. By proportional rates are meant those which differ from the corresponding local rates to and from the port and which apply only to traffic which has been brought to the port or is carried from the port by a common carrier by water.

"(d) If any rail carrier subject to the Act to regulate commerce enters into arrangements with any water carrier operating from a port in the United States to a foreign country, through the Panama Canal or otherwise, for the handling of through business between interior points of the United States and such foreign country, the Interstate Commerce Commission may require such railway to enter into similar arrangements with any or all other lines of steamships operating from said port to the same foreign country."

The orders of the Interstate Commerce Commission relating to this section shall only be made upon formal complaint or in proceedings instituted by the commission of its own motion and after full hearing. The orders provided for in the two amendments to the Act to regulate commerce enacted in this section shall be served in the same manner and enforced by the same penalties and proceedings as are the orders of the commission made under the provisions of section fifteen of the Act to regulate commerce, as amended June eighteenth, nineteen hundred and ten, and they may be conditioned for the payment of any sum or the giving of security for the payment of any sum or the discharge of any obligation which may be required by the terms of said order.

Sec. 12. That all laws and treaties relating to the extradition of persons accused of crime in force in the United States, to the extent that they may not be in conflict with or superseded by any special treaty entered into between the United States and the Republic of Panama with respect to the Canal Zone, and all laws relating to the rendition of fugitives from justice as between the several States and Territories of the United States, shall extend to and be considered in force in the Canal Zone, and for such purposes and such purposes only the Canal Zone shall be considered and treated as an organized Territory of the United States.

Sec. 13. That in time of war in which the United States shall be engaged, or when, in the opinion of the President, war is imminent, such officer of the Army as the President may designate shall, upon the order of the President, assume and have exclusive authority and jurisdiction over the operation of the Panama Canal and all of its adjuncts, appendants, and appurtenances, including the entire control and government of the Canal Zone, and during a continuance of such condition the governor of the Panama Canal shall, in all respects and particulars as to the operation of such Panama Canal, and all duties, matters, and transactions affecting the Canal Zone, be subject to the order and direction of such officer of the Army.

Sec. 14. That this Act shall be known as, and referred to as, the Panama Canal Act, and the right to alter, amend, or repeal any or all of its provisions or to extend, modify, or annul any rule or regulation made under its authority is expressly reserved.

Approved, August 24, 1912.

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O

PANAMA CANAL TRAFFIC AND TOLLS

REPORT BY

EMORY R. JOHNSON

SPECIAL COMMISSIONER ON PANAMA
CANAL TRAFFIC AND TOLLS

FOLDED PLATES

ALEUTIAN ISLANDS
KAMCHATKA
ALASKA PENN.
C A N A D A
U N I T E D   S T A T E S
MEXICO
Port Townsend
San Francisco
New York
New Orleans
Tampa
Habana
CUBA
HAITI
St. Thomas
Greytown
Colon
Panama
VENEZUELA
COLOMBIA
GUIANA
ECUADOR
Guayaquil
PERU
B R A Z I L
BOLIVIA
PARAGUAY
URUGUAY
Iquique
Valparaiso
Coronel
CHILE
A R G E N T I N A
Punta Arenas
Cape Horn
KOREA
Yokohama
JAPAN ISLANDS
Shanghai
Manila
PHILIPPINE ISLANDS
Honolulu
HAWAIIAN ISLANDS
NEW GUINEA
SAMOAN ISLANDS
SOCIETY
Tahiti
A U S T R A L I A
Sydney
Melbourne
NEW ZEALAND
Wellington
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SAN FRANCISCO TO YOKOHAMA VIA GREAT CIRCLE 4536
NEW YORK TO YOKOHAMA 9798 TO MANILA 11,548 TO SHANGHAI 10 839 TO HONG KONG 11,383 VIA PANAMA
LIVERPOOL TO YOKOHAMA 12,372
SAN FRANCISCO TO YOKOHAMA VIA EAST AND WEST LINE 4799
HONOLULU TO YOKOHAMA 3445
SAN FRANCISCO TO HONOLULU 2081
SAN FRANCISCO TO YOKOHAMA VIA HONOLULU 5536
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ST THOMAS - GIBRALTAR
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NEW YORK TO PERNAMBUCO 3696
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SAN FRANCISCO TO VALPARAISO 5140
HONOLULU TO NEW YORK 13,312
SAMOA TO SYDNEY 2355
TAHITI TO SYDNEY 3308
SAMOA TO WELLINGTON 1881
TAHITI TO WELLINGTON 2348
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WELLINGTON TO NEW YORK 11,344 TO LIVERPOOL 11,711
CORONEL TO PUNTA ARENAS 1134
VALPARAISO TO PUNTA ARENAS 1292
NEW YORK TO VALPARAISO 8380 TO SAN FRANCISCO 13,135
LIVERPOOL TO VALPARAISO
NOTE
Routes for Full-Powered Steam Vessels
Routes for Sailing Vessels
Distances in Nautical Miles

Plate I.

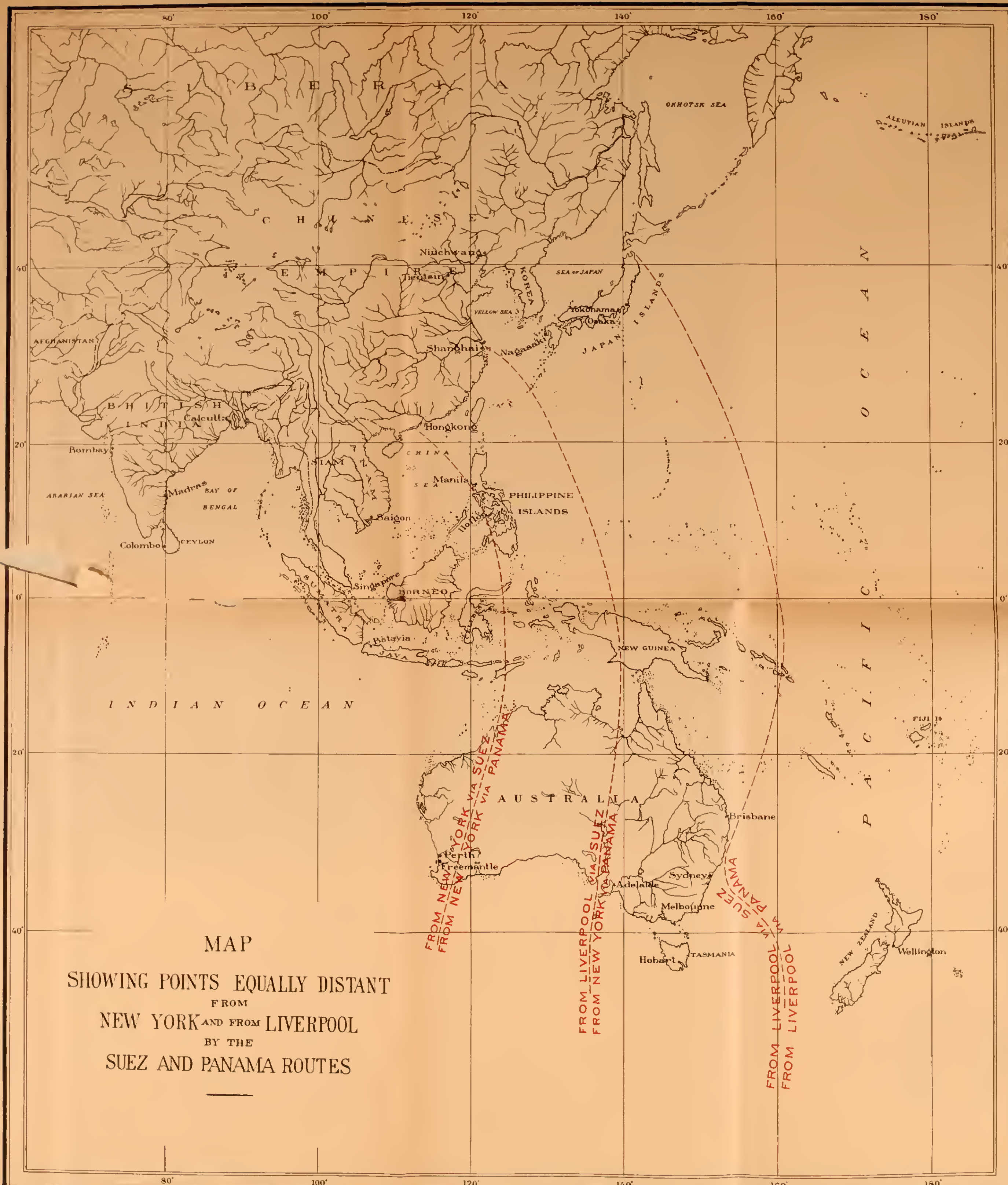
TRADE ROUTES
AND
DISTANCES BY EXISTING LINES
AND BY THE
PANAMA CANAL

AUTHORITY

U. S. Hydrographic Chart No. 1262

1912

Plate 2



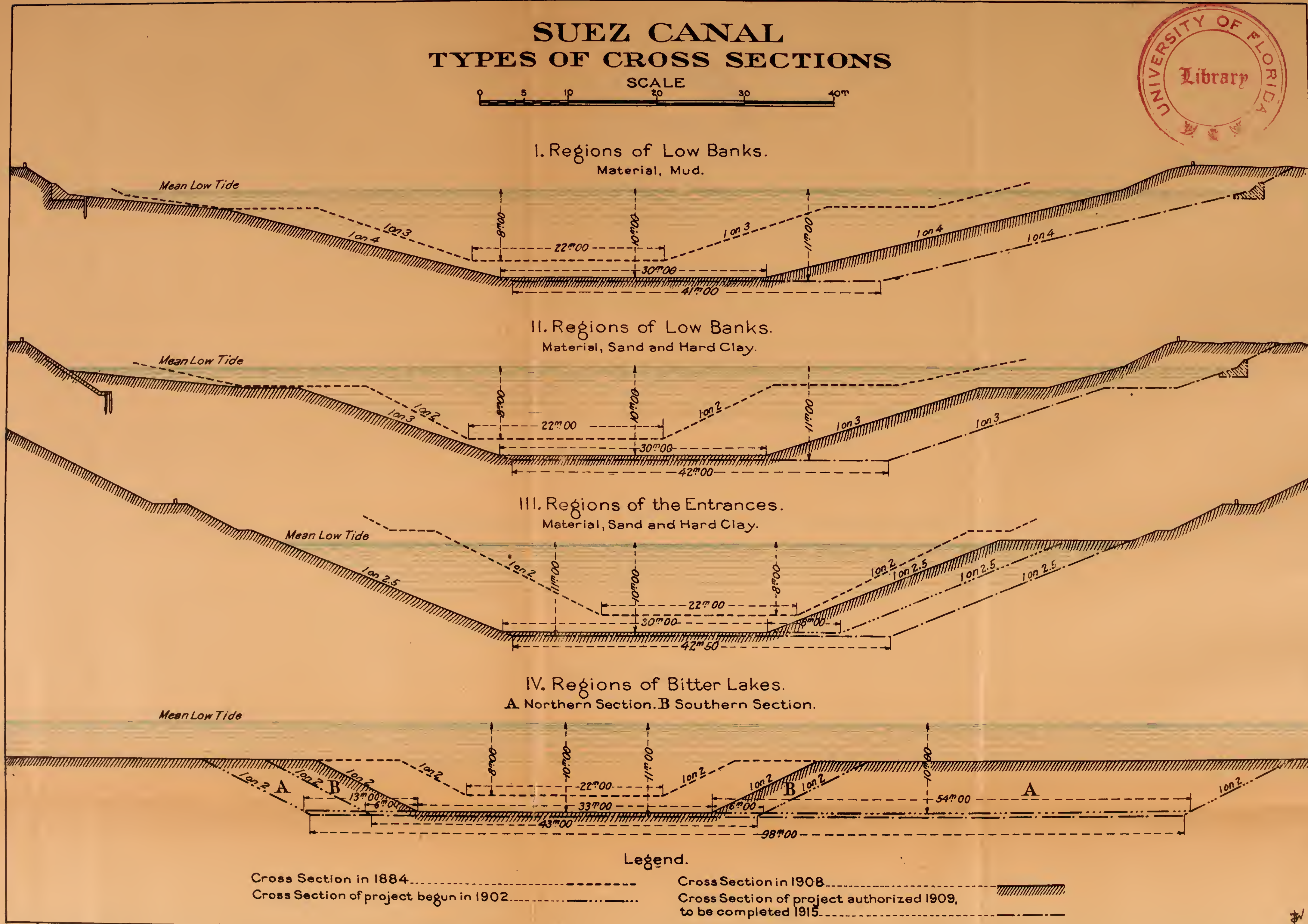
MAP
SHOWING POINTS EQUALLY DISTANT
FROM
NEW YORK AND FROM LIVERPOOL
BY THE
SUEZ AND PANAMA ROUTES

INTER-COASTAL STEAMSHIP LINES AND WATER ROUTES

Plate 4.

Thos D Wansleben

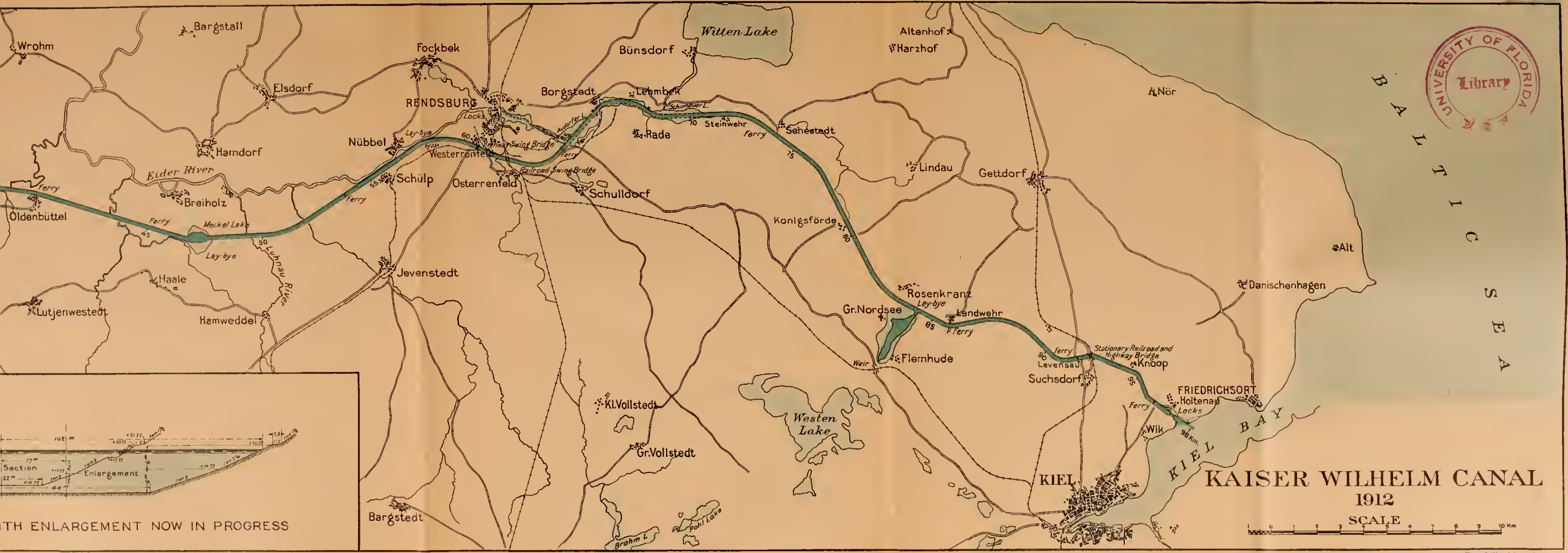
Plate 5.



SUEZ CANAL
TYPES OF CROSS SECTIONS
SCALE
0 5 10 20 30 40m
I. Regions of Low Banks.
Material, Mud.
Mean Low Tide
1 on 3
1 on 4
8m00
10m00
11m00
22m00
30m00
41m00
1 on 3
1 on 4
1 on 4
II. Regions of Low Banks.
Material, Sand and Hard Clay.
Mean Low Tide
1 on 2
1 on 3
22m00
30m00
42m00
1 on 2
1 on 3
1 on 3
III. Regions of the Entrances.
Material, Sand and Hard Clay.
Mean Low Tide
1 on 2.5
1 on 2
11m00
10m00
8m00
22m00
30m00
42m50
8m00
1 on 2
1 on 2.5
1 on 2.5
1 on 2.5
IV. Regions of Bitter Lakes.
A Northern Section. B Southern Section.
Mean Low Tide
8m00
10m00
11m00
10m00
1 on 2
A
B
13m00
6m00
22m00
33m00
43m00
6m00
B
A
54m00
98m00
Legend.
Cross Section in 1884
Cross Section of project begun in 1902
Cross Section in 1908
Cross Section of project authorized 1909, to be completed 1915

CUXHAVEN
OTTERNDORF
ELBE RIVER
MELDORF
Elpersbüttel
Norder-Busenwurth
Trennewurth
Norder-Barlt
Windbergen
Gudendorf
Helse
Krummwehl
MARNE
St.Michaelisdonn
Kattrepel
Eddelak
Kuden
Buchholz
Burg
Kuden L.
Canal
Brunsbüttel
Brunsbütteler-Hafen
Locks
Ferry
Ostermoor
Railroad Swing Bridge
Kudensee
Ecklak
Lay-bye
Nindorf
Bargenstedt
Sarzbüttel
Farnewinkel
Krumstedt
Süderhastedt
Eggstedt
Hochdonn
Holstenniendorf
Gribbohm
Wacken
Vaale
Besdorf
Hohenhörn
Schafstedt
Gr.Bornholt
Kl.Bornholt
Albersdorf
Grünenthal
Stationary Railroad and Highway Bridge
Fischerhütte
Lay-bye
Osterrade
Bunsoh
Offenbüttel
Wrohm
Beldorf
Oldenbüttel
Hademarschen
Lutjenwestedt
Present
Section
Enlargement
CANAL SECTION WITH ENLARGEMENT

Plate 6.



Thos. O. Wensleben del.


N
EASTHAM CHANNEL
BROMBOROUGH
GARSTON
Limit of the Powers of the Upper Mersey Navigation Commissioners
EASTHAM LOCKS TIDAL
6 Miles to Liverpool, 19 Miles to Bar Light Ship
36 Miles to Manchester
Canal limit of the Port of Manchester
M.S.C. OFFICE
ENGINE HO.
COTTAGES
EASTHAM
POOL HALL BAY EMBANKMENT
1 MILE
MOUNT MANISTY
POOL HALL BROOK
2 M.
3 M.
4 M.
5 M.
6 M.
7 M.
8 M.
9 M.
11 M.
12 M.
13 M.
14 M.
15 M.
16 M.
17 M.
18 M.
19 M.
ELLESMERE PORT EMBANKMENT
ELLESMERE PORT
STANLOW POINT
SYPHON
INCE BAY EMBANKMENT
INCE
INCE MARSH
GOWY RIVER
LONDON & NORTH WESTERN RAILWAY
RIVER MERSEY
PORT OF LIVERPOOL (BOUNDARY LIMIT)
PORT OF MANCHESTER (BOUNDARY LIMIT)
CHESHIRE LINES RAILWAY
LONDON & NORTH WESTERN RAILWAY
SPEKE
OGLET
HALE
HALEHEAD
LIGHTHOUSE
FRODSHAM SCORE
FRODSHAM MARSH
FRODSHAM
WESTON MERSEY LOCK
600 FT. x 45 FT.
WEAVER SLUICES
WESTON CANAL
RIVER WEAVER
WESTON MARSH LOCK
229 FT. x 42 FT. BIN.
WESTON PT.
RUNCORN HEATH
RUNCORN LAY-BYE
RUNCORN DOCKS
BRIDGEWATER LOCKS
400 FT. x 45 FT.
NO MANS LAND
RUNCORN
WIDNES LOOP
C.L.C.
SANKEY CANAL
THE HEMPSTONES
CUERDLEY MARSH
NORTON MARSH
RICHMOND MARSH
MORLEY COMMON
ASTMOOR MARSH
RANDALLS SLUICES
MERSEY AND IRWELL CANAL
STONEDELPH LAY-BYE
SANKEY BROOK
MAIN LINE
RIVER DIVERSION
PROPOSED DOCK
WALTON LOCK
VIADUCT
BRIDGEWATER CANAL
HALTON
NORTON
KECKWICK BROOK
JUNCTION
NORTH WESTERN RAILWAY
BRIDGEWATER CANAL
LONDON
MOORE
ACTON
DARESBURY
CHESTER ROAD
GRANGE MILL BROOK
WARRINGTON RESERVOIR
WALTON BR.
CHESHIRE
PRESTON BROOK


THE MANCHESTER CANAL
1912
SCALE
0 1/2 1 2 3 4 Miles
MANCHESTER
SALFORD
WARRINGTON
MONTON
IRLAMS O'TH' HEIGHT
KERSAL MOOR
SWINTON PARK
RIVER IRWELL
LANCASHIRE & YORKSHIRE RY
BOLTON & BURY CANAL
PATRICROFT
ECCLES
BARTON SWING AQUEDUCT
BARTON LOCKS RISE 15 FT.
MANCHESTER CORPORATION SEWAGE WORKS
DUMPLINGTON
TRAFFORD PARK
BRIDGEWATER CANAL
DAVYHULME
LONGFORD BROOK
CROFTS BANK
MANCHESTER CORPORATION
HIGHER IRLAM
LOWER IRLAM
IRLAM LOCKS RISE 16 FT.
MERSEY WEIR
CHESHIRE LINES RAILWAY
FLIXTON
URMSTON
URMSTON EES
STRETFORD EES
STRETFORD
MANCHR SOUTH JUNC. & ALTRM RY
RIVER MERSEY
CARRINGTON
PARTINGTON
CADISHEAD
CADISHEAD MOSS
GREAT WOOLDEN MOSS
GLAZEBROOK
HOLLINS GREEN
CARRINGTON MOSS
WYCH OR RED BROOK
WARBURTON
WARBURTON MOSS
SINDERLAND
RIXTON MOSS
WOOLSTON MOSS
WOOLSTON
PADGATE
PADGATE BROOK
PADDINGTON LOCK
WOOLSTON CANAL
WARRINGTON LOCK WEIR
MANOR LOCK
THE EES
LATCHFORD
LATCHFORD LOCKS RISE 16 FT 6 INS.
WOOLSTON WEIR
RIVER DIVERSION
THELWALL EES
BUTCHERS FIELD CANAL
STATHAM EES
THELWALL
RIVER BOLLIN
LYMM EES
LYMM
GRAPPENHALL
STOCKTON QUAY
LUMB BROOK
MORRIS BROOK
MASSEY BROOK
BRIDGEWATER CANAL
LONDON & NORTHWESTERN RAILWAY
20 M.
21 M.
22 M.
23 M.
24 M.
25 M.
26 M.
27 M.
30 M.
31 M.
32 M.
33 M.
34 M.
35 M.
36 M.
Thomas O Hanslebe del

THE MANCHESTER CANAL AND CONNECTIONS 1912

34998°—12

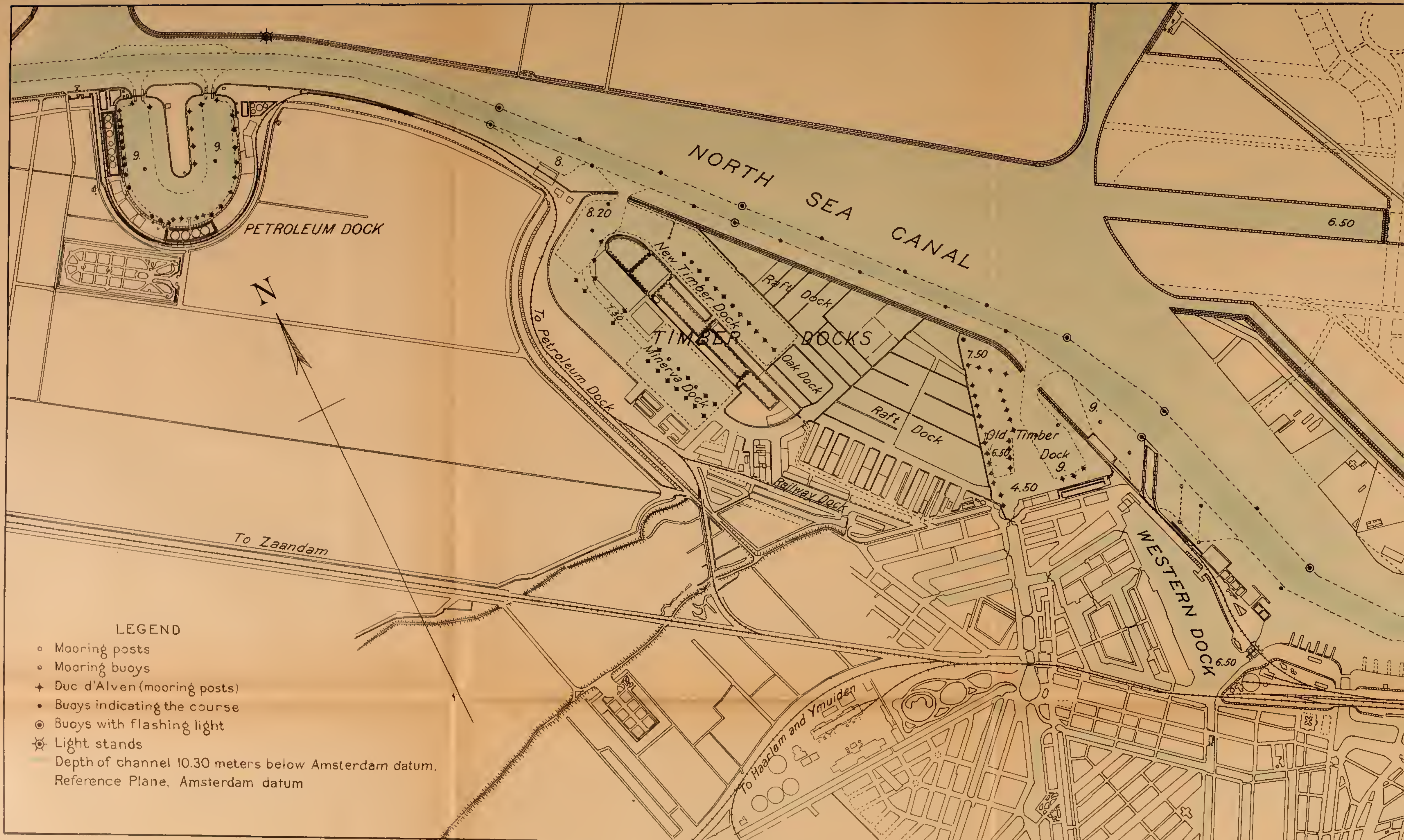
THE MANCHESTER PORT AND DOCKS 1912

CROSS SECTION OF CANAL

AMSTERDAM OR NORTH SEA CANAL 1912

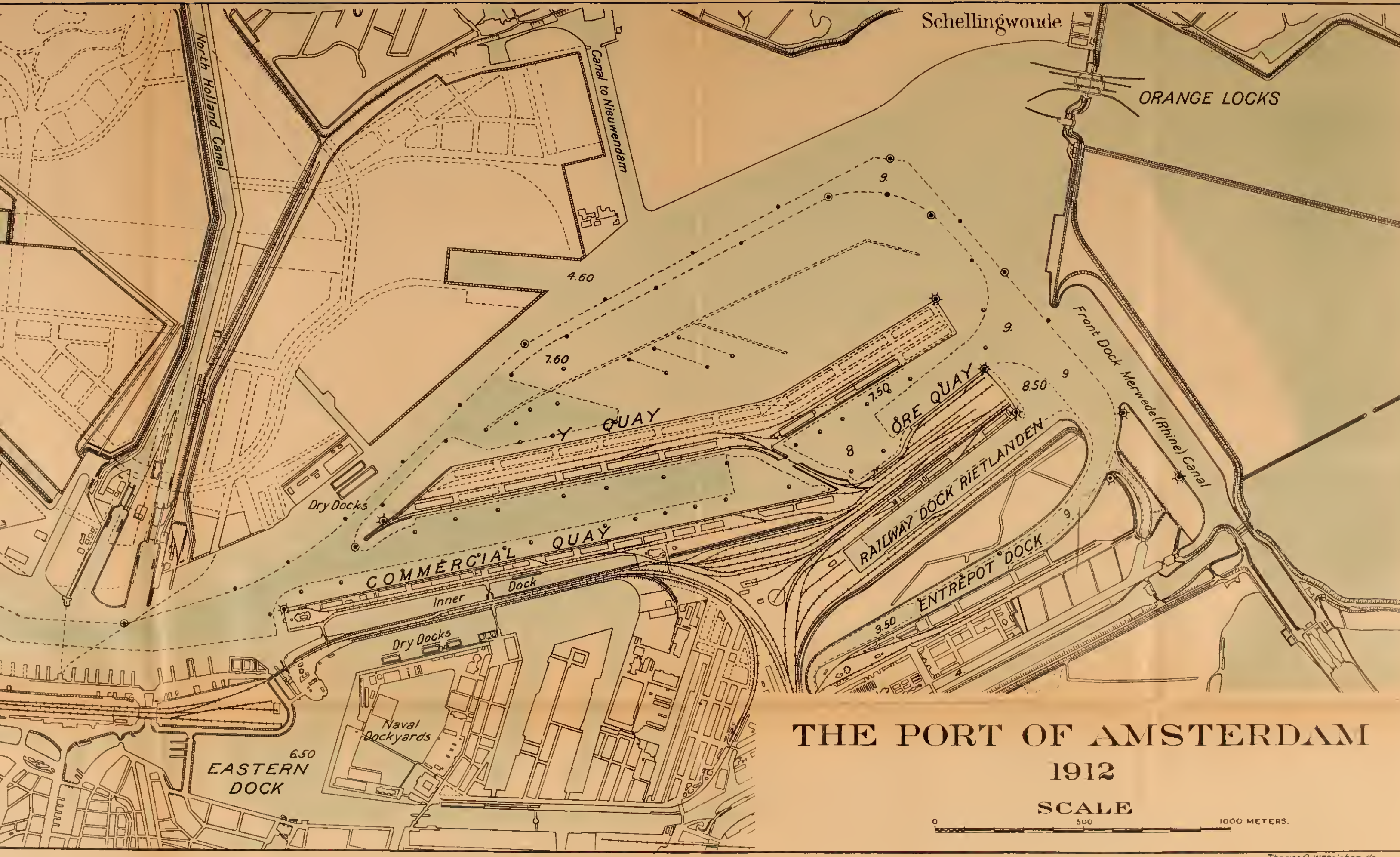
SCALE

Thomas O. Wonalebon del.



NORTH SEA CANAL
PETROLEUM DOCK
New Timber Dock
Raft Dock
TIMBER DOCKS
Minerva Dock
Oak Dock
Raft Dock
Old Timber Dock
Railway Dock
WESTERN DOCK
To Petroleum Dock
To Zaandam
To Haarlem and Ymuiden
N
9.
9.
8.
8.20
7.30
7.50
6.50
4.50
6.50
9.
9.
6.50
LEGEND
Mooring posts
Mooring buoys
Duc d'Alven (mooring posts)
Buoys indicating the course
Buoys with flashing light
Light stands
Depth of channel 10.30 meters below Amsterdam datum.
Reference Plane, Amsterdam datum

Plate II.


Schellingwoude
ORANGE LOCKS
North Holland Canal
Canal to Nieuwendam
4.60
9.
7.60
9.
Front Dock Merwede (Rhine) Canal
ORE QUAY
7.50
8.50
9
Y QUAY
8
RAILWAY DOCK RIETLANDEN
Dry Docks
9
COMMERCIAL QUAY
ENTREPOT DOCK
Inner Dock
3.50
Dry Docks
4.
Naval Dockyards
6.50
EASTERN DOCK
THE PORT OF AMSTERDAM
1912
SCALE
0
500
1000 METERS.
Thomas O Wansleben del


RUSSIAN EMPIRE
CHINESE EMPIRE
ALASKA
DOMINION OF CANADA
UNITED STATES
HUDSON BAY
BERING SEA
OKHOTSK SEA
KAMCHATKA PENA
JAPAN ISLANDS
PHILIPPINE IS.
CHINA SEA
FR. INDO CHINA
SIAM
BORNEO
NEW GUINEA
ARAFURA SEA
CORAL SEA
AUSTRALIA
NEW ZEALAND
NEW CALEDONIA
SOLOMON IS.
FIJI IS
SAMOA IS
HAWAIIAN IS.
PACIFIC OCEAN
MEXICO
GULF OF MEXICO
CARIBBEAN SEA
COLOMBIA
ECUADOR
PERU
C.Sabine
Kodiak
Coal Harbor
Dutch Harbor
Unalaska
Petropaulovsk
Sitka
Comox
Vancouver
Nanaimo
Victoria
Seattle
Tacoma
Astoria
Portland
Eureka
S.Francisco
Monterey
Santa Barbara
Redondo
Port Los Angeles
S.Diego
La Paz
Mazatlan
Tampico
Vera Cruz
Puerto Mexico
Frontera
Acapulco
Salina Cruz
Livingston
Belize
Corinto
Colon
Panama
Riviere du Loup
Quebec
Montreal
Portland
Providence
Philadelphia
Baltimore
Newport News
Norfolk
Wilmington
Charleston
Savannah
Brunswick
Jacksonville
Fernandina
Port Royal
Tampa
Key West
Mobile
New Orleans
Galveston
Sabine Pass
Habana
Cardenas
Cienfuegos
Santiago
Port Antonio
Kingston
Sta Marta
Callao
Mollendo
Arica
Iquique
Antofagasta
Taltal
Caldera
Coquimbo
Valparaiso
Coronel
Ancud
Vladivostok
Otaru
Hakodate
Newchwang
Tientsin
Dalny
P.Arthur
Gensan
Chefoo
Chemulpo
Niigata
Kobe
Onomichi
Osaka
Toba
Yokohama
Nagasaki
Shanghai
Ningpo
Nanking
Hankow
Foochow
Kilung
Tamsui
Amoy
Swatow
Canton
Hongkong
Haiphong
Manila
Bangkok
Saigon
Sandakan
Labuan
Singapore
Padang
Batavia
Surabaya
Makassar
Thursday I.
Townsville
Rockhampton
Brisbane
Newcastle
Sydney
Melbourne
Adelaide
Albany
Fremantle
Perth
Launceston
Hobart
Auckland
Napier
Nelson
Westport
Wellington
Lyttelton
Timaru
Dunedin
Noumea
Suva
Apia
Tahiti
Honolulu
LIST OF NUMBERED PORTS.
AMERICA
1 Summerside
2 Parrsboro
3 Annapolis
4 Bangor
5 Belfast
6 Rockland
7 Bath
8 Portsmouth
9 New Bedford
10 Fall River
11 Jersey City, South Amboy, Perth Amboy, Port Reading, Elizabeth Port, Port Johnson, Greenville, Port Liberty, Hersimus Cove, Hoboken, Guttenburg, Weehawken, Edgewater, Newburgh, Bayonne, Bayway, Constable Hook, Long Island City and Newtown Creek.
12 Marcus Hook
13 Chester
EUROPE
1 Aberdeen
2 Arbroath
3 Dundee
4 Alloa
5 Grangemouth
6 Blyth
7 Middlesbrough
8 Whitby
9 Boston
10 Lynn
11 Harwich
12 Dover
13 Portsmouth
14 Southampton
15 Weymouth
16 Dartmouth
17 Plymouth
18 Falmouth
19 Penzance
20 Bristol
21 Cardiff
22 Swansea
23 Barry
24 Milford
25 Carnarvon
26 Holyhead
27 Barrow
28 Guernsey
29 Jersey
30 Granville
31 Caen
32 Calais
33 Ostend
34 Flushing
35 Yumiden

Plate 12


COALING STATIONS OF THE WORLD
Principal Stations
Stations of Secondary Importance
GREENLAND
ICELAND
RUSSIAN EMPIRE
CHINESE EMPIRE
BRITISH INDIA
PERSIA
AFGHANISTAN
BALUCHISTAN
ARABIA
EGYPT
SAHARA
FRENCH WEST AFRICA
ANGLO-EGYPTIAN SUDAN
ABYSSINIA
BELGIAN KONGO
GERMAN EAST AFRICA
BRITISH EAST AFRICA
ANGOLA
RHODESIA
GERMAN SOUTH-WEST AFRICA
BECHUANALAND
TRANSVAAL
CAPE OF GOOD HOPE
NIGERIA
ALGERIA
MOROCCO
SPAIN
AUSTRIA-HUNGARY
BLACK SEA
CASPIAN SEA
MEDITERRANEAN SEA
RED SEA
ARABIAN SEA
BAY OF BENGAL
CHINA SEA
INDIAN OCEAN
ATLANTIC OCEAN
BRAZIL
BOLIVIA
VENEZUELA
GUIANA
WEST INDIES
DAVIS STRAIT
DENMARK STRAIT
BRITISH ISLES
St.Petersburg
Kronstadt
Helsingfors
Christiania
Bergen
Stockholm
Copenhagen
Hamburg
Stettin
Danzig
Konigsburg
Libau
Riga
Reval
London
Liverpool
Hull
Edinburgh
Glasgow
Cork
Dublin
Belfast
Odessa
Rostoff
Batum
Constantinople
Smyrna
Trieste
Fiume
Naples
Malta
Tunis
Algiers
Oran
Gibraltar
Lisbon
Oporto
Barcelona
Marseille
Genoa
Beirut
P.Said
Alexandria
Suez
Aden
Perim
Jibuti
Maskat
Karachi
Bombay
Calcutta
Madras
Colombo
Trincomali
Rangoon
Penang
Singapore
Sabang
Padang
Batavia
Surabaya
Mombasa
Zanzibar
Dar-es-Salaam
Seychelles
Diego Suarez
Tamatave
Port Louis
Mozambique
Lourenço Marques
Durban
E.London
Port Elizabeth
Cape Town
Mossamedes
Loanda
Kongo
Fernando Po
Lagos
Cape Coast Castle
Freetown
Dakar
St.Louis
St.Vincent
Las Palmas
Teneriffe
Madeira
Fayal
S.Miguel
Ascension I.
St.Helena
Bermuda
(St.Georges and Hamilton)
Halifax
Sydney
Louisburg
St.Johns
Boston
Portland
St.Thomas
Martinique
Bridgetown
St.Lucia
Port of Spain
Curacao
Georgetown
Para
Maranhao
Ceara
Pernambuco
Bahia
Rio de Janerio
Santos
R.Grande do Sul
Montevideo
Buenos Aires
La Plata
Bahia Blanca
P.Stanley