THE PANAMA CANAL AND COMMERCE

EMORY R. JOHNSON

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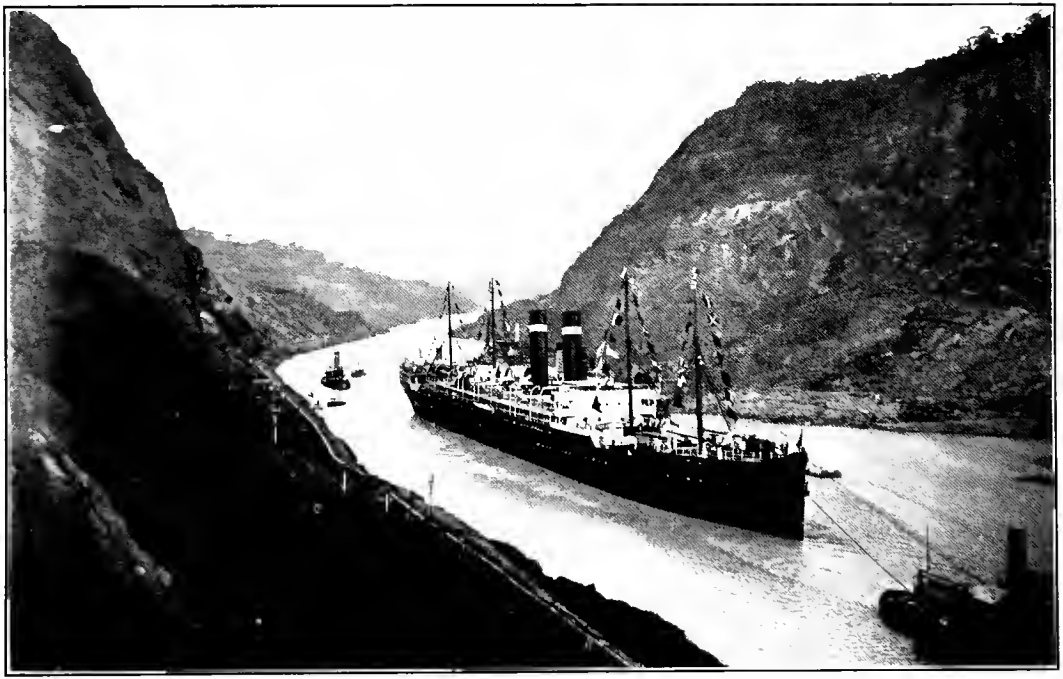

FIG. 1. THE *KROONLAND* IN GAILLARD CUT.

THE PANAMA CANAL AND COMMERCE

BY

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CHAPTER I

INTRODUCTION

In the year 1791 six vessels sailed from Nantucket and New Bedford around Cape Horn to seek whales in the Pacific. During the century and a quarter that intervened between this voyage of the first whaling fleet to the Pacific, via the circuitous route around South America, and the opening of the canal, the American people were more and more impressed with the necessity of piercing the barrier which the isthmus raised against the passage of ships from ocean to ocean.

By the settlement of the Oregon boundary dispute and by the war with Mexico the United States acquired a long frontage on the Pacific. Within the territory secured from Mexico were the deposits of gold that had been discovered while the war was still in progress, and the rush of gold seekers to California in 1848 and 1849 induced American capitalists promptly to undertake the

construction of the Panama Rail Road, which was opened in 1855.

Another group of men, headed by Cornelius Vanderbilt then prominent in ocean shipping and soon to become the dominant figure in railway affairs, formed a company which secured the right to construct a canal via the Nicaragua route. This project did not get beyond the stage of investigation, but numerous surveys and studies of various transisthmian routes from the Isthmus of Tehuantepec to the Atrato River were made from 1850 to 1880; and then, in the eighties, a company of Frenchmen headed by the famous builder of the Suez Canal made a heroic but unsuccessful attempt to construct a Panama canal. While the French were at work at Panama a company of Americans made a small beginning with the excavation of a Nicaragua canal, but failed financially in the early stages of the undertaking.

With the failure of private enterprise both at Panama and at Nicaragua, the Government of the United States began a serious study of the problem of securing a canal across the American Isthmus. After three commissions created during the closing decade of the nineteenth century had successively made surveys and reports, the United States adopted the Panama route, bought out the French Company, secured, not from Colombia as was attempted, but from the newborn

Republic of Panama, the necessary concession and rights, and incidentally obtained from Great Britain such a modification of the Clayton-Bulwer Treaty as made possible the construction, operation, and defense of an isthmian canal by the Government of the United States instead of by a corporation. Work was begun in 1904, and ten years later the Panama Canal was opened for the use of vessels of commerce.

The French failed in their attempt to build the Panama Canal, partly, but not entirely, because, being a private corporation, those who controlled it were obliged to raise large sums of money under adverse conditions and thus yielded to the impulse to promote the enterprise by indefensible financial methods. The company was confronted by an obstacle more serious than its financial troubles. The failure of the enterprise was due primarily to the fact that at the time the company undertook the work it was not known that yellow fever and malaria were transmitted from one person to another by the stegomyia and anopheles mosquitoes and that, by preventing these mosquitoes from breeding in the places where men live, the deadly yellow fever and the energy-destroying malaria might be eliminated. Experience has since shown that it is practicable, by sanitary and quarantine regulations properly enforced, to eradicate yellow fever completely, and

to reduce malaria to small proportions even in places like Cuba and Panama which in the past have suffered terribly from fever.

This fact was demonstrated by the medical officers of the United States army in connection with the sanitary work done in Cuba following the Spanish-American War. The work done at Havana from 1898 to 1901 by Doctors Reed, Sagaer, Carroll, and Agramonte in demonstrating that the stegomyia was the transmitter of yellow fever, and by Colonel Gorgas who applied the theory to the sanitation of Havana, made it possible for the United States to convert the Canal Zone from a section where yellow fever had long been endemic and violent malarial fevers had been prevalent, into one of the most healthful regions of the world.

Fortunately for the United States and especially for the army of laborers and their families who have lived in the Canal Zone since 1904, the sanitary work at the Isthmus was placed in charge of Colonel Gorgas, the man who, by driving yellow fever out of Havana, had shown his ability to cope with difficult problems of practical sanitation. How Colonel Gorgas, who is now Major General, and Surgeon General of the United States army, did his work at Havana and at Panama has been delightfully told by himself in his book on *Sanitation in Panama.*

Those who have not personally run the risk of

yellow fever infection can hardly realize how great was the danger from the dread disease at the Isthmus of Panama, and other places where the disease was endemic, before it was known that the mosquito was the agent of infection. In March, 1900, the writer was at Panama with the Isthmian Canal Commission and spent about three weeks inspecting the canal route and the work that had been done by the French Company. He and his wife, who was with him, were so fortunate as to occupy a cottage that was placed at their disposal by the late Colonel J. R. Shaler, then the superintendent of the Panama Rail Road. The cottage was located directly on the Caribbean shore and the refreshing trade winds, blowing day and night, made life most comfortable, and the visit to the Isthmus most enjoyable. There was no special thought of danger from yellow fever. Not long after, however, Colonel Shaler was visited by his three sisters who occupied the same cottage. One after another the three ladies were infected with yellow fever and all died of the disease. Such a tragedy as this helps one to realize what was gained for the people who have lived and worked in the Canal Zone, and for the construction and operation of the canal, by the extermination of yellow fever from the Zone. Indeed, the sanitation work at Panama has benefited the entire world for all time.

When, in 1905, yellow fever had been done away with and the department of sanitation had gotten malarial fevers well under control, the chief obstacle to the economic and rapid progress of the work of construction had been overcome. It was then possible for the Isthmian Canal Commission to secure, maintain, and keep in healthy efficiency the force required in each branch of the work. How the problems of engineering, administration, and construction were worked out by the successive chief engineers—that is, how the canal was built—is described by Brigadier General William L. Sibert and Mr. John F. Stevens in their book, *The Construction of the Panama Canal.*

This volume on *The Panama Canal and Commerce* is intended to explain why the canal was built, and to discuss the use of the waterway by the commerce and shipping of the United States and other countries. The commercial services being rendered by the canal are described, and an explanation is given of the schedule of tolls and the tonnage rules in force at the Isthmus. The discussion is addressed to the man engaged in shipping and also to other students of the canal in relation to commerce. The volume is the third in the series of which *Sanitation in Panama* by General Gorgas and *The Construction of the Canal* by General Sibert and Mr. Stevens are the first and second volumes.

CHAPTER II

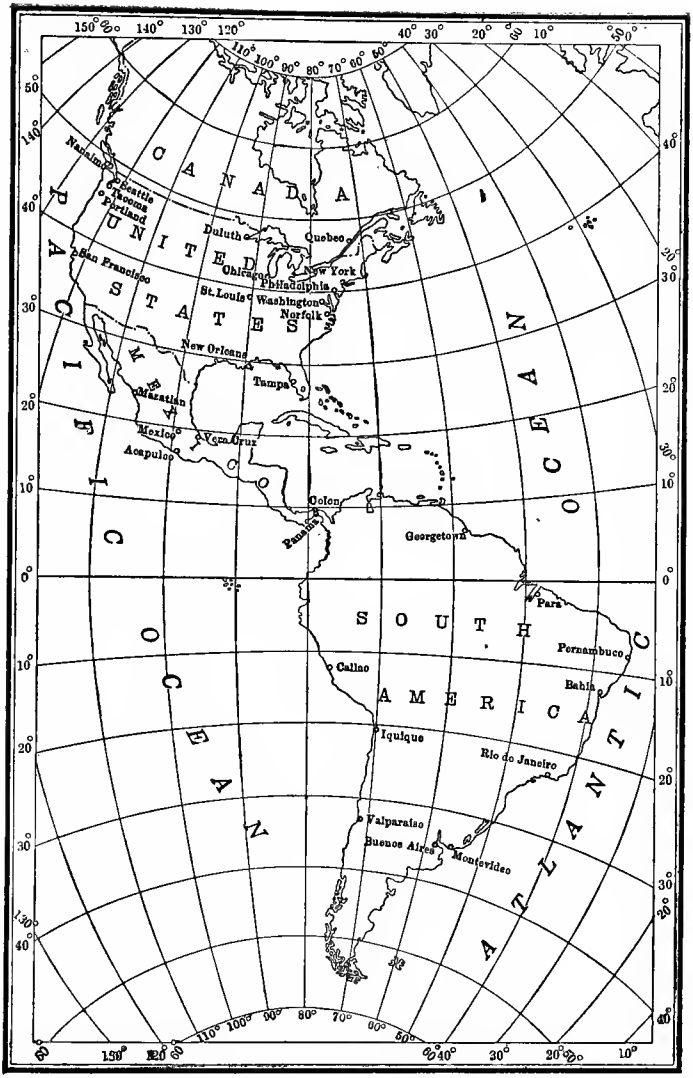
WHY THE CANAL WAS BUILT

The Panama Canal was built to shorten the length and time of voyages made by merchant vessels and war ships between the Atlantic and Pacific oceans. It has been said that, for the people of the United States, the canal is a commercial convenience and a military necessity. Whether this generalization places undue emphasis upon the military value of the canal will be determined by future events; but, for the present, it seems more accurate to say that the Panama Canal has been constructed primarily to remove the chief physical obstacle to the development of the maritime commerce of the United States, and that the naval and military benefits of the canal, important as they are or may become, are to be ranked second in value in comparison with the commercial services of the waterway.

Until the opening of the canal the strip of land forty miles wide separating the two oceans at the Isthmus of Panama compelled vessels voyaging between the two seaboards of the United States, or between any point in the north Atlantic

and any point on the west coast of North or South America, to make a detour around a large continent which reaches 56° south of the equator, and lies to the east not only of the Isthmus of Panama, but also of the greater part of North America. Viewed from the standpoint of the United States, South America should have been named Southeast America. As is shown by Map 1, the line of 80° west longitude which passes through Pittsburgh, Pennsylvania, and skirts the eastern point of Florida, passes through the western part of the Panama Canal Zone, and cuts off only a very small strip of Ecuador and Peru, Point Parina, the most western point of South America, being only a degree and a third west of the line. The broad continent of South America extends eastward to 34° 50′ west longitude, the most eastern point of Brazil being thirty-nine degrees east of New York City and fifty-five degrees east of New Orleans. A north and south line touching the Azores passes only 3½ degrees, about 250 miles, east of South America.

Before the Panama Canal was constructed a steamer making a trip from New York to San Francisco had to make 39° of easting and nearly 97° of southing to pass the Straits of Magellan; i. e., the vessel, in order to reach the west coast of the United States, had to round a point eastward of New York, a distance equal to two-thirds of



MAP 1.—WESTERN HEMISPHERE ON A POLYCONIC SECTION

the width of the Atlantic, and then proceed southward to a point 64° south of Panama, the Straits of Magellan being 55° south and Panama 9° north of the equator. The vessel had to steam 13,135 nautical miles to reach San Francisco, whereas the present route via the canal is only 5,260, a saving of nearly 8,000 miles. For a voyage between New Orleans and San Francisco the canal shortens the distance nearly 9,000 miles.

The geographical reasons were more imperative for a canal at Panama than at Suez; for the continent of Africa, around which vessels from Europe and the eastern part of the United States had to sail to reach the Orient, the Indies, and Australasia before the Suez route was available, lies directly south of Europe and extends only 35° south of the equator. To pass the Straits of Magellan a vessel must steam south 20°, and to clear Cape Horn, 21° further than is necessary to round the Cape of Good Hope and the tip of Africa. Because of the difference of the geographic relation of Africa to Europe from the relation of South America to North America, the Suez Canal shortens the route from western Europe to the Orient only about 40 per cent., while the Panama Canal takes 60 per cent. off the ocean voyage between New York and San Francisco.

The Suez Canal was completed forty-five years before the waterway across Panama was

opened, in spite of the greater geographic reasons for the Panama Canal. The commercial need for the Suez waterway arose earlier, the trade of Europe having reached large proportions before the United States established a regular commerce with the Pacific shores of the American continents. However, the Panama Canal would have been built twenty-five years earlier than it was had not the sanitary and physical problems at Panama proved to be far greater than those that had been successfully handled at Suez.

It was, in fact, only ten years after the opening of the Suez Canal that a concession to construct the Panama Canal, obtained in the interest of De Lesseps and his associates, was secured from Colombia; but the task courageously undertaken by the French Company proved too great for private corporate enterprise; and by 1890, when the canal should have been completed, the company had become insolvent. Later it was obliged to step aside and leave the completion of the task to the Government of the United States which, with practically unlimited resources at its command and with a knowledge of the control of disease that was gained after the French Company suspended operations at Panama, was able to push the construction of the canal through to completion promptly and economically.

Among the influences that caused the United

States to undertake the construction of the Panama Canal, the development of the Pacific coast states and the growth of the intercoastal trade both by rail and water routes were probably the most potent. By the year 1900, it had become evident to everybody that the western third of the United States had entered upon a period of rapid development, and the demand for cheaper transportation both between the two seaboards of the United States, and also between the west coast of the United States and Europe, to which a large share of the grain, lumber and fish of the west coast states were exported, became insistent and compelling.

Before the construction of railroads to the Pacific the traffic between the two seaboards of the United States via Panama, the Straits of Magellan and around Cape Horn was active and relatively large; but, as the transcontinental railroad lines increased in number and in economy and efficiency of operation, trade moved in decreasing volume coastwise and in enlarging tonnage by rail. The tendency to use the rail lines to ship to and from the west coast was accented by the development of the middle West, whose industries came to share with the factories and markets of the Atlantic seaboard states the growing trade of the far West.

About 1900, however, the rapid economic de-

velopment of the western part of the United States created a demand for more and better facilities for transportation coastwise between the two seaboards of the United States. In 1899, the American-Hawaiian Line began to operate steamers between New York and west coast ports via the Straits of Magellan, the company having sold the sailing vessels it had previously employed in the service around Cape Horn. The Panama Rail Road Steamship Line between New York and Colon and the Pacific Mail Steamship Company between Panama and San Francisco continued their joint service via the Isthmus of Panama.

A rapid growth in the intercoastal coastwise traffic began in 1907, when the American-Hawaiian Line abandoned the long route via the Straits of Magellan and started a service via the Isthmus of Tehuantepec and the Mexican National Railway connecting Puerto Mexico and Salina Cruz. During the succeeding five years the total intercoastal water-borne traffic, including Hawaiian sugar, nearly doubled and exceeded 1,100,000 tons in 1911. The rapid growth of this intercoastal coastwise tonnage, in spite of the expense of the transfer and double handling of goods at Tehuantepec and at Panama, shows clearly the commercial demand that had arisen for an isthmian canal that would make possible the expeditious and economical shipment of commodities coastwise be-

tween the two seaboards of the United States.

The relation of the Panama Canal to the trade between the eastern part of the United States and the west coast of South America is second in importance only to the relation of the canal to the commerce between the two seaboards of North America. The west coast of South America lies directly south of that part of the United States that imports a large tonnage of nitrates, copper, iron ore and other materials needed in the agricultural southern states and the manufacturing eastern states; while western South America imports manufactures, lumber, petroleum and other commodities that the United States is able to supply economically. Until the canal was opened, Europe had a decided advantage over the United States in trading with western South America, and secured most of the large trade of that section of the world. The opening of the Panama route has given the United States the advantage as regards transportation costs; and the future development of the commerce of the United States with western South America will depend upon the ability of American producers, merchants and bankers to compete with Europe in merchandizing and financial methods.

The growth of the trade of the United States with western South America before the opening of the canal, and the manifest assistance which

an isthmian waterway would render that trade were among the reasons that led to the construction of the canal. Prior to 1900 the commerce of the United States with western South America was relatively small, because the major share of the exports of the South American countries bordering on the Pacific were bulky commodities that could not bear the heavy cost of transportation around South America to the United States; nevertheless the imports into the United States from those countries increased 55 per cent. during the decade ending in 1899; and, in spite of the inability of American producers to make much headway in marketing their goods in the Pacific countries between the Straits of Magellan and Panama, the total trade of the United States with Pacific South America increased 27 per cent. during this ten-year period. Then followed a rapid growth in the commerce between these sections of North and South America, the increase in value from 1900 to 1910 being 158 per cent.

The opening of the canal enabled Chilean iron ore to move regularly to Philadelphia for use at the Bethlehem Steel Works, and increased the shipments of nitrates to the United States. The European War, as well as the availability of the Panama Canal route, has favored the development of the export trade of the United States to western South America, and the advance made in the

commerce of the United States since the year 1914 is not to be attributed solely to the canal; but it is evident that the canal is to be of large service to the commerce between the Atlantic-Gulf seaboard of the United States and the Pacific coast of South America.

The commerce of the United States with the Orient and Australia during the last decade of the nineteenth century indicated clearly the need of a Panama Canal. The trade of the Atlantic seaboard of the United States with Australia, Japan, and the mainland of Asia north of Singapore increased 53 per cent. during the ten years ending in 1899. The commerce with Australia more than doubled during that decade. During the first ten years of the present century, the trade of the Atlantic and Gulf ports of the United States with the Orient, other than the Philippines, did not make rapid progress. There was a gain of about 34 per cent. in the commerce with China, but a loss in the trade carried on with Japan from the eastern part of the United States. The Pacific ports of the United States made headway in trading with Japan as well as with China; but Europe, aided by the Suez Canal, had the advantage of the Atlantic seaboard of the United States in securing the commerce of the Orient. In the commerce of Australia and New Zealand, however, the showing made by the United States was

more favorable, the increase from 1900 to 1910 being about 68 per cent.

Since the closing years of the nineteenth century, Europe and the United States have been giving special consideration to the importance and possibilities of the trade with Pacific countries. During the first ten years of the century the commerce of ports on the Atlantic-Gulf coast of the United States increased about 73 per cent. The desire to enable the United States to compete more easily and successfully for the potentially large commerce of the transpacific countries, some populous and others sparsely settled, but all in the early stages of commercial development, was one of the reasons why the Panama Canal was built.

Statements as to the past growth of commerce do not fully indicate the interest of the United States in the countries bordering the Pacific. The fact that the United States is without ambition to acquire additional territory in or about the Pacific, and it is a fact, does not lessen the importance to the United States of acquiring a position of economic and commercial leadership in the Pacific. A nation such as the United States may be ambitious to expand its financial and trade influence without being territorially or politically covetous; and it would seem clearly to be not merely the privilege but the duty of the United

States to engage in friendly rivalry with the countries of Europe in measures to develop the resources of the lands of the Pacific, and to build up an ever-enlarging commerce between the United States and the countries that have been aided by American capital and enterprise.

The construction of the Panama Canal may be regarded as one of the means justifiably adopted by the United States to aid American producers, traders, and financiers in increasing and extending their helpful activities in the countries about the Pacific. Happily, in this instance, as is so often the case, the United States in helping itself has assisted other countries. The Panama Canal has been constructed and will be operated not merely to serve as an agency of the commerce of the people of the United States. The United States, in the exercise of an international trusteeship, has opened between the Atlantic and Pacific a gateway for the passage of the commerce of all nations under terms of entire equality. By the use of the Panama Canal, Europe as well as the United States may take a larger part in the economic development of the countries upon the Pacific coast of North and South America, and in consequence enlarge the volume of the commerce of Europe with all American countries beyond the Panama gateway.

It is for commercial purposes rather than for

military uses that the canal has been built. A nation that maintains an army and navy solely to preserve domestic order and to provide a means of defense against outside attack could not have been animated by military ambitions in constructing a Panama Canal. The primary object was, as has been stated, to promote the domestic industries and trade of the United States and to reduce or remove the handicap under which the American people have, in the past, competed with Europe for the enlarging commerce of the Pacific.

This statement does not conflict with the policy that the United States has adopted in fortifying the canal and establishing a naval base in the Canal Zone. It was necessary that the United States should fortify the canal in order to be able to protect the canal against attack and seizure. In case of a war against the United States, the enemy would, unless prevented by warships at sea or by fortifications at the entrances to the canal, be certain to take possession of the canal and use it to assist in waging war against the United States. The owner of the canal was obliged, as a matter of self-defense, to make the canal as secure as possible against attack.

The fortification of the canal was also made necessary by the obligation which the United States assumed, in the Hay-Pauncefote Treaty of

1901, to guarantee the neutrality of the canal. The Suez Canal is neutralized by an agreement entered into in 1888 by the principal powers of Europe. The obligation to maintain the neutrality of the Suez waterway is an international one; but the neutral use of the Panama Canal is guaranteed solely by the United States, which has solemnly promised that "the canal shall be free and open to the vessels of commerce and of war of all nations . . . on terms of entire equality," and that "the canal shall never be blockaded, nor shall any right of war be exercised nor any act of hostility be committed within it." The vessels of a country at war with the United States would necessarily be excluded from the canal, but under no other conditions will the use of the canal be denied the vessels of any nation observing the rules established by the United States for the neutral use of the waterway. To guarantee the neutral and innocent use of the canal by the naval and commercial vessels of two foreign nations at war with each other, the United States must be in a position to protect the canal works and to enforce the regulations governing the use of the canal.

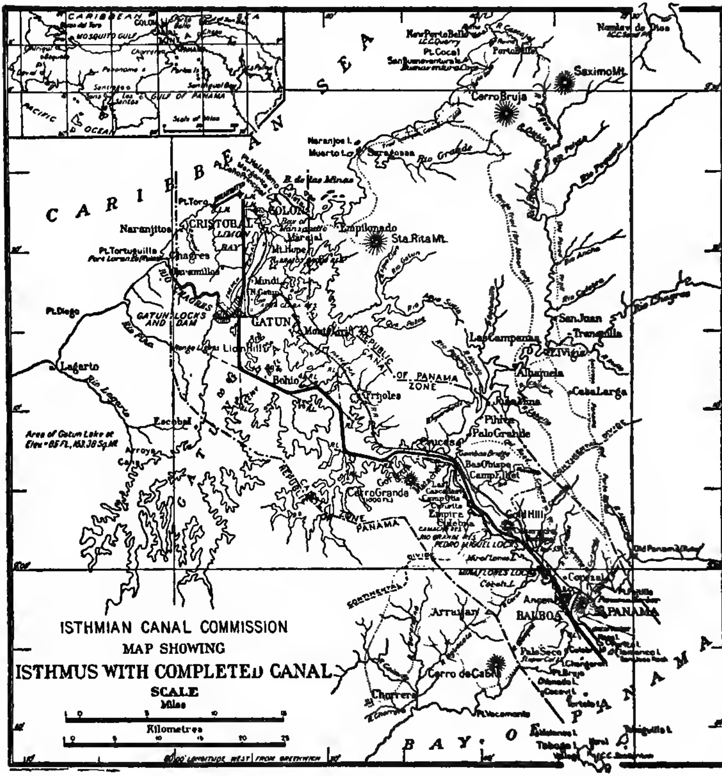
The Panama Canal has unquestionably increased the effective strength of the American navy; and, though the military purposes of the United States are defensive rather than offen-

sive, the canal may properly be regarded as a welcome military asset. The United States is open to attack from both the Atlantic and Pacific, upon both of which oceans it must maintain an efficient naval force. Until the canal was opened, the fleets that defended the eastern and western seaboards of the United States and protected the country's foreign trade were thirteen thousand miles apart. Each part of the navy had to be strong enough to do its work unaided and unsupported by the other. The effect of this upon naval operations was clearly indicated at the opening of the Spanish-American War in 1898, when the battleship *Oregon,* which was on the west coast of the United States, had to make a run of nearly thirteen thousand miles in order to join the Atlantic squadron operating in the West Indies.

The Panama Canal, by bringing the Atlantic and Pacific squadrons of the American navy closer together, has done more than to increase the mobility of the separated units of the fleet. In other ways it has added to the effective strength of the navy. The Canal Zone is a well equipped naval base with coaling stations, docks and machine shops guarded by strong fortifications. In the case of an actual or threatened war, a strong fleet can be assembled at this secure base. From the Canal Zone a squadron may go forth to strike a blow, confident of finding upon its return a secure

retreat where coal and supplies may be had, and repairs may be made.

Naval experts do not accept as correct the gen-



Map 2

eralization often made that the canal has doubled the efficiency of the American navy. Some of the aid rendered to the navy by the canal is offset by the burden which the navy and army must

share, of defending the canal against attack and of enforcing the neutral and harmless use of the waterway at all times by all nations. While it would be impossible to strike a balance between the assistance which the canal will render the navy, and the burden which it imposes upon the army and navy, one does not need to be a military expert to realize the strategic value to the United States of having strong fortifications and a secure naval base at the sole gateway between the Atlantic and the Pacific.

CHAPTER III

THE CANAL AND THE LENGTH AND TIME OF OCEAN VOYAGES

The gold seekers of 1849 and subsequent years realized concretely and personally how the narrow Panama barrier lengthened the distance and time of voyages from the Atlantic to the Pacific. Those who crowded the small sailing vessels for passage to the west coast waited impatiently for five months while the vessels made their long passage via Cape Horn; while those who thronged the steamers that ran to Chagres and the vessels that ran from the City of Panama to California made their way across the Isthmus laboriously until the opening of the Panama Rail Road in 1855, and were most fortunate if the mosquitoes, whose bites were then thought to be only annoying, did not infect them with the Chagres fever or some other violent and dangerous form of malaria. Many of the fortune seekers traveled overland, making the weary journey from the Mississippi to the coast by "prairie schooners," braving hardships of desert and mountain and dangers of attack by Indians or highwaymen.

Twenty years after the discovery of gold in California, the transcontinental railroad solved the problem of passenger transportation between the Atlantic and Pacific, but freight traffic still sought the cheaper coastwise routes between the two seaboards. Sailing vessels carried freight via Cape Horn and were continued in that service in fluctuating numbers until the opening of the canal. Some steamships were run via the Straits of Magellan rather irregularly until 1899, when the American-Hawaiian Steamship Company began a line service via the Straits, which was maintained until 1907, when the company substituted the Tehuantepec route for the more circuitous course around South America. Freight traffic between the two seaboards of the United States has moved regularly via the Isthmus of Panama since 1855 when the railroad from Colon to Panama was completed. Prior to the opening of the canal all four routes—those via Tehuantepec, Panama, the Straits of Magellan, and Cape Horn—were taken by traffic between the two seaboards of the United States and between Europe and the west coast of North and South America.

A discussion of the Panama Canal and commerce logically begins with a statement of the effect of the canal upon the length of ocean routes and the time required for voyages between Atlantic and Pacific ports. The assistance of the

canal to commerce and the economies which it will make possible in ocean transportation, are dependent upon, and roughly, though not closely, proportionate to, the reduction in distances and sailing time. In so far as distance affects the costs of transportation and the route selected by vessels, the effect of the canal upon the sailing distances between Atlantic and Pacific termini is determinative of the commercial usefulness of the canal.

It is, perhaps, desirable to note, in passing, that relative distances do not always determine the routes taken by vessels operated between widely separated ports. The largest single item in the operating expenses of vessels is fuel, and if the price of coal at stations along the longer one of two alternative routes is lower than at stations on the shorter course, the longer route may be the more economical one to take; or the saving in fuel by a shorter route that passes through a canal at which tolls must be paid may equal, in whole or in part, the tolls imposed upon the vessel. As will be pointed out in Chapter XI, the high cost of coal at stations along the east coast of South America and the relatively low price at which coal may be sold at Cristobal and Balboa afford a strong reason for the use of the canal by vessels running between Europe and central Chile, although the distance and time via

the canal are not greatly less than by way of the Straits of Magellan.

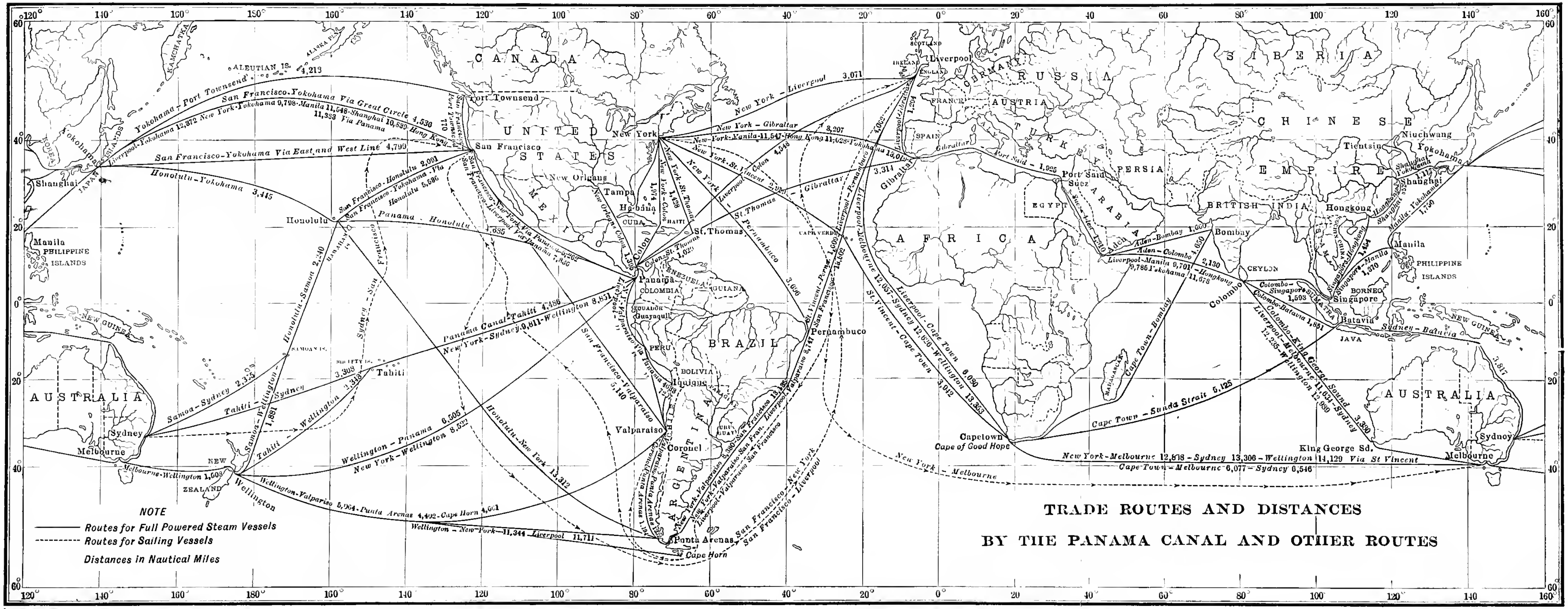
A factor other than relative distances, that affects the choice of routes by some vessels, is the traffic obtainable to and from the ports along the way. For example, many vessels from Europe to the west coast of South America take cargo to, and load return freight at, several ports along the coast from Valparaiso to Panama. If distance alone were determinative, most freight vessels plying between Europe and all the ports of Chile, except those in the northern part of the country, might go via the Straits of Magellan; but, in addition to securing cheaper coal, vessels may, by taking the Panama route, call at such of the many west coast South American ports between the Isthmus and the southern part of the populated portion of Chile as will best serve the trade in which the vessels are employed.

The greatest possible distances that can be saved by using the Panama Canal are for voyages between points on opposite sides of the Isthmus, or in general between Atlantic and Pacific ports of countries near the canal. While the canal was being constructed it was necessary to send the tug *Reliance* from Cristobal via the Straits of Magellan to Balboa. The voyage of 10,500 nautical miles took 126 days. Since the opening of the canal this vessel has several times made the run

of 44 nautical miles from ocean to ocean in half a day.

When, beginning with September 18, 1915, the canal was blocked by slides in Gaillard Cut, a large number of vessels accumulated at Balboa and Cristobal awaiting opportunity to pass through the canal. Some vessels, among others nine of the American-Hawaiian Company's fleet, after waiting a few days and ascertaining that the canal would not be opened within a month, were sent around South America through the Straits of Magellan on a voyage that added at least thirty days to the time of the trip between the two seaboards of the United States. If the canal had been open, the passage from ocean to ocean could have been made in a half-day, and the voyage between San Francisco and New York, or Honolulu and New York could have been made in two-fifths of the time required for the trip via the Straits of Magellan.

Of the routes connecting ports of the Atlantic-Gulf coast of the United States with the Pacific ports of the country, the routes from a port like Galveston on the western shore of the Gulf of Mexico are most favorably affected by the canal. From Galveston to San Francisco via the Straits of Magellan the distance is 13,727 nautical miles; while by way of Panama the distance is 4,787 miles, nearly 9,000 miles less. For voyages be-


TRADE ROUTES AND DISTANCES
BY THE PANAMA CANAL AND OTHER ROUTES
NOTE
Routes for Full Powered Steam Vessels
Routes for Sailing Vessels
Distances in Nautical Miles
CANADA
UNITED STATES
MEXICO
BRAZIL
ARGENTINA
AFRICA
AUSTRALIA
SIBERIA
RUSSIA
CHINESE EMPIRE
BRITISH INDIA
PERSIA
ARABIA
EGYPT
New York
San Francisco
Port Townsend
New Orleans
Panama
Colon
Honolulu
Tahiti
Sydney
Melbourne
Wellington
Valparaiso
Coronel
Punta Arenas
Cape Horn
Pernambuco
Liverpool
Gibraltar
Port Said
Suez
Aden
Bombay
Colombo
Singapore
Batavia
Manila
Hongkong
Shanghai
Yokohama
Tientsin
Niuchwang
Capetown
Cape of Good Hope
King George Sd.
San Francisco-Yokohama Via Great Circle 4,530
San Francisco-Yokohama Via East and West Line 4,790
Honolulu-Yokohama 3,445
Yokohama-Port Townsend
New York - Liverpool 3,071
New York - Gibraltar 3,207
Panama - Honolulu 4,685
Cape Town - Sunda Strait 5,125
New York-Melbourne 12,818 - Sydney 13,306 - Wellington 14,129 Via St Vincent
Cape Town-Melbourne 6,077 - Sydney 6,546
Wellington - New York - 11,344 - Liverpool 11,711
Honolulu-New York 13,312
Samoa-Sydney 2,353
Tahiti-Sydney 3,303
Wellington - Panama 6,505
New York - Wellington 8,522
Melbourne-Wellington 1,603
Sydney - Batavia
Colombo-King George Sound
Aden-Bombay 1,660
Aden - Colombo 2,130
Liverpool-Cape Town 6,080

Map 3

tween New Orleans and San Francisco, as is shown by Map 3, the canal reduces the distance from 13,551 to 4,683 miles, a reduction of 8,868 miles. Between New York and San Francisco the ocean route is shortened 7,873 miles; i. e., from 13,135 to 5,262 miles.

The economy resulting from shortening ocean routes is best indicated by the number of days which freight and passenger vessels thereby save in making voyages. The average time taken by a 10-knot freight steamer from New York to San Francisco by way of the Straits of Magellan was 55 days. The trip via the Panama Canal now takes 22 days, a saving of 33 days, the reduction in the distance and time of the voyage being 60 per cent.

A passenger steamer which may be economically operated in the service between the two seaboards of the United States, one averaging 14 knots at sea, can make the run between New York and San Francisco in 23 days less via Panama than via the Straits of Magellan; i. e., the time required is reduced from 39 days to 16 days. The first of May, 1915, the *Kroonland* and *Finland,* relatively large vessels carrying passengers and higher grades of freight, and formerly operated between New York and Antwerp, were put into the New York-San Francisco service via the Panama Canal. Their average time between

New York and San Francisco, including a call at San Diego or the port of Los Angeles, was 17 to 19 days. Had the vessels been operated via the Straits of Magellan each run would have taken 39 or 40 days, not allowing for one or more probable stops en route for coal.

It is, however, not to be inferred from this statement that the *Kroonland* and *Finland* would have been operated via the Straits of Magellan between New York and San Francisco had there been no Panama Canal; for it would not have been profitable to run such vessels in that service, even had it been possible for the vessels, in competition with the transcontinental railroads, to secure a full complement of passengers for such a long and time-consuming voyage. The operating expenses would have taken all the revenue obtainable at rates that could be charged in competition with the rail lines.

The reduction in the time required to make an ocean voyage becomes of greater importance with the development of transportation facilities and services. Freight and passenger vessels become larger and more expensive, and thus require greater investments of capital; operating expenses for salaries, wages, and coal increase with rising wages and prices; and overhead expenses for office rents and for the personnel needed for securing and developing traffic grow larger. All this em-

phasizes the necessity of securing as many units of transportation service as practicable from each vessel operated. The shorter the length and time of each trip, the greater the number of trips that can be taken; and, as the rates charged by way of a longer route can seldom be made higher than by a shorter route, the shorter route is quite certain to be more profitable unless some special charges like canal tolls or transfer services should be so large as to offset the lower expenses and the higher efficiency of the service by the shorter route.

The American-Hawaiian Steamship Company, after dispatching its steamers via the Straits of Magellan for eight years between the two seaboards of the United States, decided, in 1907, to change to the Tehuantepec route, although to do so it was necessary to separate its vessels into two fleets, one operating on the Atlantic and one on the Pacific, and to pay the Mexican National Railway one-third of the through rate between New York and San Francisco for the railway haul of about 185 miles and the double handling of freight at the Isthmus of Tehuantepec. The distance between New York and San Francisco via Tehuantepec (4,246 nautical miles) is a thousand miles less than by way of the Panama Canal; but the time taken to ship freight between New York and San Francisco by way of Tehuantepec was four

weeks, while the time now required via Panama is three weeks. The Panama route is also much more economical although the distance is greater and tolls of $1.20 per ton on the net tonnage of vessels, amounting to 75 cents to $1.00 per ton of cargo, are collected at the Panama Canal. An account of the fleet and services of the American-Hawaiian Line is given in the following chapter.

While the commerce between the two seaboards is the part of the trade via the canal in which the people of the United States as a whole are most interested, the people in the west coast states of the United States, because of their large exports of grain, lumber, fish, and dried and preserved fruits to Europe, view the canal quite as much with reference to commerce with Europe as with regard to trade with the eastern seaboard of their own country; and for them the reduction effected by the canal in the length of routes to Europe is of special importance. The distance from San Francisco via the Straits of Magellan to Liverpool is 13,502 miles, and to Hamburg 13,883 miles, while by way of the canal the distances are 7,836 miles, and 8,355 miles, the reduction in the length of the routes being 5,666 and 5,528 miles, or 42 per cent. for the route to Liverpool and about 40 per cent. for that to Hamburg.

For the 8-knot vessels, which are most used in the large grain traffic from the west coast of the United States to Europe, the canal shortens the time at sea 23 days and reduces the operating costs per trip from port to port as much as $6,000 or $7,000. After taking from the amount thus saved the sum required to pay the tolls charged for the use of the Panama Canal, the owners or users of the vessels in this grain trade will gain $1,500 on the average for each trip made via Panama instead of by the Straits of Magellan, and will, in addition, be able, because of the reduced time spent at sea, to secure more transportation services each year, and presumably larger gross and net returns from the vessels owned or controlled.

While the trade between the west coast of the United States and Europe is large in volume, and, with the great assistance which it is receiving from the canal route, is quite certain to grow rapidly, this part of the foreign trade of the United States is far smaller in volume and value than that which is and will be carried on between the eastern seaboard of the United States and Pacific ports of South America, the Orient and Australasia. The Panama Canal has materially shortened the routes to transpacific countries and has opened a direct highway to western South America.

Valparaiso is now 629 miles nearer to New York via Panama than San Francisco is, and Iquique, a Chilean port from which a large tonnage of nitrate of soda is shipped, is 1,258 miles nearer, the distances from the Isthmus of Panama to west coast South American ports being much less than to the Pacific coast ports of the United States. The distance from the very important nitrate port of Iquique to New York is now 2,570 miles less than to Liverpool, and 3,090 miles less than to Hamburg. The Gulf coast of the United States is from 3,000 to 3,500 miles nearer Chilean ports than are the ports of northwestern Europe.

The route formerly taken by steamers from New York to Valparaiso via the Straits of Magellan was 8,380 nautical miles in length; and the distance to Iquique was 9,143 miles. By way of Panama the mileage to Valparaiso is 4,633 and to Iquique 4,004, the saving in the distance to Valparaiso being 3,747 miles and to Iquique 5,139 miles. Stated in percentages, the reductions have been about 45 per cent. for Valparaiso and 56 per cent. for Iquique. The canal has reduced the distance from New Orleans to Valparaiso 4,742 miles and 54 per cent.; while the reduction to Iquique is 6,134 miles and 64 per cent.

A 10-knot freight steamer can now make the run from New York to Valparaiso in 15 days less time, and to Iquique in 21 days less time, than

was taken via the Straits of Magellan. Such a steamer can now get from New Orleans to Valparaiso in 19 days less time than the time formerly required; while for a trip from New Orleans to Iquique there has been a reduction of 25 days. As will be pointed out in Chapter XI, the route to western South America via the canal is not only shorter but is otherwise more economical and desirable because of the cheapness of coal at Panama as compared with the high cost of coal on the east coast of South America, and also for the reason that the commercial ports of western South America lie between Panama and central Chile, whereas a vessel approaching western South America via the Straits of Magellan has a run of 1,200 miles past the sparsely inhabited southern part of Chile, a region practically without industries and commerce.

For these reasons most of the commerce between Europe and the west coast of South America, even of Chile, will use the Panama Canal instead of the route via the Straits of Magellan. The distance from Liverpool to Valparaiso via the Straits of Magellan is only 1,540 miles greater than via Panama, and from Hamburg only 1,402 miles. For a voyage from Liverpool to the nitrate port Iquique in northern Chile, the Panama route saves 2,932 miles, and from Hamburg to Iquique the saving is 2,794 miles. To the Pacific ports

north of Chile the reduction in distances is much more, Guayaquil being over 5,000 miles nearer Liverpool and Hamburg via Panama than by way of the Straits of Magellan.

Freight steamers making voyages from British and German ports to Valparaiso can save but 5 or 6 days by taking the Panama route; for voyages to the nitrate ports about 12 days can be saved; and to ports as far north as Guayaquil 21 days' sailing can be avoided by making use of the Panama Canal. Reduction in time of voyage would not alone cause vessels trading between north European ports and Valparaiso to take the Panama route and pay the tolls collected at the canal; and it is probable that many nitrate-laden vessels might take the Magellan route to avoid the tolls, if the saving in distance and time were the only economies to be secured by using the Panama Canal. Cargoes of nitrate are, in fact, moving via the canal to Europe, and it is probable that a large share of the trade of Valparaiso with Europe will pass through the canal. By taking the Panama route, vessels trading between Europe and Valparaiso may engage in the trade of the ports between Valparaiso and Panama. Moreover, vessels leaving Chilean ports with full cargoes for Europe can save a large amount in fuel expenses by using the Panama Canal instead of going by the Straits of Magellan, along

which route coal prices are exceptionally high.

For the commerce between the Atlantic-Gulf coast of the United States and the Orient—Japan, China, and the Philippines—the savings in distances and time at sea are of special importance. While the United States has a relatively large trade with the Orient, Europe has always had the lead over the United States in the commerce of the Oriental countries, with the exception of the export trade of Japan. Europe reaches the Orient via the Suez Canal; and, until the Panama Canal was built, the major share of the commerce of the United States with the Asiatic countries bordering the Pacific, i. e., the trade of the eastern and southern parts of the United States with the transpacific countries, also took the Suez route, and was thus subject to a distance handicap equal practically to the width of the Atlantic Ocean. Now that the Panama route has become available, Europe, trading via the Suez route, and the eastern part of the United States, making use of the Panama route, compete for the commerce of the Orient under equal conditions as regards transportation costs.

The aid which the Panama Canal is now giving the trade of the United States with the Orient was concretely illustrated by the voyage of the steamship *Penrith Castle* which sailed from Galveston, in October, 1914, for Yokohama with a

cargo of 3,270 tons of cotton. The distance from Galveston via the canal, San Francisco, and the Great Circle to Yokohama is 9,323 miles. Had the vessel made the run via the Suez Canal, the distance would have been about 14,575 miles by the most direct route or 15,100 miles including calls at Colombo, Singapore, Hongkong and Shanghai. The Suez route would have been about 5,500 miles longer and would have taken from 22 to 24 days in excess of the time required via Panama.

The *Penrith Castle,* in the absence of a canal at Panama, would probably not have made the run via Suez, because that route, though the most desirable one, is nearly seven-eighths the length of the routes via the Cape of Good Hope and via the Straits of Magellan. The tolls at Suez would have diverted the vessel around Africa or South America, although either one of the circuitous routes would have been more than 2,000 miles longer than the Suez route. The sailing distance from Galveston to Yokohama via the Cape of Good Hope, including the necessary calls en route for coal and supplies, would have been about 17,170 miles, and the distance by way of the Straits of Magellan would have been about 17,350 miles; but the saving in distance of 2,000 to 2,500 miles via Suez would not alone have justified the payment of the Suez tolls which would probably have been somewhat more than $4,100, the amount

of tolls which the vessel paid for the use of the Panama Canal.

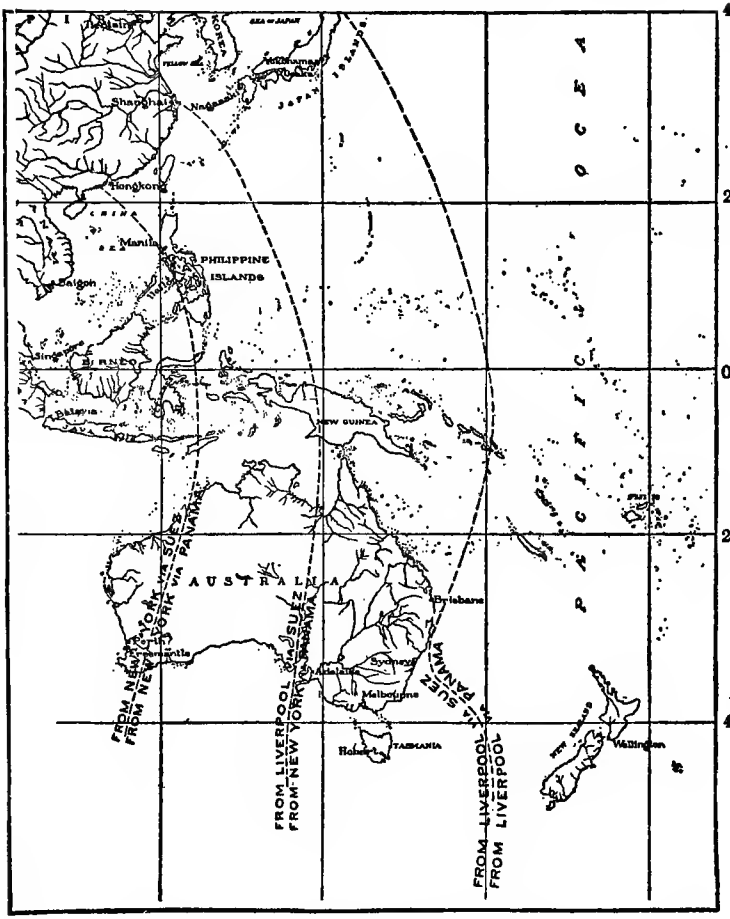
The estimated daily operating expenses of the *Penrith Castle* being $230, or about one dollar per mile, the tolls would be equal to the expenses incurred for a run of over 4,000 miles. It might possibly happen that in order to secure advantages and economies other than those resulting from reduction of distance a vessel such as the *Penrith Castle* would pay $4,100 in tolls to save 2,400 miles in sailing distance, but it is probable that, if the *Penrith Castle* had taken a cargo of cotton from Galveston to Yokohama before the Panama Canal was opened, the voyage would have been made either by the Cape of Good Hope or the Straits of Magellan, and the sailing distance would have been 8,000 miles more, or 80 per cent. greater, than the distance via Panama.

The major share of the commerce of the United States with the Orient is handled through the port of New York. The distance from New York to Yokohama via Panama, San Francisco and the Great Circle course across the North Pacific—which route from Panama to Yokohama is 300 miles shorter than the apparently more direct route via Honolulu—is 9,798 miles; while the distance via the Suez Canal and the usual ports of call, Colombo, Singapore, Hongkong and Shanghai, is 13,566 miles or 3,768 miles more than via the

Panama route as designated. From New York to Shanghai via Panama, San Francisco, the Great Circle, and Yokohama the distance is 10,649 miles; via Honolulu and Yokohama, 11,137; and via the Suez Canal, Colombo, Singapore and Hongkong, 12,525; the Panama route being shorter than the one via Suez by 1,876 miles. For a 10-knot freight steamer the sailing time from New York to Yokohama would be 15 days less than via the Suez route. For a voyage to Shanghai the Panama Canal would save 7 days.

From New York to Hongkong the distances are practically the same by the Suez and Panama routes; and the same is true of the distances from New York to Manila. To Hongkong the Suez commercial route from New York is 18 miles shorter, while to Manila the Panama commercial route is 41 miles less. Commercially, though not geographically, the Philippine Islands and southern China are the antipodes of the north Atlantic ports of the United States. As is shown by Map 4, a line drawn through the points equally distant from New York by the Suez and Panama routes and the usual ports of call passes close to Hongkong and Manila and crosses the western part of Australia.

Map 4 shows the location of points equally distant from New York and Liverpool—from New York via Panama and from Liverpool via Suez.



MAP 4.—POINTS EQUALLY DISTANT FROM NEW YORK AND FROM LIVERPOOL VIA THE PANAMA AND SUEZ ROUTES

Another line on the same map is drawn through the points equally distant from Liverpool via the

Panama and Suez routes. The significance of the facts shown by this map will be considered later in Chapter X in discussing the competition of the Suez and Panama routes. In passing, it may be noted that relative distances via Panama and Suez may not altogether determine the route taken by commerce between the north Atlantic seaboard of the United States and the Orient, nor even the route taken by all of the trade between Europe and the Far East. It seems quite clear, however, that the natural commercial route from New York to Asiatic points as far south as Hongkong and Manila is via Panama and along the coast of Asia, with calls at the larger ports of Japan and China. It is equally apparent that vessels from Europe to China and Japan will, in most cases, take the route via Suez and the many possible ports of call along the southern and eastern seaboards of Asia.

One other route of major commercial importance, that between the Atlantic-Gulf seaboard of the United States and New Zealand and Australia, is much shortened by the Panama Canal. The population and industries of Australia are in the southeastern part of the island, and its commerce is carried on mainly through the port of Sydney on the southeast coast, of Melbourne on the south coast not far from the southeastern corner of the country, and of Adelaide on the

southern coast of the eastern half of the continent. Vessels approaching Australia from Europe or the United States via the Suez Canal or the Cape of Good Hope must sail nearly the length of the island continent—which extends through 40 degrees of latitude, 2,400 miles—in order to reach Sydney, the largest city and principal port of the country. On the contrary, vessels approaching Australia from the Panama Canal come at once to Sydney, and in order to make Melbourne and Adelaide need to sail only a little more than a third of the length of the island.

It is shown by Map 4 that the western part of Australia is equally distant from New York by the Suez and Panama routes; that the central portion of the island is equally distant from Liverpool, via Suez, and from New York, via Panama; and that the eastern, and, what is of most significance, the commercially important southeastern part of the country is much nearer New York—and thus to the Atlantic-Gulf seaboard of the United States—via Panama, than via Suez; and also that this southern section of the country is nearer to New York than to Liverpool and thus to the countries about, and east of, the English Channel.

The distance from New York to Sydney via the Panama Canal and Tahiti is 9,811 miles; via Suez, Colombo, and Melbourne the distance is

14,148 miles; and by way of St. Vincent, the Cape of Good Hope, Adelaide, and Melbourne, 13,743 miles. Before the opening of the Panama Canal, the route taken from New York to Australia was not the one via Suez, but the one by way of the Cape of Good Hope which was toll free and somewhat shorter than the Suez route when the usual call at Colombo was included. From New York to Sydney via Panama and Tahiti, the distance is 3,932 miles less than via the Cape of Good Hope with calls at St. Vincent, Adelaide, and Melbourne. For voyages from New York to Melbourne the Panama Canal saves 2,770 miles, and to Adelaide 1,746 miles. For the Atlantic and Gulf ports of the United States, nearer to the canal than New York is, the Panama route to Australia effects much greater reductions in distance. For New Orleans the saving is 5,444 miles, and for Galveston 5,516 miles. Gulf ports, as a whole, are now about 600 miles nearer to Australia than New York is, whereas before the opening of the Panama Canal the distance advantage was with the Atlantic ports of the United States.

The advantage which the ports of the Atlantic-Gulf seaboard of the United States have over the British and North Sea ports in distances to Australia, and especially to New Zealand, ought in the course of time to prove of real assistance to American producers and merchants in enlarging

their trade with Australia. Sydney is now 2,424 miles nearer to New York than to Liverpool. To Melbourne, New York has an advantage of 1,262 miles over Liverpool. If the comparisons were between New York and Hamburg, instead of Liverpool, the differences in favor of New York would be 519 miles greater; and if, instead of New York, the Gulf ports of the United States were taken for comparison with Liverpool and Hamburg as regards the distances to Australia, the differences in favor of the American ports would be greater by 475 miles for Galveston, 579 miles for New Orleans, and 757 miles for Port Tampa.

New Zealand, which for the size and population of the islands has a large trade, is peculiarly situated with reference to Panama Canal routes both from the United States and from Europe. Before the construction of the Panama Canal, the short route to New Zealand from Europe as well as from the Atlantic coast of the United States was by way of the Straits of Magellan; and the location of the islands between 34° and 47° south latitude is so little to the north of the southern end of South America that the distance from Liverpool to Wellington via the Straits of Magellan is only 500 or 600 miles greater than via Panama. As routes are usually charted upon maps, it does not seem possible that the distance from Great

Britain to New Zealand can be only a few hundred miles greater via the Straits of Magellan than via Panama, but when routes are charted and measured upon a globe it is seen that in southern, or northern, latitudes where the degrees of longitude are shorter than they are near the equator the distance across the Pacific Ocean is much less than in the part of the ocean which lies between Panama and New Zealand. Similarly, as stated above, the shortest route from the canal to Yokohama is not via Honolulu, but by the Great Circle route that takes vessels past the Aleutian Islands.

The Panama Canal reduces the distance from New York to Wellington about 2,500 miles and from New Orleans about 3,500 miles, and thus reduces the time of the voyage of a 10-knot freight steamer from New York about 10 days and from New Orleans 14 days. The sailing time required for a voyage by a 10-knot steamer from Liverpool to Wellington via Panama is six or seven days less than the time required via Suez and the Australian ports, and about 13 days less than the time at sea via St. Vincent, the Cape of Good Hope, and the Australian ports. As compared with the route via the Straits of Magellan, the Panama route from Wellington to Liverpool is only two or three days shorter, and, on account of the tolls payable at Panama, would not be taken unless the saving in fuel via Panama or the desire to call at ports in

the West Indies or the United States should cause the vessel's master to prefer to make the run via Panama.

Over the six general canal routes considered in this chapter—the route between the two seaboards of the United States, that between the west coast of the United States and Canada and Europe, that connecting the Atlantic-Gulf coast of the United States with western South America, that between Europe and western South America, that between the Atlantic-Gulf ports of the United States and the Orient, and that between the Atlantic-Gulf seaboard of the United States and Australasia—moves most of the traffic that makes use of the Panama Canal. During the first year of the operation of the canal 97 per cent. of the shipping that passed through the Panama Canal was engaged in commerce over these six routes.[1] The saving which the canal effects in distances and in the time of voyages by all of these important highways of ocean commerce is so large, both absolutely and in relation to distances and sailing time by the routes necessarily followed before the oceans were connected at Panama, that the canal must prove to be of much service to a large share of the world's maritime commerce.

[1] In Chapter IV, pages 53-54, the routes from the Atlantic seaboard of the United States to the Orient and to Australasia are considered as one route, thus making the general routes five in number, according to the Government's grouping.

CHAPTER IV

SERVICES THROUGH THE CANAL

The services through the canal and, indeed, over most ocean routes are of three kinds: Those of companies that own and operate lines of vessels having a definite schedule of sailings; those of the fleets owned by a few especially large shippers, such as the Standard Oil Company, the United States Steel Corporation, and the Bethlehem Steel Company; and those of vessels chartered by producers, traders, or carriers for limited periods or for single voyages. Canal traffic is thus handled by carriers' lines, producers' lines, and chartered vessels popularly called "tramps," not because of their appearance, which differs little from that of liners, nor because of uselessness or lack of steady work, for they are busily engaged in carrying the heaviest commodities of international trade, but for the reason that they are not permanently employed over any one route or in any one kind of traffic, but are the ever-busy sea rovers that seek traffic of any kind at any port.

The fleet owned by a large producer, which may

be called an "industrial line," is midway, in character of service rendered, between the carriers' fleet run as a "regular" line and the vessels operated under charter, the ocean "tramps." The vessels of an industrial line are continuously, although not always exclusively, employed in carrying their owner's traffic, but are not operated over a fixed route, unless, as in the case of an ore-carrying fleet, they transport a single commodity between two fixed ports of origin and destination. The Steel Corporation and the Standard Oil Company use their vessels to deliver their goods at ports in all parts of the world. Incidentally the vessels composing the Steel Corporation's large fleet may seek general cargo to supplement their lading. The steel products to be shipped to some distant point may be of less tonnage than the vessel employed is capable of carrying; and, as is well-known, steel is such a heavy commodity that a vessel laden only with steel would be weighted down to its load line long before its cargo space had all been occupied. The more economical lading is one in which the heavy commodities are supplemented by lighter package, or measurement, freight. In soliciting this supplemental freight the owners of a vessel of an industrial line do what is regularly done both by managers of regular lines and by those in control of a vessel under charter—they sell berth space or take cargo at

special rates to secure a profitable lading for a particular ship.

The major share of the traffic through the Panama Canal has been carried by regular carriers' lines. Chartered vessels have been employed in carrying a part of the lumber, nitrate, and other heavy commodities that are shipped through the canal, and the vessels of the industrial lines have had occasion to make frequent voyages via the canal to American and foreign ports. It is probable that the use of the canal by chartered vessels has been much reduced by the European War, which has temporarily stopped the commerce of Germany and Belgium and has consequently much restricted the shipment of nitrate and other bulky commodities from the Pacific ports of the Americas to Europe—traffic especially adapted to transportation by chartered vessels.

It is probable that the traffic through the Panama Canal will always be handled mainly by line vessels, in spite of the fact that, under normal trade conditions, bulk cargoes of nitrate, lumber, sugar, coal, oil, and grain may comprise half or more of the freight carried through the waterway. Nitrate will probably be transported mainly by chartered vessels, and so will a part of the lumber, grain, and coal; but the sugar which comes chiefly from Hawaii will be carried by the

American Hawaiian Line, and most of the oil will be shipped in tank steamers owned by the oil producers.

When commerce is carried on regularly and in large volume between two countries or two sections of the world, vessel lines are established to handle most of the traffic. More or less frequently a large shipper having a full cargo of grain, lumber, steel products, or some other commodity that can be shipped in bulk will find it more economical or may even find it necessary to charter a vessel. Line vessels having fixed or approximate sailings and serving a greater or less number of regular shippers cannot accept a full vessel cargo from any one shipper, nor does a regular line vessel always have a large amount of berth space that may be sold, or assigned, to a single exporter or importer. The few exceptionally large shippers who have frequent demands for the entire capacity of a ship own vessels which they operate as a part of their business; the occasional and irregular exporter or importer having a full cargo for transportation secures a chartered vessel, and, as the total number of such irregular shippers in each country is relatively large, there is a large number of chartered vessels in service and they transport a large, though probably not a major, share of the heavy traffic of ocean commerce.

The maritime commerce of all of the belligerent

nations has been seriously restricted by the European War, and, in the case of some of the warring countries, over-sea trade is entirely suspended. It need hardly be noted that a paralysis or even a partial interruption of the trade of several of the great commercial countries of Europe must inevitably disorganize, to a greater or less degree, not only the international exchange rates and the foreign trade, but also the domestic finances and industries of practically all countries. The finances and industries of South American countries were temporarily so crippled by the sudden outbreak of the European War that for many months their purchasing power was greatly reduced, and their trade even with the United States via all routes, including those through the canal, instead of being larger than usual as a result of the war, was for some time of less than normal volume.

The war, it is true, created an abnormal demand in Europe for foods and army supplies of all kinds, including among other articles great quantities of munitions, and this enlarged export trade, having resulted in increased shipments to Europe from the west coast of the United States and to Vladivostok from the eastern seaboard of the United States, largely and possibly quite fully offset the limiting effect which the war may have had upon the entire foreign trade of the

United States and upon the trade that makes use of the Panama Canal.

On the eighteenth of September, 1915, after the canal had been in operation for thirteen months, except for a few interruptions for periods of one to five days, slides involving a large area on each side of the cut at Culebra blocked the canal which remained closed until April 15, 1916, or for a period of seven months. The services through the canal that had been established during the first year of operation and were in existence in September, 1915, when the canal was temporarily blocked, are the services described in this chapter.

About 97 per cent. of the traffic through the canal during the first year was handled over five general routes. An account of the vessel lines operated over those routes will include most of the services through the canal. What share of the total traffic was carried by regular lines and what share by chartered vessels not operated in line services cannot be stated, but it is certain that the regular lines handled much more traffic than was transported by ships not connected with lines. The five general routes over which the regular lines were operated were as follows: (1) The United States intercoastal route; (2) the Europe-Western North American route; (3) the Europe-Western South American route; (4) the United

States-Western South America route; and (5) the United States-Far East route.

Over the first of these routes, that between the two seaboards of the United States, four lines were operating through the canal under regular schedules in September, 1915. These lines included the American-Hawaiian Steamship Company, which, under normal conditions, is able to dispatch a vessel each way every five days. The company had a fleet of 25 vessels in operation and 3 under construction. The president of the company, Mr. George S. Dearborn, in a letter written in September, 1915, stated:

> We have but 16 of our 25 vessels in the trade between New York and United States Pacific coast ports and Hawaii. Nine of these are in the service between New York and Pacific coast ports and Hawaii and seven between United States Atlantic and Pacific coast ports. The remaining 9 vessels of the fleet in commission are chartered out, some in the transatlantic trade, some in South American trade to Atlantic coast ports, and others in the South American nitrate trade to the Pacific coast. . . .

Mr. Dearborn further stated:

> Under normal conditions, the [company's] 8 steamers of 12,000 tons capacity, with two of the 10,000-ton type, would be employed in the trade to the Pacific coast ports

and Hawaii, returning with sugar—a round voyage of 15,000 miles. The balance of the fleet would be employed in the coast-to-coast trade, governed, of course, by the economic conditions of supply and demand, and those not required would be chartered for outside business.[1]

A midship section of a typical steamer of the American-Hawaiian Company's Panama Canal fleet is shown in Figure 2. Figure 3 presents a longitudinal profile of the same vessel. This

[1] The American-Hawaiian Company's fleet in 1915 included the following vessels having the designated gross and net tonnage and cargo capacity:

Steamer	Gross Tons	Net Tons	Cargo Capacity (Tons)
Alaskan	8,672	5,621	12,000
American	5,591	3,643	8,000
Arborean	Building	.....	9,000
Arizonan	8,672	5,621	12,000
Artisan	Building	.....	9,000
Californian	5,707	3,717	8,000
Columbian	8,580	5,599	12,000
Dakotan	6,657	4,068	10,000
Floridian	Building	.....	10,000
Georgian	6,606	4,016	10,000
Hawaiian	5,597	3,651	8,000
Honolulan	7,059	4,421	10,000
Iowan	6,649	4,064	10,000
Isthmian	5,404	3,469	6,000
Kansan	7,913	5,131	12,000
Kentuckian	6,606	4,016	10,000
Mexican	8,580	5,598	12,000
Minnesotan	6,656	4,068	10,000
Missourian	7,914	5,077	12,000
Montanan	6,649	4,063	10,000
Nebraskan	4,409	2,824	5,000
Nevadan	4,409	2,824	5,000
Ohioan	6,649	4,064	10,000
Oregonian	5,598	3,651	8,000
Panaman	6,649	4,064	10,000
Pennsylvanian	6,649	4,064	10,000
Texan	8,615	5,636	12,000
Virginian	7,914	5,077	12,000

ship is one of the 8 vessels added to the fleet during 1912-13. Vessels of this type are designed solely for the transportation of freight. They can average 14 knots at sea, but for the sake of econ-

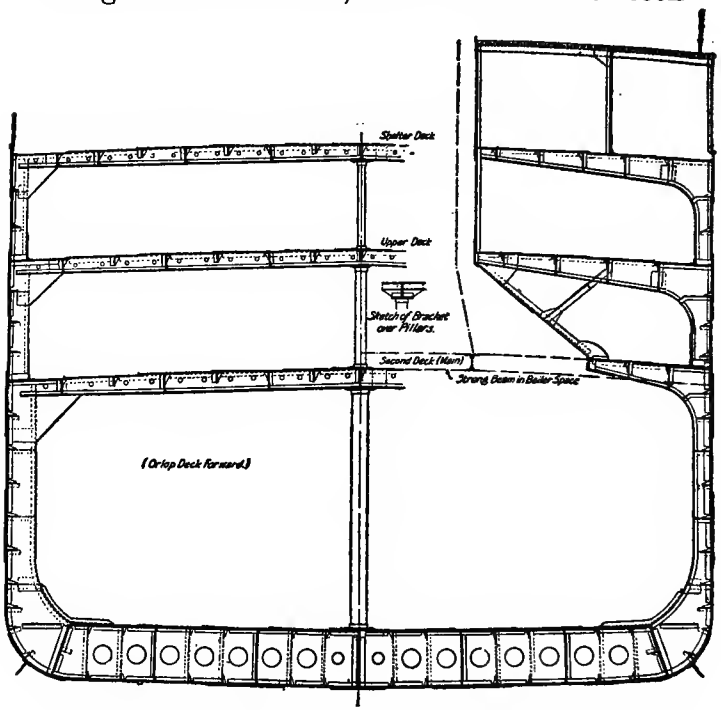


FIG. 2.—MIDSHIP SECTION, TYPICAL COASTWISE STEAMER FOR PANAMA CANAL SERVICE

omy are operated at 12 knots. The vessels are about 415 feet long between perpendiculars and of 53 feet 6 inches beam. Their molded depth to the uppermost full-length deck (shelter deck)

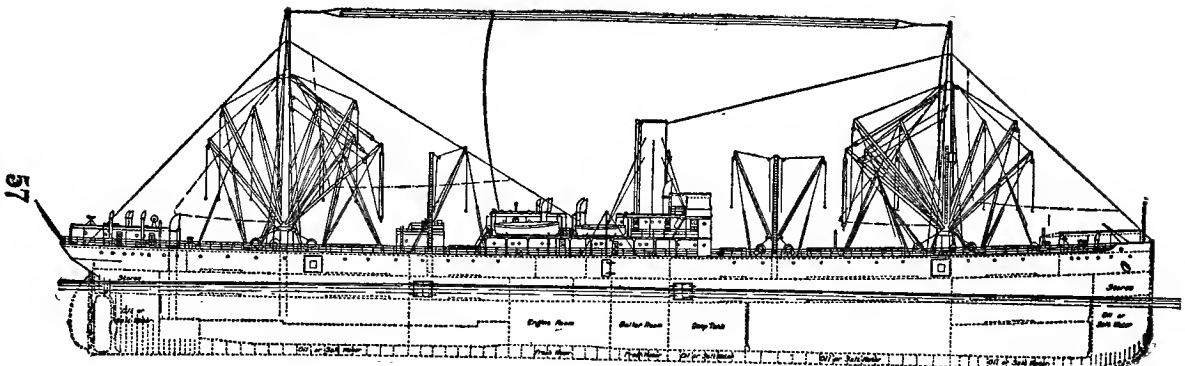


FIG. 3.—PROFILE OF TYPICAL COASTWISE STEAMER FOR PANAMA CANAL SERVICE

is 39 feet 6 inches. Their gross tonnage, American registry, is about 6,600 tons, and their net tonnage is about 4,200 tons. Their cargo capacity is 10,000 tons.

At the close of the first year of the operation of the canal the Luckenbach Steamship Company was maintaining weekly sailings each way between the two seaboards of the United States. The fleet consisted of 10 steamers owned by the company and 2 operated under charters. The vessels of this fleet average somewhat smaller than the American-Hawaiian fleet, their gross tonnage ranging from about 3,000 to 5,000 tons. The newer vessels of the Luckenbach Line measure about 5,000 tons gross and vessels of this size ordinarily can be loaded with 7,000 or 8,000 tons of freight.

A third line between the two seaboards, the Atlantic and Pacific Line, operated by W. R. Grace and Company, in 1915, dispatched a vessel each way once a month. The fleet included 5 vessels, 4 of which measured 6,309 tons gross and 4,325 tons net each. The fifth vessel is somewhat smaller. The four large vessels were of the same type as the *Santa Clara,* of which a photograph is presented in Figure 4. This company also operates the Merchants' Line between New York and ports on the west coast of South America via the Panama Canal; and, in normal times, there are fort-

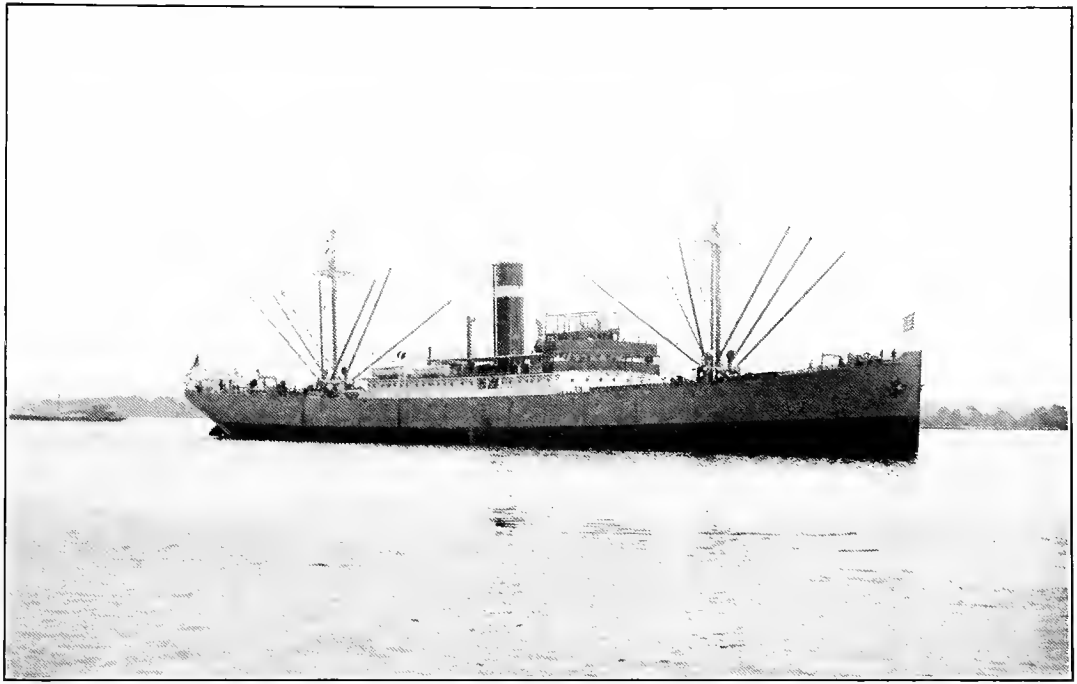


FIG. 4. THE *SANTA CLARA* OF THE ATLANTIC AND PACIFIC STEAMSHIP COMPANY.

nightly sailings in this service which are performed by 7 steamers.

In the summer of 1915 the Panama-Pacific Line, one of the companies of the International Mercantile Marine Company, began the operation between New York and San Francisco of the *Kroonland* and *Finland* (Fig. 5), large vessels of over 13,000 tons gross and about 8,500 tons net. These vessels carried passengers and higher classes of freight and made the trip via the canal in 17 to 19 days. The *Korea* and *Siberia,* of 11,284 and 12,760 tons gross respectively, were sold in 1915 by the Pacific Mail Steamship Company to the Atlantic Transport Company eventually to be operated in the coastwise trade in connection with the *Kroonland* and *Finland;* but in 1916, the *Korea* and *Siberia* were sold to the Toyo Kisen Kaisha. With these 4 vessels, the Panama-Pacific Line would have been able to maintain a combined passenger and freight service with sailings at intervals of approximately 10 days. A photograph of the *Kroonland* is presented in Figure 1, the frontispiece.

In addition to the sailings of the four intercoastal lines above described, the services between the two seaboards of the United States in September, 1915, included the dispatch of a vessel each way about once a month by Crowell and Thurlow, and an intermittent service by Sud-

den and Christenson, Swayne and Hoyt, and the Dollar Line. The great demand, which was created by the European War, for neutral vessels in the foreign trade caused the diversion to the foreign service of numerous vessels that have been and would otherwise now be operated through the canal in the American coastwise trade.

The foregoing account of the services of regular lines operated by way of the canal between the two seaboards of the United States should be supplemented by a brief reference to two special types of vessels sometimes operated by ocean transportation companies, but more often by producers who employ their own ships to transport their products. These are the special types of vessels for the transportation of lumber and for the carriage of oil in bulk.

For the transportation of lumber the so-called "steam schooner" was developed on the west coast of the United States. A profile of a typical steam schooner is shown in Figure 6. This vessel is 235 feet in length, of 42½ feet beam, and has a molded depth of 18 feet 8 inches. Its gross tonnage, American registry, is 1,600 tons and its net tonnage only 915 tons. It will be noted that the engine room is well aft and that there is only one deck extending from the engine room to the forecastle. The entire central portion of the vessel, with the exception of one deck, is an open space

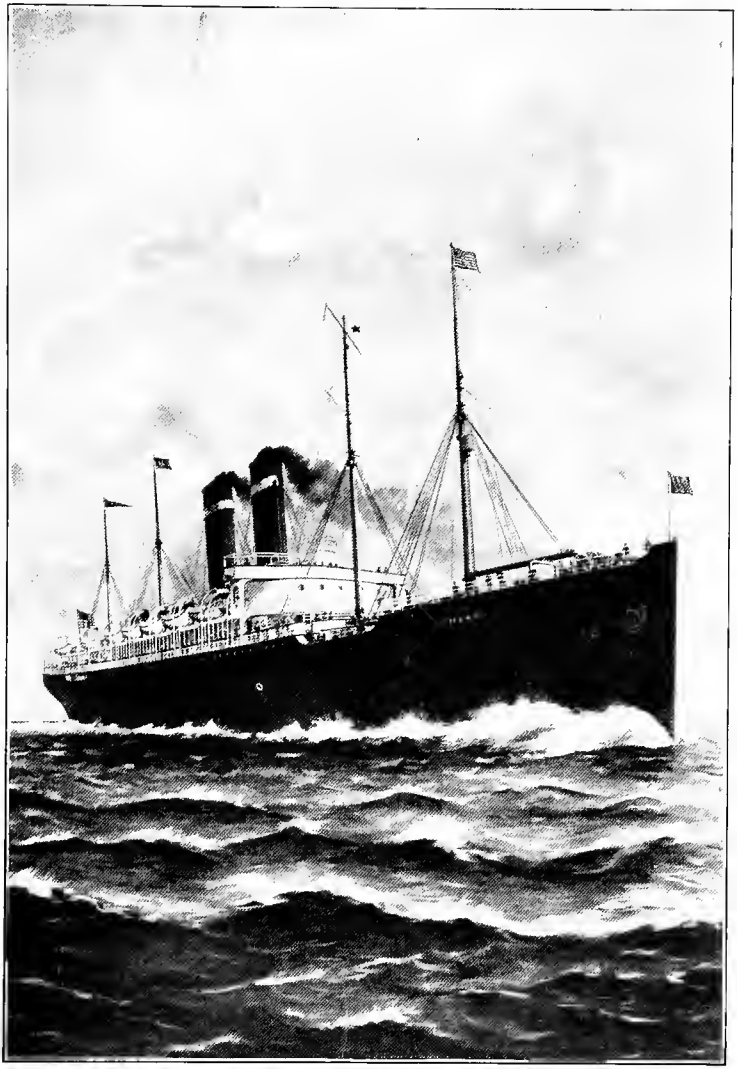


FIG. 5. THE *FINLAND* OF THE PANAMA-PACIFIC LINE, INTERNATIONAL MERCANTILE MARINE COMPANY.

for the stowage of lumber. This small vessel can carry 1,500,000 feet of lumber, only about half of which is stowed below the deck; the remainder is carried as deck cargo. Some vessels of this type make use of the Panama Canal, although lumber, even when moved in full vessel cargo lots, is not always transported in vessels of this type. A lumber carrier of different design operated by Crowell and Thurlow, of Boston, is illustrated by Figure 7.

Petroleum oil is a commodity that is handled in large tonnage through the Panama Canal. This is carried, for the most part, in tank vessels operated by the Standard Oil Company and other companies engaged in the oil trade. Most of the oil tankers are equipped with steam engines, but some of them have been provided with an internal combustion oil engine of the Diesel type. Figure 8 presents a profile of an oil tank carrier equipped with the Diesel engine. This type of engine, which does away with the boiler room and which requires but a small quantity of fuel, is becoming popular as technical difficulties in its construction and operation are overcome. As the profile shows, the engine room is in the after part of the ship, as also are most of the living quarters. There is a small cargo hold forward and relatively large water ballast tanks in the peak, and forward hold. The main portion of the vessel is divided

into 14 tanks, 7 on each side of a central longitudinal bulkhead.

The services thus far described have been those over the first of the five main routes above mentioned. An account of the services established via the four other routes during the first year of canal operation may be confined to an enumeration of the principal lines that were in operation in September, 1915.

Over the route via the canal between Europe and the west coast of North America, the Harrison Line maintained monthly sailings between Great Britain and Pacific ports of the United States and Canada, and in connection with the service of the Harrison Line was the Direct Line running vessels to and from Glasgow. The East Asiatic Company dispatched a vessel each fourth week from Scandinavian ports via Genoa and thence to Los Angeles, San Francisco, Portland, Tacoma, Seattle, and Vancouver. Each four weeks a vessel was dispatched in the opposite direction over the same route. The Johnson Line operated one vessel at intervals of 60 days over approximately the same route as that followed by the East Asiatic Company. The Swedish Transatlantic Company also operated a 60-day service over this route. Alfred Holt and Company maintained a monthly service from Great Britain, via Kingston, to west coast ports, from San Francisco

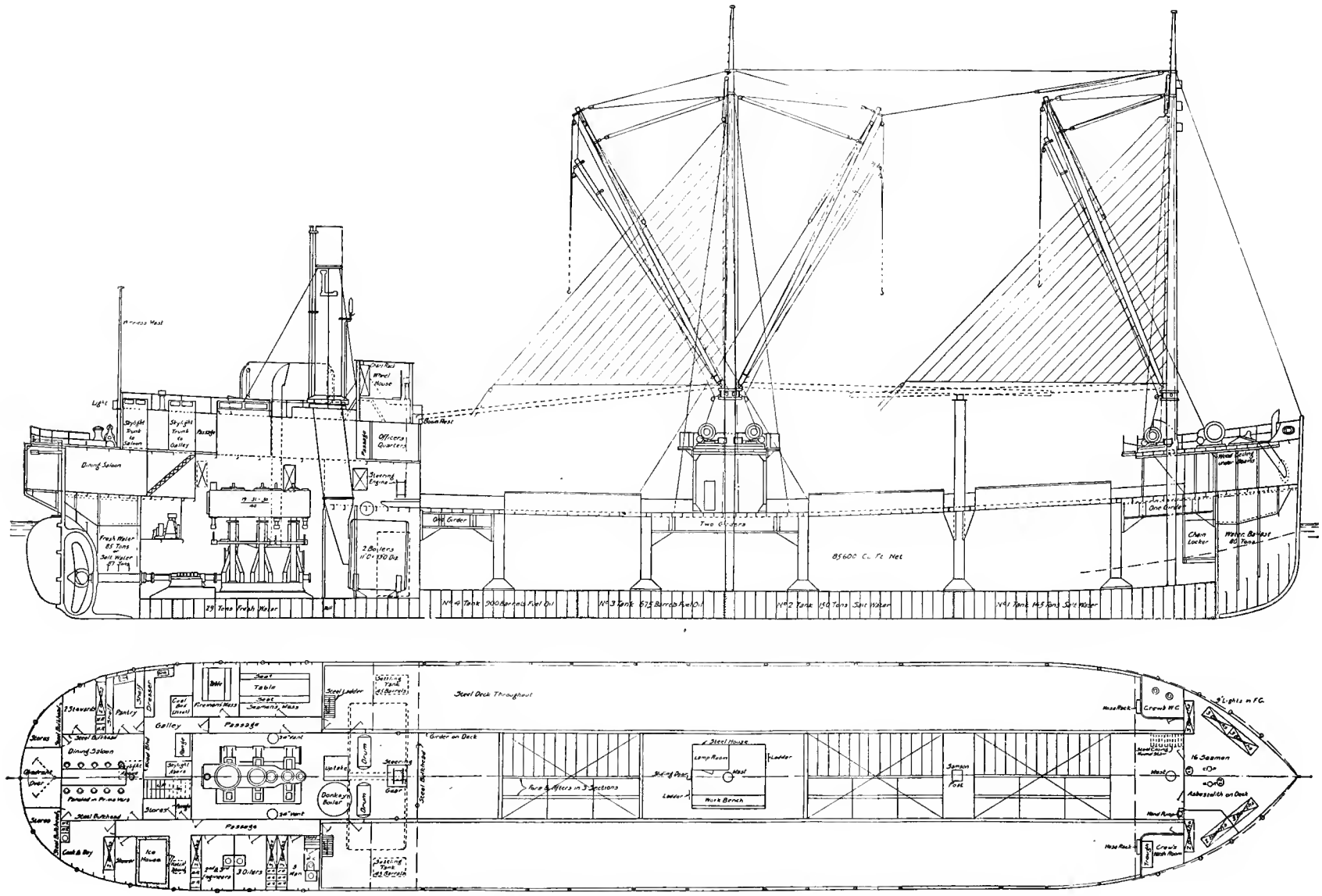


FIG. 6.—PROFILE OF "STEAM SCHOONER" FOR WEST COAST UNITED STATES LUMBER TRADE

to Vancouver inclusive. The Maple Leaf Line dispatched a vessel at intervals of about 6 weeks from New York to Vancouver, thence to San Francisco and from thence to Europe and back to New York.

Over the route between Europe and South America three services were maintained at the close of the first year of canal operation. The East Asiatic Company dispatched vessels fortnightly each way over the route from Scandinavian ports to Genoa and Barcelona, and thence to the west coast ports of South America from Guayaquil to Valparaiso inclusive. The Pacific Steam Navigation Company and the Royal Mail Steam Packet Company maintained fortnightly services from Great Britain, via the West Indies, to the west coast of South America as far as Valparaiso. This service was supplemented by a fortnightly dispatch of vessels operated between the canal and west coast South American ports. The Johnson Line maintained a service on a six-weeks schedule between Scandinavian ports and the west coast of South America.

On the route between the United States and the west coast of South America, three lines were operated, one of them, the Merchants' Line, owned by W. R. Grace and Company, has already been referred to. It had sailings each way between New York and ports of Ecuador, Peru and Chile.

These sailings were on a monthly schedule and in normal times the schedule would be a fortnightly one. The West Coast Line, operated by Wessel, Duval and Company, maintained a service with monthly sailings between New York and the ports on the west coast of South America. The New York and South America Line of the United States Steel Products Company had an approximately fortnightly service over this route.

Between the United States and the Far East, including Japan, China, the Philippines, Australia and New Zealand, several lines were operated through the Panama Canal. The sailings over this route are less regular than over the other routes mentioned, partly because of the fluctuations in the volume of trade, and partly because vessels sometimes use the Suez Canal for the voyage to or from the Orient. The Nippon Yusen Kaisha maintained monthly services between New York and the Orient. The American and Manchurian Line (Ellerman and Bucknall Lines) maintained sailings at intervals of approximately three weeks between New York and Vladivostok. The same line also maintained sailings each three weeks from New York to New Zealand and Australia. Several companies, including the American and Oriental Line, the Barber Line, the Shewan Tomes and Company, and the Indra Line, together maintained a service from New York to Vladivos-

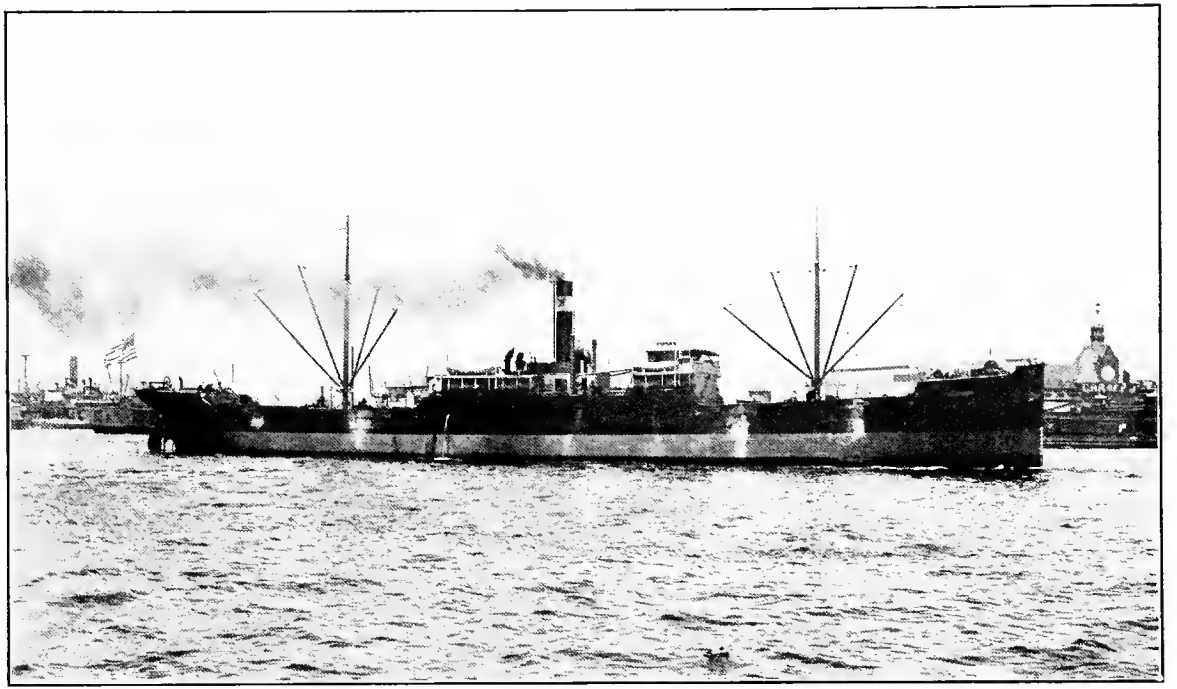


FIG. 7. THE *LEWIS K. THURLOW*.

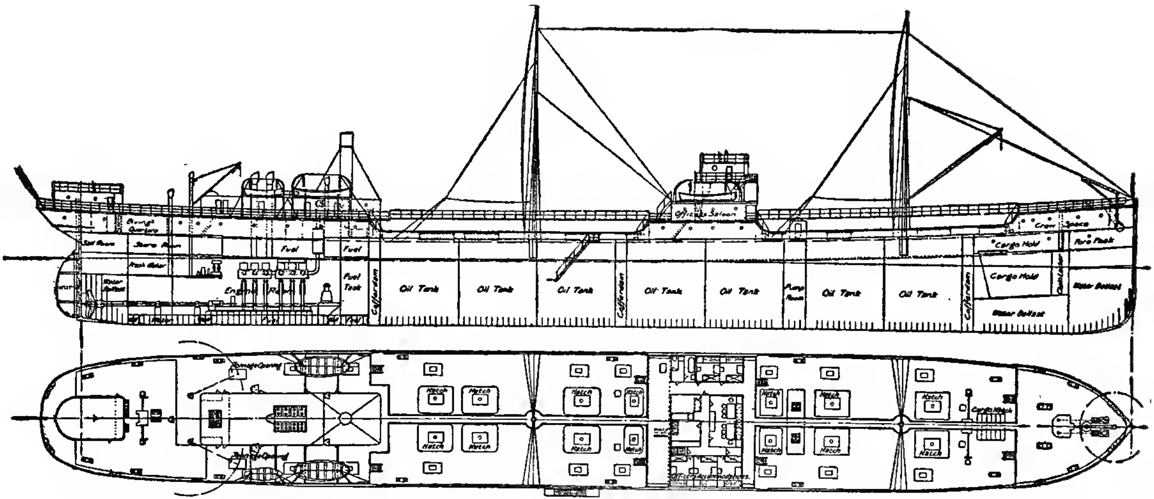


FIG. 8.—PROFILE AND UPPER DECK PLAN OF OIL TANK CARRIER, WITH DIESEL ENGINES

tok with sailings at about ten-day intervals. The Prince Line had sailings about once in five weeks from New York to the Far East, while the United States and Australia Steamship Company dispatched vessels at intervals of six weeks from New York to Australia and New Zealand ports.

The lines operated over the five routes that have been considered do not include the services of several lines whose routes terminate at the canal. Lines having the canal as a terminus carry a considerable volume of traffic that is transferred at the canal. The Panama Rail Road Steamship Line has a weekly service between New York and Cristobal. The Pacific Steam Navigation Company has maintained a fourteen-day schedule between Cristobal and west coast ports as far south as Valparaiso. The South American Steamship Company (Chilean Line) has dispatched vessels each two weeks from the canal to west coast South American ports, while the Peruvian Steamship Company has maintained a two-weeks schedule from the canal to ports of Ecuador and Peru. This company also dispatches vessels northward from the canal to Salina Cruz and intermediate ports on a fortnightly schedule.

The development of services through the canal during the first year of its operation was greatly hampered by the European War. The trade of Europe with countries reached by the canal was

much reduced in volume, and a large share of the world's shipping was made unavailable for commercial uses by the interning and blockading of vessels, the commandeering of ships for military and naval uses, and the actual destruction of a large tonnage of both freight and passenger steamers. It was only the trade between the two seaboards of the United States that was approximately normal; and for that trade the services established via the canal were fully equal to the predictions made before the isthmian route was opened.

The total interruption of traffic for a period of seven months as a result of the Culebra slide of September 18, 1915, coming at a time when the European War had created an abnormal scarcity of shipping, caused many vessels that had been operated through the canal in 1915 to be diverted to other services. It can hardly be expected that all the vessels thus diverted will be restored promptly to their former routes through the Panama Canal. The services through the canal during 1916 can hardly include all the lines and vessels that were in operation in September 1915.