



Digging the Cut

he held a meeting at his home. Any worker with a problem could come to see him. Many an unhappy person took his worries to the Colonel. And dozens of workers stayed on the job because of the Colonel's help in his Sunday-morning chats.

But even the Colonel was discouraged by the landslides. Work-

ers would dig away for weeks into the side of Gold Hill or Contractors Hill. After dynamite had been placed and had blown the face of the rock into pieces, clumsy steam shovels would trundle in to eat away at the broken boulders. Just when a good-sized ditch had been dug, a landslide would begin. A sudden rain might start it, or a loud noise, or perhaps nothing that anyone could see or hear. With a loud crash, part of the hill would slide into the new ditch like a terrible waterfall. The heavy fall of earth would bury men in their steam shovels.

Workers were killed; weeks of work were spent in vain. With more dynamite and other steam shovels the crews would begin again.

It took ten years to do the job. At last, in 1914, the canal was finished. Bright new concrete walls marked three sets of locks — two on the Pacific end of the canal and one on the Atlantic. A huge dam now plugged the mouth of the wild Chagres River. Behind it rose one of the world's large artificial lakes, covering many square miles of jungle.

Now the canal was ready. What ship should be first to go through it? The freight passenger ship *Ancon* was chosen for the honor. This vessel had brought hundreds of workers to their jobs in the Canal Zone. Early on the morning of August 15, 1914, the *Ancon* started from the Atlantic Ocean into the newly cut channel. A few hundred lucky construction workers crowded aboard her for the historic trip. Other hundreds on the Atlantic shore waved to the *Ancon* as she steamed up the channel. Whistles and bands hailed her. At Gatun Locks the shiny new towing locomotives came to meet the ship. The lock gates opened for the first time. Crowds cheered as the ship moved into the lock chamber. The gates swung closed. They worked fine!

Major General George Washington Goethals



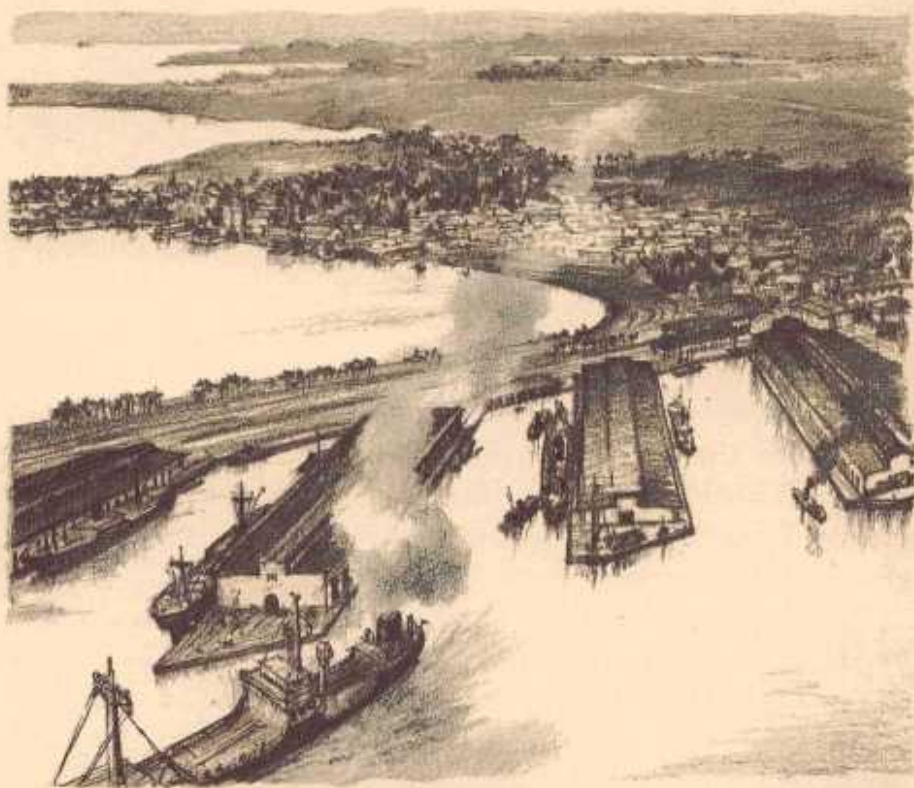
Keeping the Canal Running

Now that the great job of building the Panama Canal was finished, General Goethals was given a special honor. The President of the United States appointed him as first governor of the Panama Canal Zone. Since then each governor has been appointed from General Goethals' outfit, the Corps of Army Engineers, for a four-year term.

The job of running the waterway belongs to the marine director. He is always an officer of the United States Navy, and is chosen for a three-year term.

In addition, many specialists are needed to keep the canal working. Nearly 3,500 United States citizens live in the Canal Zone and work for the Panama Canal agencies of the United States government. These citizens belong to seven hundred professions and trades. Pilots, dredging engineers, lockmasters, lawyers, teachers, tugboat operators, doctors, policemen, mechanics, and shipfitters are only a few of them. Dozens of canal employees or their wives are children or grandchildren of men who came to work under General Goethals when the canal was being built.

Citizens of Panama have an equal chance with United States citizens for positions. Nearly ten thousand Panamanians work for the Panama Canal agencies.



At each end of the canal is a port for vessels

Running this waterway for the world is expensive. In addition to the day-to-day work of getting the ships through, there is the cost of repairs and upkeep. Three sets of locks must be kept working smoothly; every five years they must be overhauled. A large force of pilots must be trained to take ships through. The channel must be dredged constantly to keep it always 42 feet deep. At Balboa on the Pacific coast, and Cristobal on the Atlantic, ports must be kept open to vessels twenty-four hours a day. And

there is also the expense of keeping the Canal Zone the healthful place that Colonel Gorgas made it.

The ships that go through the Panama Canal from all over the world pay tolls to keep the waterway running. An average-sized freight ship pays \$4,000 to go through the canal. It would cost the same ship about \$50,000 and twenty precious days of sailing time to go around South America.

Toll rates are figured by the ton. Ships carrying cargo pay 90¢ a ton. Ships in ballast — freight ships without cargo — pay 72¢ a ton. Ships of the world's navies, passenger ships, and other ships that carry no cargo pay 50¢ a ton. United States ships pay the same rates as do those of any other nation.

The Panama Canal Company is the United States government body that keeps the canal running. Out of the money received



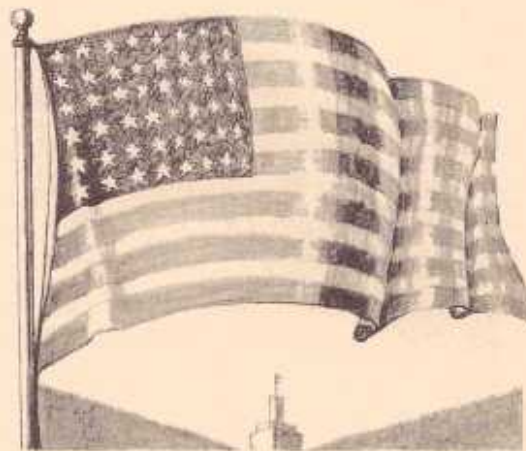
The Canal Zone has been made into a healthful place

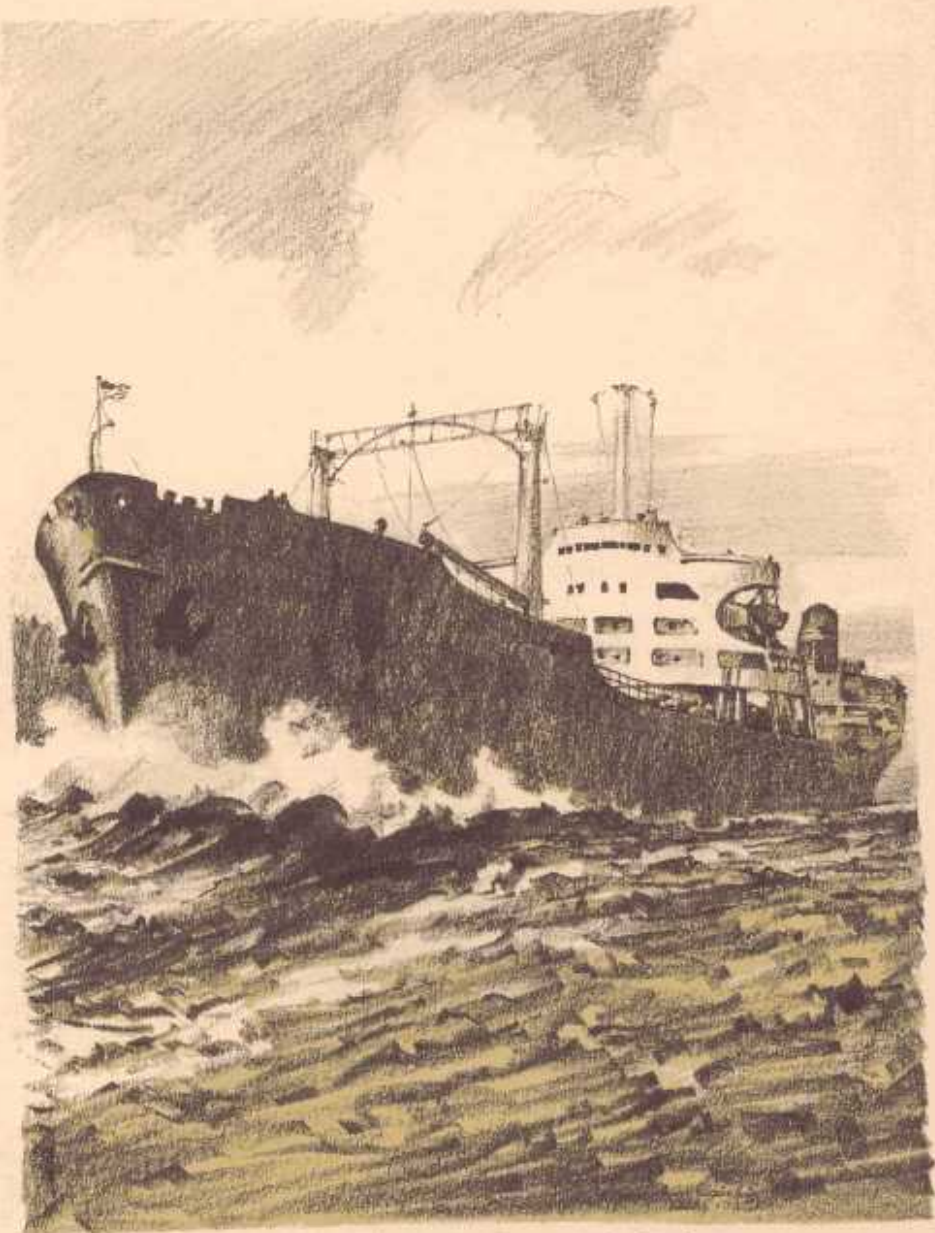
from tolls, it pays \$1,930,000 each year to the Republic of Panama under the treaty agreements.

The United States government provides money each year for employees' housing, schools, hospitals, police protection, and other community services. This money is paid back to the government out of money the Canal Company receives in tolls.

The Panama Canal pays its own way. The United States taxpayers do not spend a cent to keep it running. The United States, on the other hand, does not try to make a profit from the canal.

The cost of military protection for the canal is taken care of by the Department of Defense. It is very, very important that this busy waterway be carefully guarded. The United States Army, Navy, and Air Force all have bases in the Canal Zone; and the country's defense of the Caribbean Sea is centered in the Zone at the headquarters of the Caribbean Command.





Ships of commerce are the canal's chief users

But since World War II the passenger traffic is only half of what it used to be. Many people in a hurry now travel across the oceans by air. That does not mean that the canal is used less, however. It is busier than ever before. People are journeying all over the world now, carrying new ideas and new ways of living to undeveloped lands. And the materials to build up backward countries go by ship. Road-building machinery, dredges to make new ports, steel for new buildings, derricks to pump untapped oil, rails for new railroads, all travel by ship. Much of that cargo goes through the Panama Canal.

The freight ships of the world are the canal's chief users. They funnel through the waterway from 72 different trade routes. The money they save by using this short cut amounts to 150 million dollars a year.

More than half the ships that use the canal are going to or coming from the United States. Important in this traffic are the American ships that sail regularly between the east and west coasts of that country.

Ships that pass through the canal with cargoes bound for the United States carry raw materials mostly. Ores, fuel, and other materials are needed to feed the busy American factories. And some things must be brought in from outside because the United States does not have them at all. Manila fiber for making rope comes through the canal from the Philippines. Rubber comes through the canal short cut from Indonesia and Thailand; coffee from Colombia, Chile, and Peru; tin from Chile and Peru.

Tremendous ore ships carry iron ore regularly from Peru to Philadelphia and Baltimore. The eastern United States needs lumber, too. Ships from the Pacific Northwest and Canada move

through the canal, their decks piled high with lumber.

The United States uses the canal more than any other country. Ships registered in England, Norway, Germany, Japan, Panama, and Liberia are the next most frequent users; but many other countries are grateful for the Panama Canal, too.

Italian, British, Norwegian, and German ships run up and down South America's west coast frequently. They carry machinery and other manufactured goods from Europe to Chile and Peru. They pick up ores, coal, and fertilizers to take back to their home ports. Japanese ships go through the canal almost every day. They take manufactured goods to the east coast of the United States and South America. Then back to Japan they hurry with the coal, pig iron, and steel bars that country lacks.

The magic passageway between the oceans has helped to build up countries far from the canal. Chile, for instance, depends on the Panama Canal as if it were a lifeline. Soon after the waterway opened, nitrate mining became a thriving industry in Chile. Loaded on ships, this mineral for fertilizer went through the canal to the eastern United States and to Europe. Now nitrates are less important because artificial fertilizers can be made, but today Chile trades other cargoes as well. Out of the country's rich earth thousands of tons of valuable copper, tin, and nickel are mined each year. These minerals travel to the United States, England, Italy, and Germany by way of the Panama Canal.

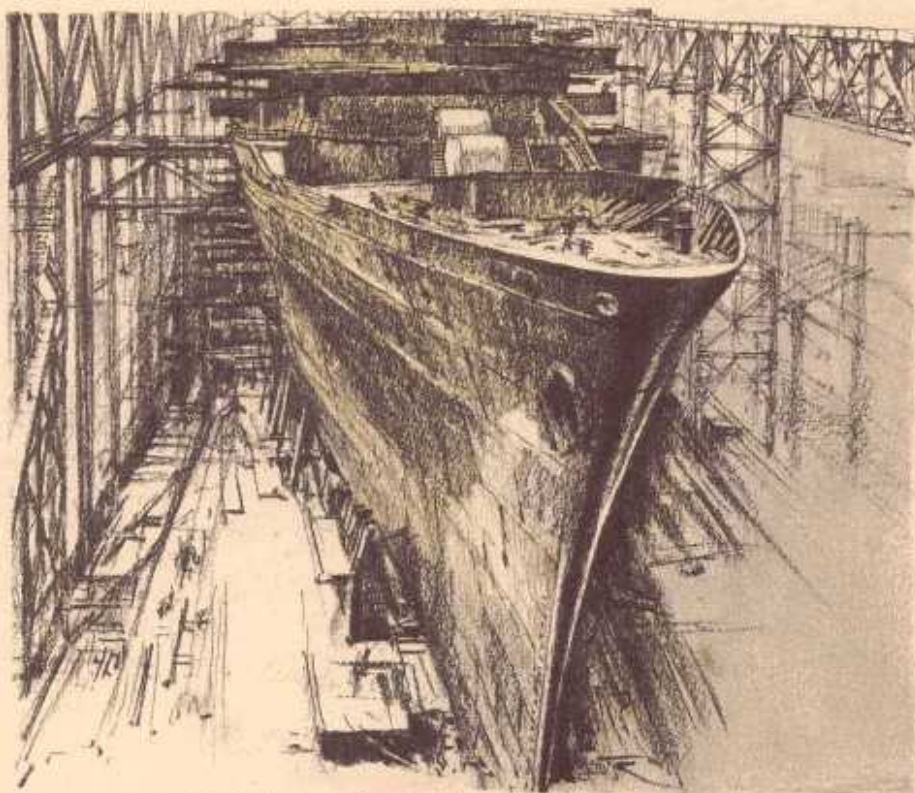
Everything from hairpins to huge steel derricks appears on the cargo lists that ships must present before they enter the canal. By watching the cargoes, a person can trace what is going on all over the world. Trouble in the Near East cut off its huge oil output in 1955. A few weeks later many strange black tankers flying the red explosives flag were steaming through the canal.

Oil to turn the wheels of the world was being carried over a different route.

When the Suez Canal closed for several months in 1957, dozens of strange ships appeared for the first time at Panama. Australian, Free Chinese, and Russian ships — all used to running regularly through Suez — arrived. Some of these ships were like an embarrassed boy at a new school; they were newcomers who didn't know the rules. They all had to be admeasured, since there was no record of their measurements in the Panama Canal files. They had to choose ship's agents to arrange for tolls payment. Many of them did not own a United States flag; they had to send quickly for courtesy flags to fly while going through the waterway.

Headlines in today's papers will be felt in the Panama Canal traffic a month from now. What ships are using the canal? What cargoes are they carrying? Where are they taking their loads? The answers to these questions can change from day to day. The fruit crop fails in Italy and Spain, and ships file through the waterway with extra banana shipments for Europe. A famine strikes in South Korea, and ships carrying wheat to starving people hurry through the short cut. Canada completes a big aluminum- processing plant in British Columbia, and a new trade route is traced on the oceans to carry bauxite ore from Jamaica through the canal to the plant in western Canada.

A freight ship blasts its tremendous whistle as it steams into the Panama Canal. Somewhere, perhaps halfway around the world, something has happened in business or politics to send that ship cruising through the winding waterway. Weather, a revolution, crop failure, a business boom or a depression — all can be marked and charted by the changing line of traffic through the Panama Canal.



Today larger ships are being built than ever before

The Canal of the Future

The concrete lock walls in the Panama Canal stand only 110 feet apart. Those 110 feet are beginning to raise a great problem in the future of the waterway.

When the locks were built, Goethals and his fellow engineers did not dream of today's huge ships, which only modern ship engines have made possible. And the canal's engineers faced a problem. Would lock gates wider than 110 feet be strong enough to stand up to the strain of constant opening and closing? It



A U. S. battleship scrapes through a lock

was thought wisest not to chance too great a width.

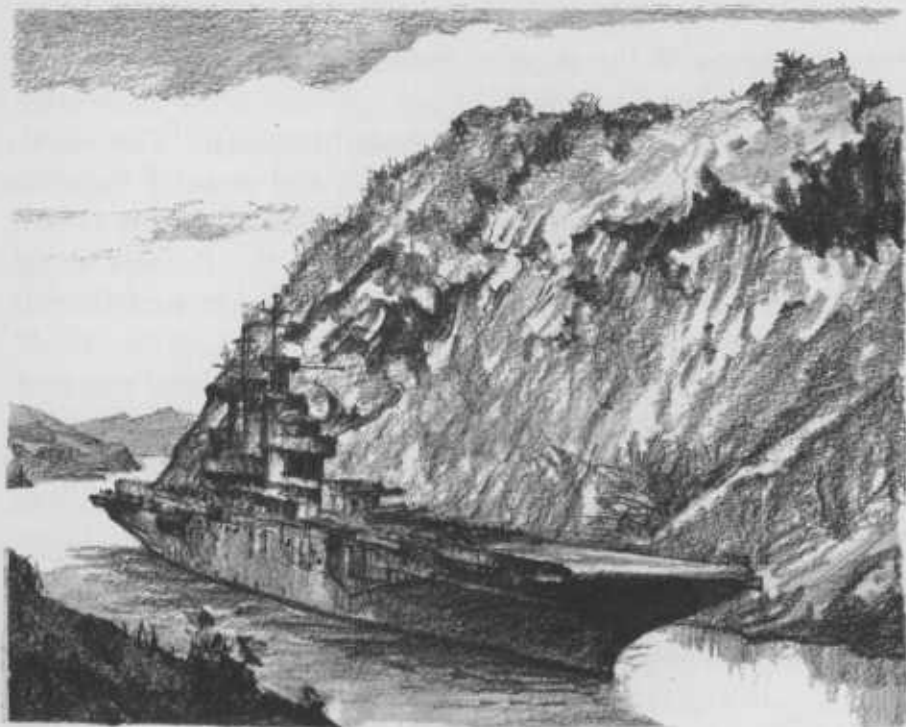
For many years, as stronger engines made it possible to build larger vessels, ship designers carefully remembered the measurements of the Panama Canal locks. "One hundred and ten feet by one thousand," they said to themselves as they drew plans for new ships.

When the *Queen Mary* was launched in 1936, here was a ship 118.5 feet wide. She was 8.5 feet too broad in the beam ever to pass through the concrete locks of the Panama Canal. But that fact was not important. She and her sister ship the *Queen Elizabeth*, which was launched a little later, were designed especially for transatlantic service. They would not need to use the canal.

During World War II the United States Navy launched giant aircraft carriers and enormous battleships. In building all of them, designers remembered the lock measurements of the Panama Canal. No ship must be too wide to pass through that waterway.

All the battleships of the United States fleet can go through the Panama Canal, although they need the help of five pilots to do it. One pilot stands on the bridge and four others are spaced around the ship. They give orders by portable radio as the battleship moves through the locks with only inches to spare. The screeching and scraping can be heard for a mile away as a towering gray monster like the 108-foot-wide *Missouri* is tugged through by ten straining locomotives. Paint has been scraped off the hulls of battleships. The wooden fenders that protect the concrete walls have been splintered. But no big damage has ever been suffered by these giants of the fleet as they passed through the canal.

With the flight decks of the United States Navy's aircraft carriers carefully built to be just under 110 feet, many carriers have been squeezed through the locks. The first big one to pass



A plane carrier in the Cut

through lopped off a lamp post that hung out over the lock tower at Gatun. After that the outstretched necks of the lights were turned around, and the overhanging roofs of the lock towers were put on hinges. Now they could protect the tower crew from sun and rain on most days. But when a carrier came through, the roof could be raised out of the broad sweep of the flight deck.

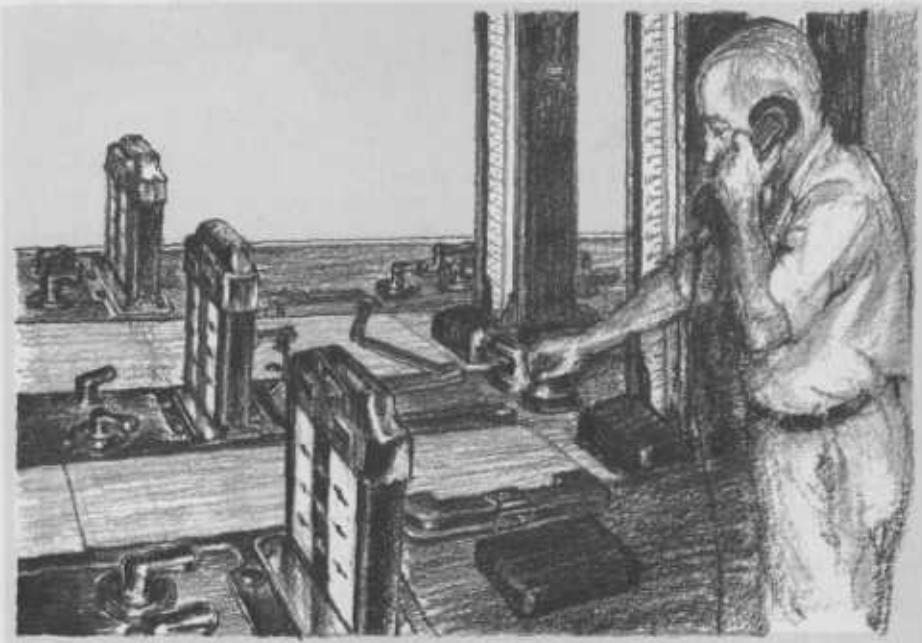
After World War II, when jet planes came into use, it was found that they could land more safely on a flight deck at an angle. The angled landing made the flight deck wider than 110 feet — too wide to pass through the canal. In respect to aircraft carriers the United States now has a two-ocean navy. It takes a

month for one of the ships to go around the Horn, from one ocean to another.

Now several large oil tankers have been built. The canal's 42-foot channel is too shallow for them, and some of them are too long for the thousand-foot-long locks. So far, the big tankers are traveling on routes that do not go near the Panama Canal. But the day may come when tankers that need to pass through the waterway will not fit.

Freight ships are growing in size, too. Panama Canal engineers are beginning to worry. They can see that some day the canal may be too narrow for the trade that uses it most.

Many new ships that will fit the locks are too big to pass another ship in Gaillard Cut. Traffic through the canal is sharply



The traffic control room

slowed down when Gaillard Cut becomes a “one-way street.” Sometimes, while one ship has a “clear Cut,” fifteen or eighteen others must wait in Miraflores Lake or Gatun Lake.

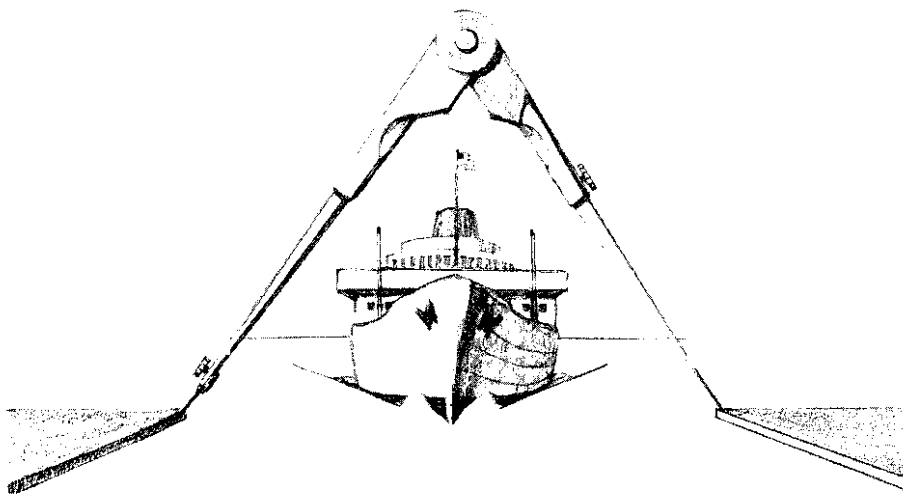
When three or four “clear Cut” ships arrive in one day, the marine traffic control staff has a real problem. They look at their control board as if it were a tight game of chess. What ship should move first in order to save the most time for every vessel? Every ship goes through the canal so that it may save time. Time is money on the high seas, for a crew must be paid, and perishable cargo moved.

Gaillard Cut will soon be widened and dredged to five hundred feet. That has been done already for a short way. But the concrete locks cannot be stretched an inch. The problem of the future is: how can the Panama Canal be enlarged?

The United States Congress took some first steps toward enlarging the canal in 1939. The plan was to build a third set of locks alongside the present ones. Work was started, but stopped after the United States entered World War II. At that time it was important that everyone work to help the war effort.

Congress studied the problem of the canal again in 1947. The effects of bombing during the war had raised a new question. Since one good-sized bomb could destroy the locks, should a lock canal be built at all? Many people felt that the best way to improve the canal would be to dig a new one from ocean to ocean *at sea level*. Then there would be no locks, no dam, and no artificial lake to be protected from air attack.

The sea-level canal plan is for a broad, open waterway free of dangerous curves, and six hundred feet wide. It would be about five miles shorter than the present canal. Ships could pass



through it in half the time they take today, and even big ships could pass each other in its channel.

But what about the big difference in the tides of the two oceans? With a twenty-foot Pacific tide and a three-foot Atlantic tide, would the canal between them stir up dangerous water currents? It has been decided that ships could navigate in spite of the currents. But a tidal lock would make their passage safer. The lock would operate only when the tidal currents ran high. Except for the tidal lock, there would be clear sailing from ocean to ocean.

A sea-level canal would cost over three billion dollars, and would take ten years to dig. Traffic on the present canal would not be closed during that time except for seven days at the very end. In that last week, land plugs would be removed from the channel near each ocean, and Gatun Lake would run out into the sea.

Some other engineers favor another plan for the canal. This

calls for a new set of larger three-chamber locks at Gatun and a three-step set at Miraflores. Pedro Miguel Locks would not be rebuilt. The lake behind Miraflores Locks would be raised to the same level as Gatun Lake.

Deciding how to make the canal bigger and when to do it is the problem of the United States Congress. Pilots continue to put ships carefully through the waterway. Accidents are bound to happen now and then as bigger ships geared to higher speeds move through the narrow locks and dangerous channel. Every few months a ship runs aground or scrapes a lock wall.

Yet the Panama Canal of today stands as a modern miracle of engineering genius. Without any major changes it has worked well since 1914. The trade of the world moves through it; and the commerce of the United States depends on it. Peoples have been brought closer together by it; and it has helped make a better life for millions who live along the 72 trade routes it serves. The oceans have been joined, and a passageway made through the Americas.

All Kinds of Ships Go



Since the *Ancon* passed through the canal on August 15, 1914, all manner of ships have gone from ocean to ocean through this waterway. The largest was the United States battleship *Missouri*, which weighed 45,000 tons.



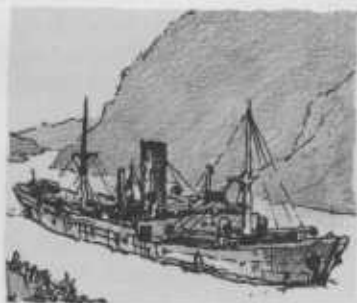
Whaling fleets of several ships, large and small, have gone through the canal.



Probably the strangest-looking craft to go through the canal were the floating dry docks. These huge steel structures were used in the Pacific during World War II. They were too wide to go through the locks, so tanks were fastened to one side of them. As these tanks were filled with water, the side of the dock to which they were attached sank. The other side rose high in the air. Sideways the docks were hauled through the canal.

Through The Canal

Sometimes a ship comes to the canal and the owners cannot afford to pay the toll charges. Such a tramp steamer sits forlornly outside the canal entrance, sometimes for weeks. Finally the money to pay the canal treasurer arrives. The tolls are paid, and the ship goes proudly on its way through the canal.



The smallest boats to go through the canal are little hand-hollowed canoes called "cayucos," made by Panama's Indians. Canal Zone Boy Scouts in teams paddle these tiny craft from the Atlantic to the Pacific in a three-day race each year.



A forlorn-looking, boarded-up ferry boat went through the canal some years ago. The bridge across San Francisco Bay was completed, and the harbor ferry boat was no longer needed. Under its own power it rumbled through the canal, bound for Argentina. There it has a job again, carrying passengers from Buenos Aires to Montevideo in Uruguay.



Panama Canal Facts and Figures

Distances

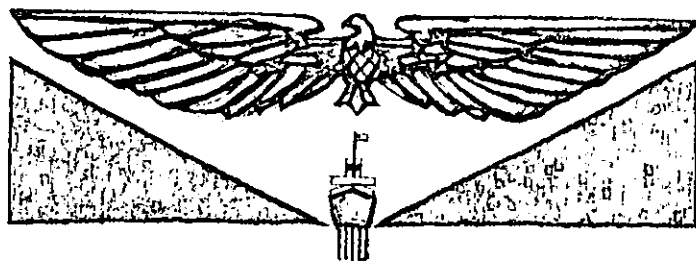
	<i>Miles</i>
Airline distance between Balboa on Pacific and Cristobal on Atlantic	38
Length of canal, deep water to deep water	50
Shoreline distance of Gatun Lake	1,100
Distance saved by ships, New York to San Francisco	7,873

Dimensions

	<i>Feet</i>
Length of each lock chamber	1,000
Width of each lock chamber	110
Depth of each lock chamber	70
Minimum depth of water in each lock	40
Width of each lock gate leaf	65
Height of lock gates	47-82
Thickness of each lock gate leaf	7
Diameter of main culverts to fill locks	18

Numbers

Towing locomotives	70
Towing locomotives used for each ship	4 to 10
Daily average total passages (for 1957)	27.77
Total ocean-going commercial passages in 1957	8,579
Total canal passages of all vessels to July 1, 1957	263,934
Tons of cargo shipped through the canal to Dec. 12, 1956	One billion tons





Other Books To Read

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Fast, H. M. *Goethals and the Panama Canal* Messner 1942
Judson, C. I. *Soldier Doctor; the Story of William Gorgas*
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