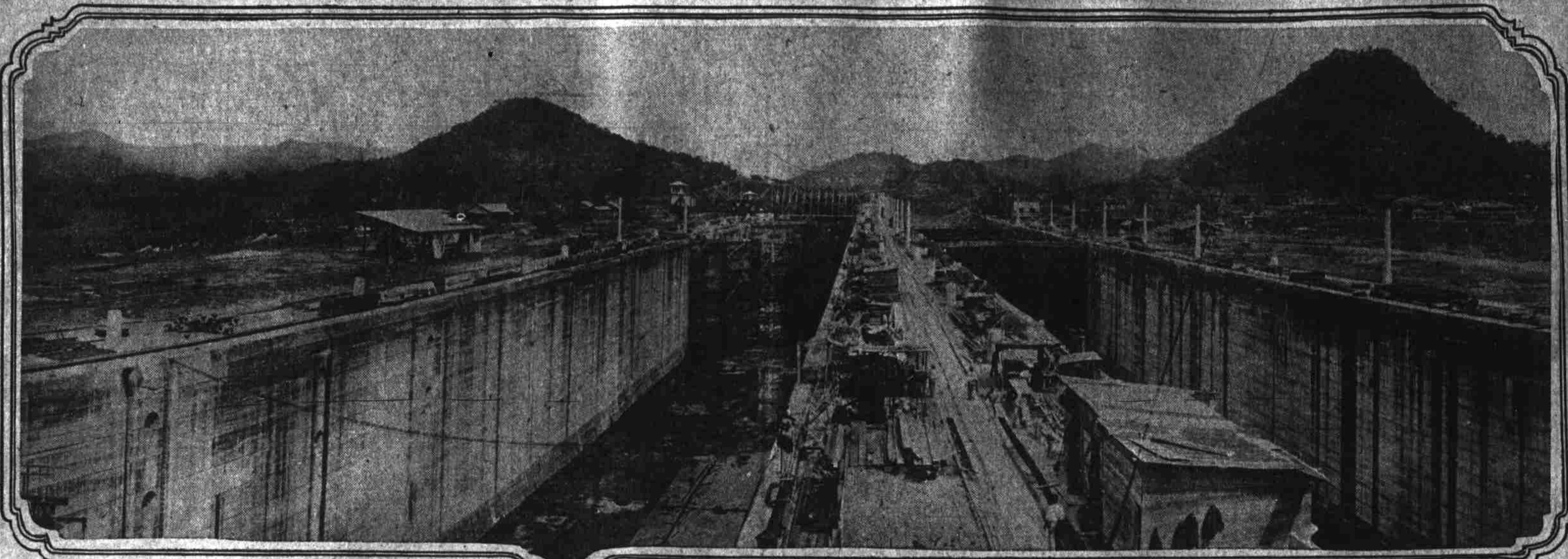


GENERAL VIEW OF PEDRO MIGUEL LOCK LOOKING TOWARDS THE GREAT CULEBRA CUT



Photograph Copyrighted by International News Service.

PANAMA CANAL COMPLETED AFTER NINE YEARS' WORK

(Continued From Page One.)

A supply train leaves Cristobal. It is composed of refrigerator cars containing ice, meats and other perishable articles, along with a number of cars containing other supplies. These are delivered at the stations along the line and distributed by the quartermaster's department in the various settlements.

The Panama canal does not, as is generally supposed, cross the isthmus in an east and west direction. On the contrary its general direction is from northwest to southeast. The Pacific entrance near the city of Panama is 21 miles east of the Atlantic entrance near Colon. The length of the canal, from shore line to shore line is about 40 miles but the additional dredging of a deep waterway to both approaches really makes the canal 50 miles long.

The canal is a lake canal as well as a lock canal, the dominating feature being Gatun lake, an artificially created body of water covering about 194 square miles in the northern half of the portion of the isthmus through which the canal passes. The channel of the canal through the lake is about 24 miles in length. It is intended that the surface of the water in the lake shall be maintained at 37 feet above sea level. This level will not only extend through the lake, but through the Culebra cut, which takes off at the southeastern end of the lake. As the cut is nine miles in length this means that about 33 miles of the journey traversed by ship in passing through the canal will be at a height of 37 feet above the sea. On both the Atlantic and Pacific sides, there is an approach channel, which is an inlet to the sea, extending from deep water to the locks, which will lift the vessels to the level of the lake through which they are to pass.

Locks at Gatun.

In passing through the canal from the Atlantic to the Pacific, a vessel will enter the approach channel in Limon bay, which has a bottom width of 600 feet and extends to Colon, a distance of seven miles. Here it will enter a series of three locks and be raised 87 feet to the level of the lake. Steaming through the dredged out channel of the lake it will enter the Culebra cut. The channel in the Culebra cut is in width from 500 to 1000 feet. After passing through the cut, which has a bottom width of 300 feet, the vessel will enter the Pedro Miguel lock and be lowered 30 1/2 feet to Miraflores lake, which has an elevation of 14 1/2 feet above sea level. Steaming for one and one-half miles through the lake the vessel will then enter the two Miraflores locks and be lowered to sea level, passing into the Pacific through a channel about eight and one-half miles in length, and having a bottom width of 800 feet. The water in the Culebra cut, as well as the approaches in both the Atlantic and the Pacific will be about 45 feet deep. In Gatun lake the depth of the water varies from 45 to 85 feet.

In order to form this gigantic artificial lake it was necessary to impound the waters of the Chagres river behind a big dam. This huge barrier, called the Gaillard dam, is located about seven miles south of Colon at the northern end of the lake. It is a mile and a half long and nearly a half mile wide at its base, about 400 feet wide at the water surface and about 100 feet wide at the top, which is about 105 feet above sea level or 20 feet above the normal level of the lake. It is in reality a low ridge uniting the high hills on either side of the Chagres valley, so as to convert the valley into a huge 11,000,000 cubic yards of material, most of which is spoil from the Culebra cut.

No ship will be allowed to pass through the locks under its own power. Electrically operated towing locomotives will be provided for this purpose. To each ship there will be four locomotives, two on either side of the bow and two at the stern. The towing cables will be attached to the locomotives by winding drums so that it will be possible for the cable to be paid out or taken in while the locomotive is stationed on the tracks. Thus the big ships will be under absolute control at all times. To further safeguard the locks from accident, fender chains will be stretched across them. These chains will be capable of stopping a 10,000 ton ship running at four knots an hour, within 75 feet, which is less than the distance that will separate the chains from the lock gates. These chains can be lowered into grooves in the bottom of the locks when the ship is ready to pass out.

Another safety device in the locks is the system of double gates which have been provided at the entrances to all the locks and at the cover end of the upper lock in each flight, the guard gates at each pair protecting the lower gate from ramming from a ship which

might possibly get away from the towing locomotives and break through the fender chains.

In addition to this there is a movable emergency dam placed at the head bay above the upper locks at both ends of the Gatun lake. These can be swung into place in case of an accident and stop the flow of water from the lake into the remainder of the canal.

The time of transit through the canal for a vessel of the largest type has been estimated at from 10 to 12 hours, depending on the rate of speed maintained in passing through Gatun lake. It will take an hour and a half to send a ship through the three locks at Gatun and the same time to pass it through the three locks on the Pacific end. The Pedro Miguel and the two Miraflores locks. The feat of raising a large ocean going vessel, with a full cargo aboard 87 feet and lowering it to its initial level in the space of these hours would have been declared impossible a half century ago. Yet that is exactly what can be done and what will be done when the canal is thrown open for navigation.

Canal's Cost Approximately \$400,000,000.
The total cost of the canal, including the purchase from the New Panama Canal company (the French combine) and the payment to the Republic of Panama, will closely approach the \$400,000,000 mark. Three-fifths of a billion dollars to dig a 40 mile ditch! This is by far the most costly engineering project in the world. No other engineering marvel has cost \$10,000,000 a mile to build as has the Panama canal.

Over \$15,000,000 of this sum has been spent in making the canal zone habitable and sanitary. At first glance this seems to be an enormous amount of money to spend in cleaning up a place in which few people will reside permanently, yet the engineers say that the sanitation of the canal zone was the chief factor in making the canal a real-

AMERICA SUCCEEDS WHERE FRANCE FAILS

Vigorous Wielding of Roosevelt's "Big Stick" Wins Canal Zone for U. S.

(By the International News Service.)

Colon, Panama, Oct. 4.—When the United States finally took over the work of constructing the big ditch, the first moves made were to eradicate all of the graft and incompetence that ruined the French plans. The canal zone was made clean of yellow fever and malaria by the introduction of sanitation and the draining of swamp lands. The most modern mechanical appliances were brought into use, and the best engineering and brains of America were put to work. While the United States underestimated the cost of constructing the canal, the expenditures being double the first estimate, the estimate of the time came close to being accurate.

Several international commissions of engineers investigated the work upon the canal and reported that completion of the work should be practicable. In 1899 President McKinley sent a commission of engineers to Panama, which commission reported in favor of accepting the offer of the Panama Canal company to sell its concessions and property for \$40,000,000. After a careful investigation of the title of the Panama company, congress in 1903 authorized the president to purchase the franchise of that company and its property for \$40,000,000 and this was done.

Efforts were then made to effect a treaty with Colombia which would allow the United States to go ahead and construct the canal without interference or confusion with Central

AMERICAN POLITICS

Colombia apparently thought it saw an opportunity to get rich quick, and an effort was made to gently "hold up" Uncle Sam. All efforts at treaty making failed because of Colombia's exorbitant demands, which caused much dissatisfaction in Panama, and in 1904 Panama declared its independence of Colombia.

And then Colonel Theodore Roosevelt, as president of the United States, wielded the "big stick" with telling effect. A treaty made between the United States and Colombia in 1904 gave to the United States the right to maintain uninterrupted transit across the Isthmus of Panama, and because of this President Roosevelt directed the commanders of the battleships, Nashville and Marblehead, then in Colombian waters, to prevent the invasion of Panama by Colombian troops. This the warships did, and the American officials in charge of the Panama railroad refused to transport Colombian soldiers. Colombia, unable to do anything to put down the rebellion of Panama, was forced to sit back while the United States soon after officially recognized the Republic of Panama, which republic granted to the United States exclusive control and occupation of the Panama canal zone. The United States under the treaty with Panama, also had military control over the cities of Panama and Colon, with the right to maintain order in those cities by force of arms, which gave us an excuse to quarter troops in them.

Colombia sent a special ambassador to Washington with a proposition that the United States allow Colombia to re-annex Panama in return for which Colombia would greatly reduce her former offer with regard to the canal. Colombia was now very humble, and evidenced no desire whatever to "hold up" Uncle Sam, but the authorities at Washington declined to have any further dealings with that Central American republic.

S. O. S. Call.

She—I am going to order just about everything on the bill of fare. What are you going to call for?
He—I think I'll call for help.—Judge.

COL. GOETHALS IS GENIUS WHO MADE THE DIRT FLY

(Continued From Page One.)

assistant to Lieutenant Colonel Merrill, who this time was in charge of improvements on the Ohio river near Pittsburgh. On December 14, 1891, Goethals was made a captain and placed in charge of improvements being made in the Tennessee river near Chattanooga. This was Goethals' first big engineering assignment. The river was a series of rapids, which made navigation practically impossible. It was Goethals' task to clear the river of boulders and other obstructions and build a channel 14 1/2 miles long, 70 to 100 feet wide and six feet deep.

Completion of the work fell to another, however, for before, Captain Goethals could complete it the Spanish war started and Goethals was made a lieutenant colonel of volunteers and chief of the volunteers' engineering corps. On December 31, 1898, he was honorably discharged from this position and returned to West Point as an instructor in engineering.

When the war department wanted an able engineer in 1900 to take charge of the construction of defenses along the New England coast, Goethals was chosen, raised to the rank of major and sent to Newport, R. I. There he found that besides erecting the coast defenses, he would have to make extensive improvements in the harbors of Hyannis, Nantucket, New Bedford, Vineyard Haven, Fall River, Woods Hole, Chatham, and supervise the construction of bridges across Buttermilk bay and Wareham, Swift, Acushnet, Monomunk and Seekonk rivers.

There was nothing that Goethals liked so much as this active, outdoor life, with the actual command of many men. He was in the midst of the happiness attendant upon the completion of a good job on the New England coast defenses, when he was plucked away to decorate a chair in Washington. He was as-

signed to the general staff of the army, a job which Goethals did not like, but which, nevertheless, is a high honor and a great compliment to a man's ability. Probably the general staff assignment was the best thing that ever happened to Goethals, for while in that connection he met Secretary of War Taft, who was later to call Goethals to the attention of Colonel Roosevelt when a man was wanted to take charge in Panama.

The great opportunity of Goethals' life came after he had been attached to the general staff for four years. In February, 1907, Goethals, still a major, was sent to Panama to aid in the engineering work of which John F. Stevens had charge. Within a few months Stevens retired and President Roosevelt appointed Goethals in his place on the theory that "a military man can't quit." And Goethals didn't quit. Quitting wasn't in his line. So far as he was concerned there wasn't any such word in the English language.

Within a month after he had tackled the world's greatest engineering problem with the energy and vigor characteristic of him, Goethals was made a lieutenant colonel and on December 1, 1908, two years after he took charge in the canal zone, he was raised to the rank of colonel.

Within a few days after his appointment as chief engineer of the Isthmian Canal commission, Goethals was a national figure. Several months after he started work he was a figure of world wide prominence.

Making the Dirt Fly.

"Dig! Make the dirt fly!" This was President Roosevelt's command to Chief Engineer Goethals, and Goethals carried it out to the letter. He dug with tremendous energy. The big ditch had never met such a stubborn person before. It had overcome many able and accomplished engineers, but it couldn't overcome Goethals.

He took immense interest in his work. He realized that there was more to do in the zone than dig a canal. He found conditions there unsanitary and he set about, in military fashion, to make things quite the reverse. He couldn't have obtained better results if he had had out of the mud and equipment of the surgeon general's department of the United States army at his command. He cleaned up the fever, destroyed the mosquito by destroying the swamp lands. He organized a working army of 40,000 men and kept them working in unison, overcoming petty jealousies among the various division commanders. He imported the latest and most modern machinery possible, and insisted that Washington give him absolute free reign in the conduct of affairs in the zone.

There was much objection to making Goethals a little dictator, but he managed to convince the powers that be that unless he had the power of a czar in his own territory he would be able to accomplish but little. He has been called the "Czar of the Zone," the "Solomon of the Isthmus" and the "Dictator of Panama." He was all of that, and then some. He held his own court, settling disputes. In order not to stop work on the canal for even a moment, Goethals held his court on Sunday mornings from 7:30 to 10:00. He would hear complaints, defenses and pass judgments. His judgment was final. No one ever thought of appealing to Washington.

When Colonel George Washington Goethals finished the canal he was 65 years old. That will be in 1915. Greater honors are undoubtedly awaiting him. It has been suggested several times that he be made a major general, outside of the chief of the general staff, the highest rank in the United States army.

Colonel Goethals' Assistants.
Colonel Harry F. Hodges was graduated from West Point in 1881, one year after Colonel Goethals. They had been friends at the academy.

Lieutenant Colonel David Du B. Galliard has been in charge of all excavations in the canal prism except the work incidental to lock and dam construction. This means that it has been Galliard's job to break the backbone of the Isthmus of Panama, and to clear away the debris. It was a sketch of Colonel Galliard in a book called "The Making of the Panama Canal." It is said: "It has been a project that the world will always regard as stupendous. He has unflinchingly shoveled the clay out of the way, much as the householder shovels the snow from his sidewalk, and gone about his business of cutting the backbone of Culebra."

Lieutenant Colonel William I. Sibert, with Hodges and Galliard, is a member of the Isthmian Canal commission. He has been in charge of the building of the great dam and locks at Gatun, and he has had other duties connected with the digging of the canal at the sea level stretches.

BALBOA DUMPS AND NAOS ISLAND BREAKWATER ON PACIFIC END



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