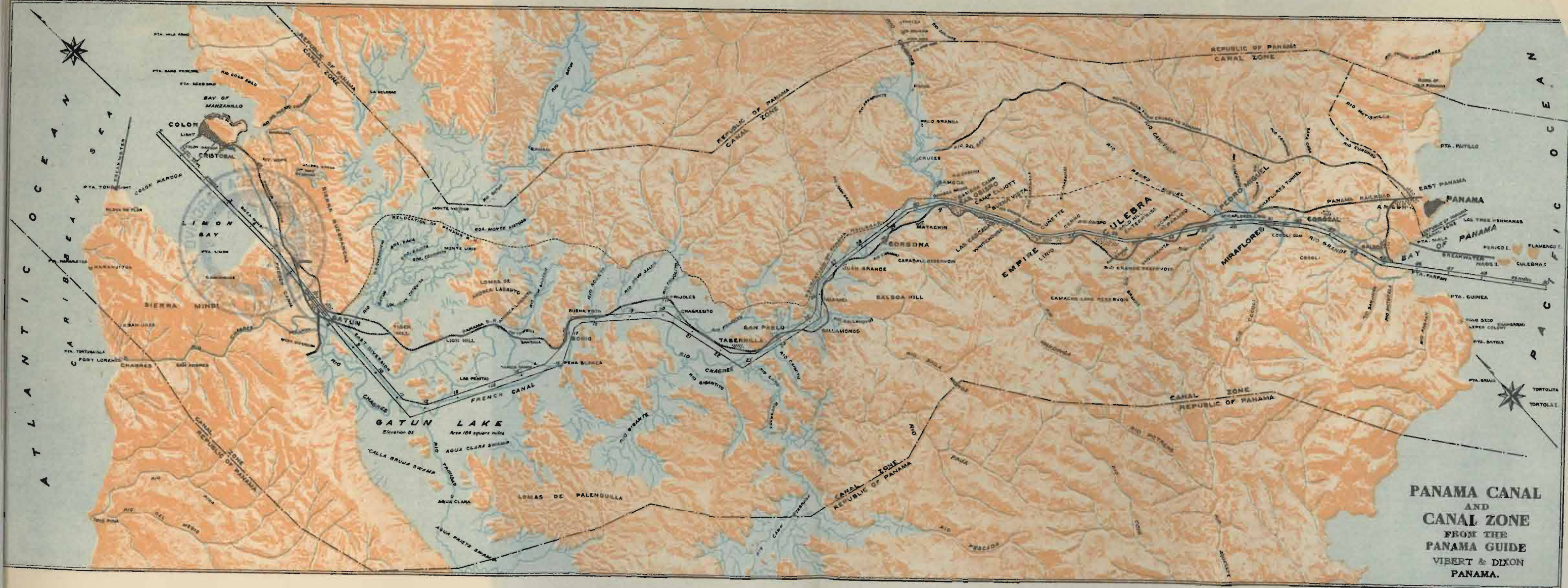


# THE PANAMA GUIDE

BY

JOHN O. COLLINS







# THE PANAMA GUIDE

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JOHN O. COLLINS

I. C. C. PRESS  
QUARTERMASTER'S DEPARTMENT  
MOUNT HOPE, C. Z.

## INTRODUCTION

*This Guide Book answers most of the questions that I have been asked during the past four years regarding Panama and the Panama Canal. It is a compilation from reliable sources. Only a few of the many books on the Panama Canal are reliable, and in my text I have quoted only these: "Panama" by Albert Edwards, "Panama" in Porter's Progress of the Nations Series, "Old Panama" by Dr. C.L.G. Anderson, the Panama Government's school history by Sosa and Arce, the annual reports of the Isthmian Canal Commission, and "The Canal Record" are especially commended to those who wish a deeper knowledge of Panama and the Canal than this guide book can give.*

JOHN O. COLLINS.

Ancon. 1912.

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## The Master Builder.

Everywhere one goes on the Isthmus he will hear: "The Colonel said," and "The Colonel did," and many other references to "The Colonel." "The Colonel" is Geo. W. Goethals, Chairman of the Isthmian Canal Commission, Chief Engineer of the Canal, President of the Panama Railroad, Governor of the Canal Zone, resident member of the Panama Canal Fortification Board in charge of construction, and, combining all these officials in one, he is the autocrat of the Canal Zone.

No one is more careful than Colonel Goethals to give due credit to his predecessors and coworkers for their share in the success of the Panama Canal. It is not an invidious comparison, therefore, to say that no one so much as he personifies that success.

A virtual despot over a little kingdom of 50,000 workers, he shows every day the decision, resourcefulness, and tact that mark a great executive. Some of his coworkers disagree with him in questions of policy, but they all pay tribute to his ability. With the mass of the workers he commands the respect that only able and honest men can win, and such sympathy as is accorded only to very human men.

He is six feet tall, every inch bone and muscle. No one on the force works harder than he. His day begins ordinarily at 7 o'clock in the morning when he takes one of the early trains from Culebra for his tour of inspection. The afternoon is spent in his office at Culebra, and often he works there until his bedtime, 10 o'clock.

On Sunday mornings he holds court at Culebra to hear the complaints or petitions of the workers under him. There is no laborer that cannot get an audience with the despot, no tale so petty that it cannot find in him a patient listener. The knowledge that this is true has a restraining influence on men who might take advantage of petty authority, inspires every worker with confidence, and promotes general satisfaction.

Colonel Goethals' administration began in April, 1907, and since then there have been disbursed under his direction about two hundred and twenty million dollars, without one suspicion of favoritism or of the aggrandizement of himself or any of his subordinates. His record of wise, honest service is quite unique.

Now that his fame is secure, many men are flattering him, great universities have conferred degrees upon him, and many who have watched his work in Panama hope that his country may one day have his services as its President. But no tribute that may fall to him will be counted so great as this—

The men who have worked with and under him believe him Able, Wise, and Just.

Geo. W. Goethals (Colonel, Corps of Engineers, U. S. A.). Born Brooklyn, June 28, 1858. College of the City of New York. Cadet Military Academy, June 14, 1876, second lieutenant Corps of Engineers, June 12, 1880; first lieutenant, June 15, 1882; captain, December 14, 1891; major, February 7, 1900; lieutenant-colonel, March 2, 1907; colonel, December 3, 1909; lieutenant-colonel volunteer service and a chief of engineers, May 26, 1898, to December 31, 1898; General Staff, August 15, 1903, to March 4, 1898; graduate Army War College, 1905. For several years instructor in Civil and Military Engineering at West Point; in charge of construction Mussel Shoals (Tennessee River) canal; member of Board of Coast and Harbor Defense. Chairman of the Isthmian Canal Commission, and Chief Engineer of Panama Canal since April 1, 1907. Governor of Canal Zone; President of Panama Railroad; Member of Panama Canal Fortification Board in charge of construction.



## From Colon to Panama.

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Along the route the tourist travels in crossing the Isthmus today, white men have been traveling for nearly four hundred years. Long before Jamestown was settled the Chagres River was a highway whose name was known to all the adventurers of Europe, and now when Jamestown is untenanted it is again to become a great highway, for the Panama Canal follows its valley half across the Isthmus. From the car window the tourist may see the valley up which men of our race have toiled for four centuries, and within two miles of the place where the railroad crosses the river (at Gamboa) is the village at which the river journey ended and the portage began on the old route to Panama. There was another way, all overland, from Porto Bello and Nombre de Dios to Panama, and the map of the Republic of Panama in this book shows the general route of the old trails. Elsewhere you will find further reference to the river, the trails, and the old cities, as the fortified places were called. In this place it is proposed only to follow the line of the railroad from Colon to Panama, telling briefly the story of each village along the route.

### Cristobal-Colon

This city or overgrown village bears the Spanish name of Christopher Columbus, although for many years it was known as Aspinwall, the Panama Railroad officials having chosen to call it by that name. But the Colombian Government insisted on Colon, and in 1882 when the French began to fill in the portion of the town near the canal entrance, they called their settlement Cristobal, so the joint town, American and Panaman, is called Cristobal Colon. The site was nothing but a coral reef backed by mangrove swamp when Columbus sailed past here on his fourth voyage, in November, 1502, and it remained little more until the railroad builders began their work in May, 1850. That was only twenty years after the first railroad was built in the United States.

It would be wrong to conceive of Colon as having had an uneventful history merely because it is a city young in

years, and even today bears the marks of a construction camp. As the Atlantic terminus of the Panama Railroad it has been a place of international importance ever since the first train crossed the Isthmus. A less prepossessing site for a city could scarcely be imagined, and yet its growth was natural, since it was necessary to locate the docks at this point. It is situated on the Island of Manzanillo, which was formerly cut off from the mainland by a narrow strait known as Folks River. The island itself was a coral reef upon which mangrove trees had taken root and grown up into a tangled mass, catching silt and gradually transforming the reef into a swampy island. Upon this the first shanties and stores were built by the railroad pioneers in June, 1850. In November, 1851, two steamers, unable to land their passengers for California at the mouth of the Chagres River, disembarked them at Colon, whence they were hauled to Gatun on the railroad, there to take canoes for the river journey. From that time Colon became the center of the California transit trade on the Atlantic side, and the village grew rapidly and was very prosperous until the completion of the transcontinental railroad in the United States in 1869, when it declined and once more became only the railroad terminus.

In Otis' handbook of the Panama Railroad, published in 1862, there is a picturesque description of the city of Colon (Aspinwall), which was then at the height of its prosperity as a stopping place for people making the journey to and from California. There were hotels and shops, and warehouses, half a dozen steam and sailing-vessel lines made it a port of call, and the railroad colony was already firmly established in not unattractive surroundings, of which the writer says:

Upon the sea beach at the north end of the island you will first observe the hospital of the Railroad Company, a couple of large airy buildings surrounded by generous tiers of piazzas, about which a general air of tidiness and comfort prevails. Although built for the exclusive use of the company, strangers requiring medical aid are permitted to avail themselves of its advantages. A little to the left is a long wooden building, which contains the lecture-room, library, and clubroom of the employees of the company. A well-selected library of several hundred volumes, and the standard periodicals and journals, may be seen here; there are also materials for a snug game of billiards, backgammon, or chess. Three or four neat little cottages come next along the line of the beach, the residences of the principal officers of the company, with little garden plats in the rear and an occasional coco tree throwing pleasant shadows over them. A little farther on is a fine corrugated iron dwelling, the residence of the

Royal Mail Steam Packet Company's agent; next to this is seen the general rendezvous of the Railroad Company's officials (usually known as the mess house) imbedded in a grove of coco and banana trees. Within fifty yards of the rolling surf, the sea breeze ever laying through the surrounding foliage, it would be difficult to find a more desirable tropical residence. Still farther on to the right are the buildings of the terminus, car repositories, etc., and machine shops whose tall chimneys send up steady columns of smoke, while the ring of many hammers breaks cheerily upon the ear.

First the city built up along the reef near the sea, then back into the swampy land behind the reef. The French added to it in the early 80's by dredging material from their canal channel and depositing borrowed rock and earth upon the swampy land, making a foundation for their employes' village, now a village of American Canal workers, known as Cristobal. When the American Canal builders came here in 1904, Colon had ten thousand people, and about nine thousand of them lived in shanties built on piles. At high tide the houses were surrounded by water, so that no one could walk along the streets back of Front Street without danger of falling into the mire. Since then the town site has been filled in, and the Panamans and the Panama railroad are paying for the work. Colon is clean, well drained, and healthful today, although it doesn't look it. It has 18,000 inhabitants, and there are 2,000 in Cristobal. In 1870 Colon had 8,246 inhabitants, and in 1896, 13,203.

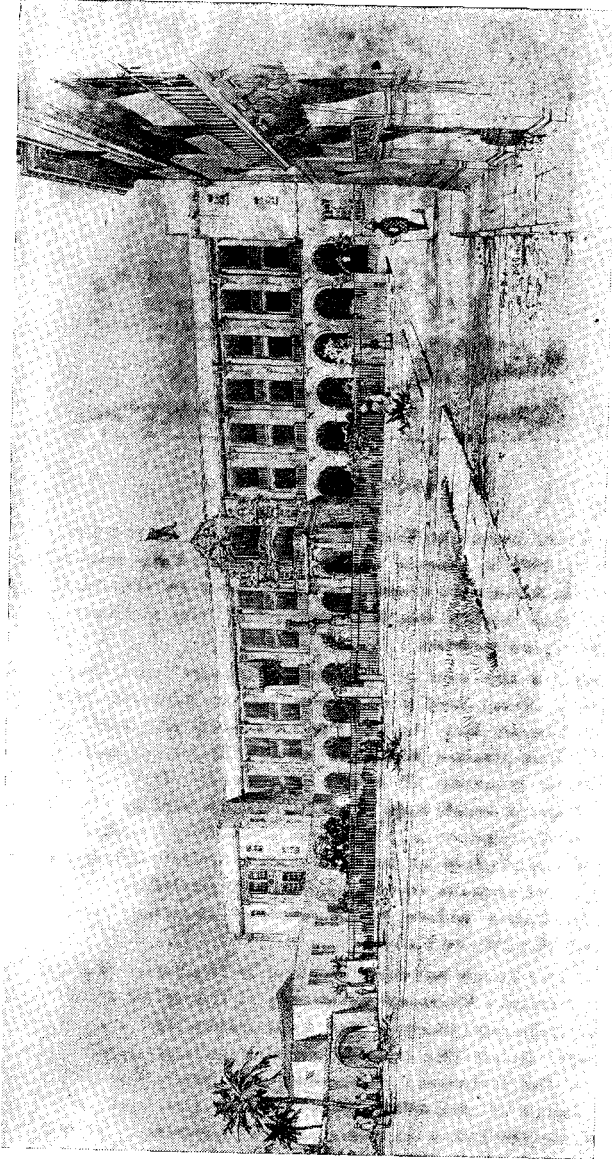
Colon has suffered from several destructive fires, the more important being that of 1885, referred to on page 127, and that of March, 1911, when ten city blocks were burned and 1,200 people left without shelter.

The sightseer in Colon should begin where the settlement itself began in 1850, at the north end of the island, known as Colon Beach. On the site where Washington now is being erected the new Washington Hotel. Hotel, a modern structure of reenforced concrete and hollow tile, the first eating house was built for the railroad employes; and around it grew up the railroad village. It was not an attractive place in the old days, except that the waves were then breaking on the reef just as they are now, and coconut palms were waving before the breeze; and yet to it came to live and give their life's work the men and women who built the Panama Railroad, and were identified with its early history. The eating house later gave place to a large frame structure which in time was itself enlarged. This was recently moved to a site

behind the Episcopal Church, where it now remains in its original character as an employes' eating and lodging house. On a plat of grass in front of the old hotel, on a site now occupied by one corner of the new Washington, a monument was erected to the founders of the railroad, Aspinwall, Stephens, and Chauncey. It is a shaft of red granite on a base of red stone with the busts of the three founders cut on the shaft near the base. It is to occupy the center of a flower bed at the entrance to the new hotel; that is, on the side looking towards Colon, where it will be nearly hidden by plants and ferns, a merciful eclipse, since the monument is very ugly.

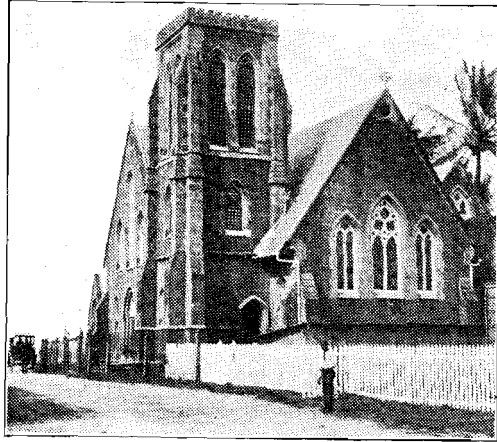
The new hotel accommodates 175 people, having 88 bed rooms, and contains all the baths, toilet rooms, writing and lounging-rooms, dining-rooms, kitchen with modern cooking apparatus, electric lights and fans, and other conveniences that distinguish a thoroughly up-to-date hotel. It is run by the Panama Railroad, that is, by an agent of the United States Government, just as the Tivoli, at Ancon, is conducted by the Canal Commission. The architecture is of the Spanish Mission style modified to suit the local conditions. Broad verandas look out upon the sea and between the hotel and the sea wall is laid out a garden, where palms, ferns, and other tropical plants have been planted. At the east end, the sea wall is blocked out to provide a swimming pool, open on the sea side, 125 by 100 feet and from 3 to 9 feet deep; a baffle wall has been constructed in front to protect it from rough water. There is a breeze here all the year round, and the Washington Hotel will be as cool in July as Bar Harbor, and no warmer in winter time than it is in July. Like the other Government hotels, it will have no bar, but in other respects will be the same as a good hotel at an American summer resort.

The gray stone building in modified Gothic style, immediately west of the hotel site, is Christ Episcopal Church, which was built by contributions from the Christ Church, Hospital, Quarantine. Panama Railroad Company and missionary societies. It was dedicated in 1865 and, except for a few years, when it was used as a Colombian arsenal, barracks, and storehouse, has been a place of worship ever since. At first under the jurisdiction of the Protestant Episcopal Church of the United States, its government was changed to the Anglican Church in 1883, when thousands of British ne-



NEW WASHINGTON HOTEL—COLON





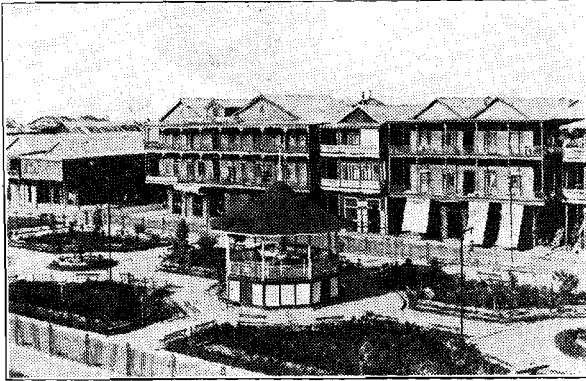
CHRIST CHURCH—COLON.

groes came from the West Indies to work on the Canal, and again in 1907 it passed to the American Episcopal Church, when the American canal work had been established. Both whites and blacks worship here, but the majority of the members are negroes.

Beyond the row of railroad employes' quarters, in the enclosure about half a mile west of the church, also fronting on Limon Bay, is the Panama Railroad and Isthmian Canal Commission hospital with 525 beds, and modern means for treating all kinds of illness. This hospital has grown from a small field hospital established by the Panama Railroad Company in 1851. Immediately beyond it is the quarantine station at which persons from plague and fever ports must remain to complete their period of six or seven days' isolation before being allowed to cross the Isthmus or enter the city of Colon.

On the beach between the site of the hotel and the piers of the Panama Railroad Company is the office headquarters of the railroad whence the superintendent and his subordinates direct the conduct of the railroad and steamship line on the Isthmus. Adjoining the line of piers immediately south of the office building and the hotel site is the Colon freight office of the railroad company. It was built in 1864 and rebuilt after the fire in 1885. This building has

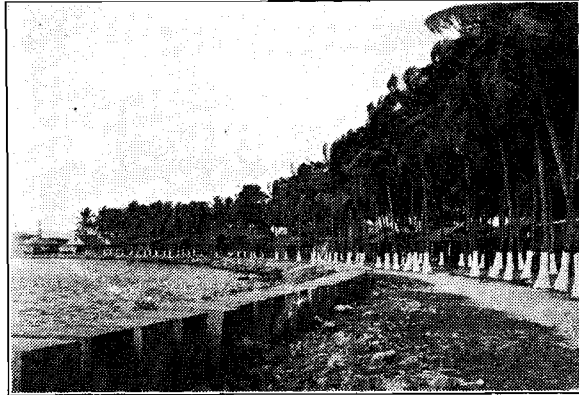
also served as quarters from time to time for Colombian troops, and within its walls in November, 1903, were concentrated the American residents of Colon and the half hundred marines sent there to defend them from the massacre threatened by the commander of the Colombian troops that had recently landed on the Isthmus.



PLAZA—COLON.

Other buildings in Colon worthy of mention are the masonry structures of the Panaman Government—one a public school, and the other a municipal building; the frame building on the water front near the railroad station, which is the home of the Strangers' Club; the brick house adjoining it, in which the Isthmian poet, J. K. Gilbert, wrote his poems, now collected in the book, "Panama Patchwork," and the concrete block railway station. Owing to encouragement by the railroad company, which owns nine-tenths of the land in Colon, there is a distinct tendency on the part of merchants and others to build concrete structures. A Masonic hall is to occupy the block immediately back of the commissary building; the railroad is erecting a three-story building on Front Street, which is to be used as stores and living apartments; and other concrete buildings are in process of erection.

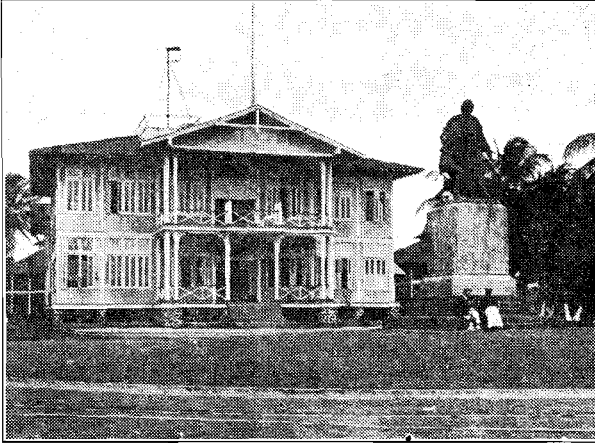
Across the Canal Zone line in the village of Cristobal are the cold-storage and manufacturing plants of the Commissary system, a modern fire-station house, Cristobal. and the old French Canal headquarters, on Cristobal point. One of these buildings was built for Charles de Lesseps, son of the Canal promoter,



SEA FRONT—CRISTOBAL.

and was occupied by him and other canal officials during the French regime. It is now used as offices for the Commissary system and other branches of the Canal administration. Occupying a little knoll on the point is situated the statue of Christopher Columbus, in heroic bronze, in the attitude of protecting an Indian girl crouching by his side. It is said that he is supposed to be explaining away the terror of the girl, but Ferdinand de Lesseps said upon the occasion of his visit in 1880 that he was learning from the Indian "the secret of the straits," and in turn was explaining to her its profound importance. This statue was presented to Colombia in 1868 by the Empress Eugenie, and was set up in the railroad yard in Colon in 1870, but upon request of Lesseps it was removed to Cristobal point. The construction of the docks at this point will again place it in a railroad yard, and it is proposed to remove it once more, this time to set it up in the garden in front of the new Washington Hotel on Colon Beach.

Columbus  
Statue.



COLUMBUS STATUE AND LESSEP'S HOUSE—CRISTOBAL.

Construction work in progress in front of Cristobal is that for a system of five piers enclosing ten docks which will be the Atlantic terminal docks for the Panama Canal. Each dock will be capable of berthing ships 1,000 feet long, and the space between the piers (300 feet) will be sufficient to allow two ships to enter and dock at one time without danger of collision.

Across the bay from Cristobal is the canal settlement of Toro Point, where live the men who are constructing the breakwater at the entrance to the canal and those who are building the fortifications, which are to guard the west side of the entrance. The fortifications for the east side will be on Margarita Island, about a mile north of Manzanillo Island on which Colon is situated. In what may be considered the back yard of the city are situated the Panama railroad shops, where the railroad equipment is erected and repaired.

Farther south along the line of the railroad are the unloading docks for canal supplies, the dry dock and marine shop at Mount Hope, and the main storehouse for canal and railroad supplies. Here also, on the east side of the railroad, covering the knoll opposite the warehouse, is the Mount Hope Cemetery, which has been the burying

ground of Colon and Cristobal from their beginning. Its original name was Mount Hope, although there was a period during the French regime when it was referred to as Monkey Hill, on account of the presence there, in early days, of a number of the monkeys which are found in the woods all over the Isthmus.

At the Marine Shop the French erected the dredges and other equipment with which they carried on the Atlantic entrance work. Their plant was enlarged and the dry dock rebuilt by the Americans so that the equipment now in use in the Atlantic entrance could be repaired. Five dredges, half a dozen tugs, a fleet of barges, and a dozen small launches are kept in repair here. The work is in charge of Maj. Chester Harding, Assistant Division Engineer.

The original storehouse at Mount Hope was burned in April, 1907, and the main building, erected immediately afterwards, is of sheet iron with concrete fire walls dividing it into compartments which are connected by automatically closing doors. The stores consist of 12 buildings with 249,000 square feet of space, and the stock on hand in 1912 was valued at two million dollars. One of the parts is a modern printing plant under the management of an American printer, Mr. Albert P. E. Doyle. Its work includes *The Canal Record*, the *Official Handbook*, *The Panama Guide*, and all the stationery and other work of the Canal and Railroad, except the annual reports. Along the old French canal are the unloading docks with berths for three ships, and here nine tenths of the Canal freight is unloaded. The initial accounting for all this freight is done at the Mount Hope Depot, by the staff of the Depot Quartermaster, Capt. Courtland Nixon, who is in charge of the storehouses, printery, and docks, but 90 per cent of the freight is delivered direct to its destination along the Canal, only a small part being kept at Mount Hope.

A shopper's guide to Colon is published herewith, and by referring to the map of the city the tourist can readily find the location of any shop with relation to

Shopping and one of the principal buildings of the city. Eating in Colon. In general it will be found that European and Asiatic goods are cheaper here than in stores in the United States, but considerably more costly than in European cities. There are a number of novelty shops in which souvenirs of the Isthmus are sold, but one will find very little that is characteristic of Panama because there are few industries in the Republic other than agriculture.



Only employes of the American Government on the Isthmus are permitted to buy goods at the Panama Railroad commissaries, and only coupons representing cash are received in payment.

There are not many good eating places in the city, because most of the people live in their own homes, and the balance, being nothing but bachelors, get along as best they can with the thirty-cent meals at the Canal and railroad mess halls, or in private eating clubs. One can always get a good meal in pleasant environment at the Strangers' Club, but few visitors are so fortunate as to have guest cards.

**Coach Rates** The rates for coach fare in Colon are given in the following table expressed in American currency. Panaman currency has the same face value as American, but the Panaman coin is twice as large as the American.

		PERSONS.			
		One.	Two.	Three	Four.
One coach, per hour.....		.75	1.00	1.25	1.50
Between any two points in Cristobal.....	One way...	.10	.20	.25	.30
	Round trip	.20	.35	.45	.50
Between any point in Cristobal and any point in Colon, including Colon Hospital.....	One way...	.10	.20	.25	.30
	Round trip	.20	.35	.45	.50
Between any point in Cristobal and any point in Colon beyond or east of Colon Hospital.....	One way...	.15	.30	.40	.50
	Round trip	.30	.50	.65	.75
Between Mount Hope Pumping Station and I. C. C. corral... ..	One way...	.10	.20	.25	.30
	Round trip	.20	.40	.45	.50
Between Mount Hope pumping station and any point in Cristobal or in Colon south of 11th street.....	One way...	.25	.50	.65	.80
	Round trip	.50	.85	1.10	1.25

#### SHOPPER'S GUIDE.

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### Mindi.

At this point the Mindi River flows into the bay, and here also the French Canal Company had begun to construct a viaduct for the relocation of the Panama Railroad, required by the construction of the canal. The stone piers for the viaduct may still be seen in the fields on the east side of the railway tracks. The section between Colon and Gatun through which the train is now passing was one of the most difficult for the builders of the Panama Railroad to construct their line through, because it is low, marshy land. The old line ran a few hundred feet west of the present line up to Gatun, but it was necessary to abandon this in 1909 on account of the construction of Gatun Dam, which runs across the old location of the railway. On the left, as the train nears Gatun, may be seen a large dyke of earth paralleling the railroad track. This was constructed for the purpose of holding material from the hydraulic excavation of the canal immediately north of Gatun Locks.

## Gatun.

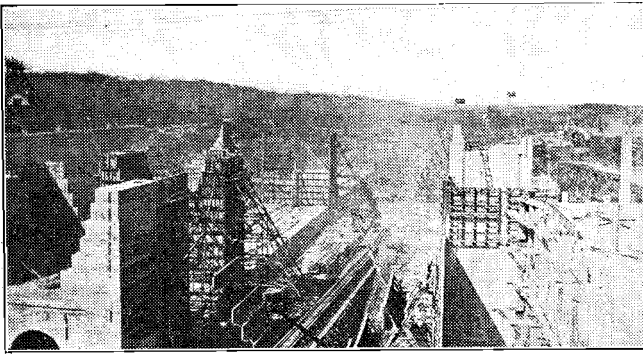
As the train enters Gatun (name probably derived from "gato", (cat,) as applied to the smooth-running river that joins the Chagres at this point) one may see on the right the walls of the locks rising above the level of the surrounding country, and beyond them the long low mound which is Gatun Dam. The steel towers seen on either side of the lock walls support the cableways on which concrete is handled from the mixers into the forms. The first stop is at New

Gatun, and here, by looking out of the window, one may get an idea of the two sections into which every large village of the Canal Zone is divided—the "native" and the "American" sections. The native section is not inhabited exclusively by natives of Panama, but largely by West Indian negroes and European laborers. It is the part in which one finds the saloons, small retail stores, and the lodging-houses and apartments which are so generally preferred by the negro laborers to the quarters furnished free by the Government. The "native" town is the center of the non-American life. Beyond it is the American settlement, a series of frame houses, all of one type, varying in size according to the salary of the official or employe who occupies them. Here are the family and bachelor quarters for Americans, the mess hall, lodge hall and church, post office, commissary store, and administrative offices.

Hold on to your hat when you alight at Gatun because this is the breeziest place on the Isthmus. The tourist will do well to go direct to the building on Locks, Dam, the hill, in which is the office of the Division Channel. Engineer of the Atlantic Division, Lieut. Col. Wm. L. Sibert, and the administrative staff under his direction. From the veranda of this building the best view of the canal that can be obtained from any one point is afforded. Looking northward one can see the waters of Limon Bay, the masts of shipping in the harbor of Cristobal and Colon, and, nearer, the dredges at work in the Atlantic entrance to the canal. Looking into the valley the locks are seen, and beyond them the dam in process of construction. The plans of the locks and dam are referred to in the section of this book devoted to the canal. The method of construction can be seen from the veranda.

The locks are placed in a hill on solid rock, and are three parallel concrete chambers forming three distinct steps for

the purpose of lifting ships from the sea level to the lake section or lowering them from the lake to sea level. The dam is composed of two long mounds or toes of rock and earth running parallel to one another and, on the natural level of the ground, about 1,200 feet apart. Between these mounds an impermeable mass of sandy clay is pumped by suction dredge. The water flows off, allowing the impermeable core to remain between the rock toes. About half way across the valley the spillway is being constructed through a hill for the purpose of regulating the surface of Gatun Lake, in order that the water in flood-time may not



CONSTRUCTION OF CONCRETE WALLS OF GATUN LOCKS.

rise so high as to threaten the destruction of the dam. On procuring permission from the office, the tourist may walk down to the locks and cross the chambers upon one of the construction bridges, or, if he is ambitious and willing to undertake a fruitless climb, he may descend into the locks themselves. From the construction bridges one gets a very good idea of what the locks are like, for he sees them in all stages of construction, from the completed walls to those now in process of building, and from the completed gates at the south end to the gates now being erected. (See page 78.)

Gatun was not always a brand-new village perched on a hill overlooking the valley. Says *The Canal Record*:

The old village of Gatun, which lay on the river flats below the present town was abandoned in 1903, and the site is now covered by feet of rock and earth under Gatun Dam. At the time it was abandoned, the village contained a church, priest's house, school, a

dozen small shops, and ninety or more small houses of all descriptions, from the bamboo hut with palm thatch to the typical sheet iron roof shanty. Most of the buildings were moved to the new townsite, now known as New Gatun. The railroad line also ran through the dam site and as soon as the present line into Gatun was opened, this likewise was abandoned, and the station building was razed. By the middle of 1909 the last vestiges of the old village had disappeared before the encroaching work on the dam.

The antiquity of the place is uncertain, because none of its buildings were of masonry. In his narrative of the pirate Morgan's march to Panama in August, 1670, Esquemeling says: "The first day they sailed only six leagues, and came to a place called De los Bracos. Here a party of his men went ashore, only to sleep and stretch their limbs, being almost crippled with lying too much crowded in the boats. Having rested awhile, they went abroad to seek victuals in the neighboring plantations; but they could find none, the Spaniards being fled, and carrying with them all they had."

The location on the river corresponds to that of Gatun, for six Spanish leagues equal about nine miles, and even if the situation of De Los Bracos is not identical with old Gatun the narrative indicates that the region thereabouts was somewhat settled. It is also known that the Spaniards had erected a fort on a hill 120 feet above the river, overlooking the town, which was probably one of the outposts they had established at various points along the isthmian trade routes. Evidences of the old fort are found to-day, and the site is shown on the original land-map made for the Panama Railroad in 1855. At that time the village had about one hundred buildings of all kinds. Writing of it in 1861 Otis says it was a village composed of forty or fifty huts of cane and palm. In the early days of the California immigration it was the first stopping place in the canoe journey up the Chagres, where "bongo-loads of California travelers used to stop for refreshments on their way up the river, and where eggs sold four for a dollar, and the rent for a hammock was two dollars a night."

In 1881 the French chose Gatun as the site for one of the canal residencies, erected machine shops there, and built a number of quarters for laborers, calling the new section, "Cite de Lesseps." This continued as a center of the work of excavation until 1888, when all operations ceased, not to be resumed here until 1904.

When the Americans arrived in 1904, Gatun was the center of a comparatively large river trade. Bananas and other produce from the Gatun, Trinidad, and Chagres Rivers, were brought there for transshipment by rail, and for sale. Once a week, a shipment of from seven to nine carloads of bananas was made, and on the shipping day, as many as a hundred canoes would tie up at Gatun.

### The Lake Villages.

From Gatun the original course of the railroad lay through the bottom-land along the Chagres River. But on account of the forming of Lake Gatun, the reservoir for the upper level of the canal, the line now leaves the river course, and turning eastward makes a detour around the east side of the lake region. Just before the old line was abandoned *The Canal Record* printed the following article:



The villages between Gatun and Matachin will be covered by the water of Gatun Lake. They have never been important in the sense of size, or as the center of any peculiar type of life. In fact they are little more than jungle hamlets, yet they have a distinct place in American history, because they were known to European civilization many years before Jamestown was settled or Massachusetts Bay was an English colony.

In *The Canal Record*, November 29, 1911, there was republished a letter in which attention was called to the fact that the names of some of these villages appeared on the map published with Esquemeling's narrative of the Buccaneers in 1678. Most of them antedate that time, for they were not named by the English who plundered with Morgan, but are spoken of in Esquemeling's book as places already known, and invariably they bear Spanish names. It is probable that most of them date from the early days of navigation on the Chagres River, when it was one of the most-used routes for commerce across the Isthmus. Among these are Ahorca Lagarto, Barbacoas, Caimito, Matachin, Baillamonos, Santa Cruz de Juan Gallego, and Cruces (Venta Cruz).

As early as 1530 Spanish ships sailed down the coast from Nombre de Dios and entered the Chagres, whence their goods were transferred to canoes and taken up the river as far as Cruces, a distance of 36 miles from the river mouth, near the point where Culebra Cut begins. From Cruces they were taken overland to Panama. At times

**The River Route.** of high water, when the stream could be navigated readily by shallow boats, this was the easiest route across the Isthmus, although the trails from Nombre de Dios and, after 1586, from Porto Bello, were kept open and were much used by pack trains. The harbor at the mouth is not so safe as those at Nombre de Dios and Porto Bello, and yet that the trade by this route was not inconsiderable is attested by the fact that the entrance to the Chagres was guarded by a fort (San Lorenzo). The river hamlets were of the type of the settlements that grew up along the highways during the days of travel by coach and saddle, and their people probably subsisted as much by the trade they drove with travelers as by the products of their own fields. Yet Esquemeling speaks of cultivated fields, so there was undoubtedly some farming along with the travel trade.

The river trade became steadily less after the reign of Philip II, because Spain's monopoly was gone, and the all-water route to Peru by the Strait of Magellan was found less dangerous. But this was because the trade itself was less, for the Chagres route continued in use up to the time of the completion of the Panama Railroad in 1855. Since then the villages in the lake region have been "way stations," with two brief periods of prosperity—one when the French were working near them, and the other when the Americans were carrying on their operations. (See reference to abandonment of Isthmian route, page 119.)

The region in which these lake settlements are situated will probably not be under water before August, 1912, but the railroad track was torn up in February, and therefore the native hamlets and American canal settlements are being moved, the houses torn down to be erected again elsewhere, or in the case of shacks merely abandoned in the jungle. It is difficult to persuade some of the inhabitants that the inundation will ever take place. One old bush

settler, after receiving repeated warnings heedlessly, ventured it as his opinion that the Lord had promised never again to flood the earth. Such people as these will be assisted in their moving, because the present hamlets will be isolated when the railroad is torn up and in case of a sudden rise in the river, with the backing up of water after the Gatun spillway dam is raised, it would be difficult to rescue them.

In this blotting out of the river hamlets and of one of the world's historic trade routes, nothing of value will disappear—only a few shabby hamlets, and a hundred or more isolated huts in the jungle—while the river route will give way to the canal, and the railroad to a straighter and better line outside the lake area above all danger of flood.

In the hamlets and the jungle there are three distinct types of buildings, in addition to the quarters for Canal employes. Of these the most picturesque and primitive is the open hut in the jungle, which consists of a palm thatch raised about eight feet above the ground on bamboo poles.

#### **Jungle Hamlets.**

Here a bush family has its incongruous being, for this jungle home is often within sight of the railroad trains, and within it one sees plantain being fried in a modern kettle over a modern brazier, while the drinking water is dipped with a gourd from a square, 5-gallon-capacity oil-can. A little more advanced type of dwelling is the pretty hut made of closely set bamboo sticks, sometimes plastered with mud, and with the broad overhanging thatched roof, in which lizards and bugs rustle about day and night. There are none of the more substantial native huts, found in some of the villages in the interior of Panama, built of clay blocks and covered with overhanging pantile roofs. The third type of house, although more modern, can scarcely be considered an advance on the bamboo hut. It is built of lumber and covered with a corrugated-iron roof. Old residents of the Isthmus say that this type is due to the easy pilfering of lumber and roofing iron, left in storehouses and on isolated buildings by the French canal builders, and that it was unknown before 1885. Usually these buildings have been arrested in dissolution by patches of soap boxes or tin flattened out from old cans, which gives them a motley look. The village stores are little better than this latter type of dwelling. Here and there one sees in a settlement of such nondescript houses, the trim little cottages built by the French and more recently used by the Americans; and the more airy and well screened quarters of the American canal period. These, however, are late additions. The original villages were jungle settlements existing because of the isthmian transit.

The next settlement of any importance up the river from Gatun is Bohio. Between these two villages are three hamlets—Lion Hill, Tiger Hill, and Ahorca Lagarto—none of them numbering over half a dozen huts and without any apparent reason for existing except that some bush negroes or natives happened to settle there.

#### **Bohio.**

The two first mentioned are essentially railroad camps that have existed since 1851, when they were successively the terminus of the road. Ahorca Lagarto, however, is on a bend in the river, and may well have been a resting place for the cramped travelers in canoes. Of the origin of its name Otis says: "Ahorca Lagarto, 'to hang the lizard,' deriving its name from a landing-place on the Chagres near by; this again, named from having, years back, been pitched upon as an encampment by a body of

government troops, who suspended from a tree their banner, on which was a lizard, the insignia of the Order of Santiago." In 1908 it had sixty-two inhabitants, of whom three were white, two yellow, and the balance negro.

Bohio appears to have been another bush hamlet in 1862 when Otis wrote. Until recently it has been called Bohio Soldado (Soldier's Home.) The French made it the site of one of their district headquarters in 1882, erected a machine shop on the west bank of the river and did considerable work there under the old sea-level plan for a canal, which was excavated to this place to a sufficient depth for light draft boats. Here as well as at any place can be seen today the plan of the sea-level canal, which included the main channel and two large diversions or drainage ditches one on each side of the canal proper.

Under the French plan for a lock canal, Bohio was the site for the first dam, and the excavation for the locks at this point can be seen in one of the hills on the opposite side of the river from the railroad. As it has existed during the American regime the village has been a relic from the French period. Such surveys, investigations, and excavation as were necessary here were done by men occupying the French houses. In recent years Bohio has been the center of a small local trade in vegetables, brought in from the jungle by canoe and pack animals, in exchange for groceries and liquors sold in the Chinese and native shops. At the time of the official census in 1908, it had 526 inhabitants, of whom 447 were colored and native, 69 white, and 10 Chinese.

At Bohio the Americans carried on investigations in 1904 and 1905 to determine whether that location would be used for locks and a dam, and in 1909 excavation by hand and with steam-shovel was carried on to remove a small hill and part of a dump made by the French, which stood in the canal prism. Across the river, where the machine shops were situated in the French days, and where they carried on work for the lock emplacement, the edge of a hill is now being removed by a contractor. The work at this point is typical of all that between Gatun and Culebra Cut, consisting as it does of the excavation of small elevations in the canal channel and the toes of the hills that project into the prism.

Near Bohio are the hamlets of Peñas Blancas and Buena Vista, both on the river, and each merely a collection of huts of various descriptions. Frijoles (beans) is the next railway

**Frijoles.** station, a village of 784 inhabitants in 1908, of about a thousand when it became a center for relocation work on the Panama Railroad, now being rapidly deserted. Here for many years an old Frenchman ran a distillery in which he made rum of such good quality that he boasted that it was sold in Colon to rectifiers who made it into "genuine French cognac." One of the familiar sights of this hamlet is the village washing-place, a pool near the railroad tracks, formed by the swirling of the water in the Frijolita River at a point where it is turned at right angles to its previous course by the interposition of a bank of clay and rock. The method of washing clothes among the lower-class natives and West Indians can be observed here. This also is locally known as the place where one may buy bananas of peculiarly delicious flavor.

Frijoles is mentioned in Otis' guide book published in 1862, but the next village, Tabernilla (little tavern), although it appears on the Harrison-Arosemena map, is not. It was one

**Tabernilla.** of the centers of the French works, and there was a small field repair shop at this point, with a few buildings that served as quarters for the working force. During the American occupation it became a village of over two thousand inhabitants (2,079 in 1908), because here is situated the largest dumping ground on the canal work. The location was chosen in 1906 because it is on the main line of the railroad, outside of the canal prism and afforded a plot of ground two miles long and almost as wide for wasting of spoil. In all about sixteen million cubic yards of material were wasted here, all of which will be below the level of the lake. The dump was abandoned at the close of 1910, and immediately the village population decreased, the people remaining there being largely employes with families who could not procure quarters elsewhere. These are now being moved because the demolition of the place is under way.

Between Tabernilla and San Pablo the railroad crosses the Chagres River at Barbacoas. The original bridge was built of wood, but early in the history of the railroad it was replaced

**Barbacoas Bridge.** by a bridge of six wrought-iron through-plate-girder spans ranging from 101 to 109 feet in length, supported upon seven masonry piers. This bridge is mentioned by Otis in 1862, and is said to have been one of the first of its type ever constructed. It was not built however to carry such heavy rolling stock as that placed on the road by the Americans, and so the three channel spans were replaced in 1908 by heavier girders, while the floor system of the three remaining spans of the old bridge were reinforced.

San Pablo (St. Paul) was originally a plantation worked by Catholic priests. It was a railroad station in 1862, was a laborer's camp in the French days, and during the American

**San Pablo.** occupation has been a small canal village. It also is being demolished, and the last excavation in the lake region is now in progress there. Across the Chagres River from San Pablo is Caimito, one of the names found on Esquemeling's map. It was a canal labor camp in the French time and also under the Americans until the work at that point was finished. Of this class, also, is Mamci, likewise a railroad station in 1862, and little more than that today, although it was the location of several quarters for Canal workers a few years ago.

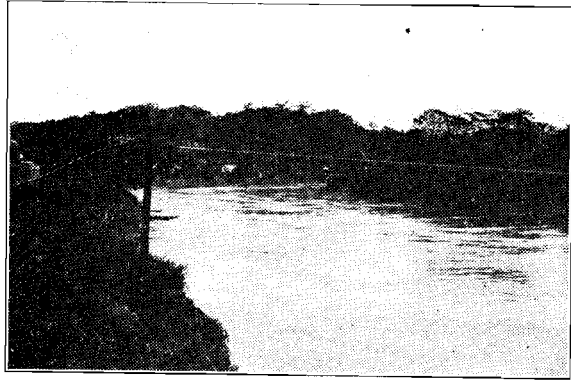
Gorgona bears the name given by Pizarro to an island off the coast of Colombia, near Buenaventura, because he found around it such treacherous currents. It may be that this name

**Gorgona.\*** was adopted arbitrarily, or that the Chagres River travelers found in the river at this place some eddies that reminded them of the currents at Gorgona Island. Of this place Otis says: "The native town of Gorgona was noted in the earlier days of the river travel as the place where the wet and jaded traveler was accustomed to worry out the night on a rawhide, exposed to the insects and the rain, and in the morning if he was fortunate regale

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\*Gorgona means sea-fan. The island off Colombia was named after the zoophyte. The whirlpool took its name from the island which it is near. For Balboa Hill see page 207.

himself on jerked beef and plantains. In the French time large shops were situated here, at the point where the American shops now are, known as Bas Matachin.



SCENE ON THE CHAGRES RIVER AT GORGONA.

Gorgona should not be classed with Gatun and Bohio as a purely jungle hamlet, because it appears to have been a settlement of some size long before the railroad was built. It was one of the places at which the river travelers stopped for the night, and all about it were cultivated farms. At the time of the first Canal Zone census in 1908 its inhabitants numbered 1,065 whites, 1,646 blacks, and 39 Chinese a total of 2,750. The population has increased owing to the expansion of work in the shops. The site of the shops and the lower parts of the village will be covered by the water of Gatun Lake, and therefore, the shops will be moved in about a year to the site reserved for the permanent marine shops at Balboa.

This is the Spanish word for butcher, and this village, or the site of it, also appears on Esquemeling's map. There-

fore the current Isthmian-folk etymology Matachin. that it is a combination of the words "matar," to kill, and "Chino," signifying a wholesale death among Chinese laborers engaged in the construction of the Panama Railroad, is erroneous. For years this was the point at which trains from Panama to Colon passed those going the other way, and it had some local importance on that account, because the wait here often ran as high as half an hour. In the time of the first French company it was a labor camp, excavation was carried on here, and a few miles below, at the point they called Bas Matachin, the shops were situated. These shops have since

been enlarged and refitted into the present Gorgona Shops. The Americans also did considerable excavation at this point. It is the starting place for canoe trips up the Chagres River. As soon as the Gorgona Shops are moved to Balboa, the cause of existence of Matachin as a camp of canal laborers will have ceased and the village will again sink into a hamlet. In 1908 Matachin had 2,042 inhabitants, of whom 698 were whites, but its population has greatly decreased since 1909, when excavation at this point was completed.

One other point in the lake region, on the abandoned line, is worthy the tourist's knowledge. In all but one spot the location along the river was good, Black Swamp, and that spot lies about five miles south of Gatun and is known as the Black Swamp. It is simply a swamp over which it was difficult to construct a railroad line, because the weight of the embankment and of the rails and rolling stock was so great as to displace the light, water-impregnated material underneath. On this account the road sometimes sank into the swamp. This was particularly true when the Americans placed the new heavy rolling stock upon the railroad in 1905, and from that time until 1908 this section of the line required constant attention.

In the effort to form a fill over which the trains could pass safely a number of old French dump-cars were thrown in bottom-up and thousands of tons of earth and rock were dumped there, only to sink into the swamp and afford but temporary relief. In 1908, however, the railroad engineers succeeded in constructing a trestle and filling it with cinder and other light material which successfully withstood the traffic up to the time when the railroad was abandoned in January, 1912. There is no subject on the Isthmus to which the chronic liar turns with greater joy than to the Black Swamp. The tourist will make a mistake in interrupting him or indicating in any way that he disbelieves the tales. Almost invariably they are untrue, but almost as invariably they are interesting. Soundings made in 1908 showed that the solid bottom beneath the swamp is 185 feet below the surface. It is an interesting comment on the stories that the watershed of the Chagres will not hold the water impounded by Gatun Dam, to know that this swamp has remained here, four feet above the level of the river, ever since the railroad was constructed in the middle of the last century.

### The Relocation Country.

Returning now to Gatun from a side trip that the tourist will hardly take, and yet which must be considered because of the historic interest of the old river towns and the former route of the railroad, the traveler takes the train over the new line of the Panama Railroad, known as the "relocation."

From Gatun to Pedro Miguel the country through which the railroad runs is "new;" that is, it is jungle little touched by the transit life until January, 1912. There were settlers in the bush all along the river, but they make little impression on the jungle, merely planting a few vegetables, and making trails from their homes to the main trails. The village of Monte Lirio was a typical "bush" hamlet before the railroad work was begun, its houses of bamboo and thatch, or board and thatch, its streets muddy, and sanitary conveniences none. It drowns on in much that condition now, while near it is the new Monte Lirio, known as Mitchellville, so named after a foreman popular with the workers. At various points along the line, town sites have been laid out in order that people driven from their homes in the Lake Region may have somewhere to rebuild. On either side of the train as it passes through this section may be caught pretty glimpses of the jungle, the trees and plants always green, those that dry up in the dry season being so few as to make little impression on the general color-scheme.

One half mile north of Monte Lirio the railroad crosses an arm of Gatun Lake, which reaches up into Panama territory by way of the valley of the Gatun River. The bridge over this arm of the lake is 318 feet long and is built in three spans, two of them composed of fixed girders 103 feet long, and one of a bascule or lift span, which can be raised to let ships pass into the upper part of the lake.

The point where the railroad crosses the Chagres River is known as Gamboa (a fruit like the quince). The bridge is built on a curve and spans an opening 1,300 feet wide. The channel span is a 200-foot riveted truss, and it is connected with the banks by 14 through-plate-girder spans, each 80 feet long. From the bridge one catches a glimpse of the northern entrance of Culebra Cut. A new townsite has been laid out at the northern end of the bridge. Pending the use of the relocated line between Gamboa

and Paraiso, after the opening of the Canal, the trains leave the relocation here, back down across the dike that separates the excavation in Culebra Cut from the Chagres River, and run up the old line of the railway to Pedro Miguel. There is nothing of interest on the east side of Culebra Cut between Gamboa and Paraiso, except the jungle and glimpses of its primitive life, because all the canal villages are along the old line of the railroad on the west side of the canal. A paragraph will tell about each one as the tourist catches glimpses of them while his train speeds on.

### The Culebra Cut Villages.

*(For facts on work in this section see page 88.)*

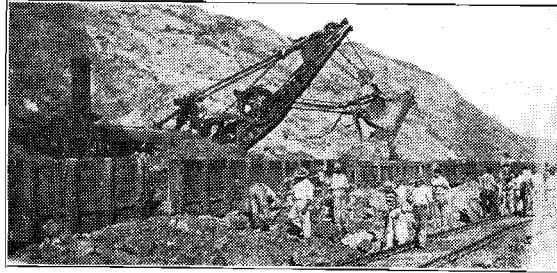
Obispomeans "bishop." There are two hills at this point, one of them higher than the other, called Haut Obispo, while the lower is called Bas Obispo. The Obispo River flows into the Chagres at this point, and here in days before the railway was built was a hamlet of bush people. As explained at greater length in the section of this book on the canal, the Obispo Valley is utilized as the canal route to a point near the divide at Culebra. The hamlet was situated on the trail from Gorgona to Panama, was made a railroad station, and when the French began work was turned into a labor camp, with small shops. Excavation continued here on the sea-level plan until 1887, when the emplacement for locks was begun. Under the Americans the excavation was continued and Bas Obispo became a typical canal village. In 1908, it had 1,744 inhabitants; but its importance and size have dwindled rapidly since 1910, when the excavation was practically completed at this point.

This village will always be associated in the minds of Canal workers with the greatest accident that has occurred on the canal. In December, 1908, the work in Culebra Cut at this point had reached a stage where it became necessary to dig out the side of the rock hill that rises above the canal on the west bank. To this end, 53 holes were drilled along the edge of the hill, and into them was packed 44,000 pounds of 45-per-cent dynamite. It was planned to set off this charge after the men had quit work at 5 o'clock on the evening of December 12. The last hole was being tamped at 11:10 o'clock on the morning of the 12th, when one of them exploded, setting off the others. The side of the hill



was thrown forward into the canal, as had been planned, but beneath it were buried several men on their way home to lunch, while many others were struck by flying rocks. In all twenty-six people were killed, and a dozen were permanently maimed.

Situated upon a hill at Bas Obispo is the camp of the Marine Corps, Camp Elliott. It is a tribute to the spirit of this corps of the service, that the pretty Camp Elliott little settlement was laid out, streets made, and some of the buildings erected by the men of the command. A battalion of marines is stationed here. In the course of three years this camp will be abandoned for one at the Pacific entrance to the canal.



STEAM SHOVEL AT WORK IN CULEBRA CUT.

Every American in Panama delights in displaying his knowledge of Spanish to the tourist. Invariably this knowledge is only sufficient to enable him to get Las Cascadas into trouble with a coachman and require a policeman to extricate him; but he supposes that the tourist knows nothing of this, and is duly complacent. Your guide is of that type. Right along he has been telling you the English translation of the Spanish names and will continue to do so. Las Cascadas, for instance, means "the waterfalls" or "cascades." Here the Obispo River formerly tumbled over a precipice forty feet high on its way to the Chagres, and here still tumbles down the water collected by the diversion canal on the west side of Culebra Cut. This village dates from the French times, when it became the site of a labor camp. Under the Americans it continued as one of the centers of canal life. Here were established an engine-house, where forty locomotives

tie up for the night to be cleaned out and made ready for their morrow's work, and an air-compressor plant to supply air to the drills in the north end of Culebra Cut. It does not appear on the maps prior to 1880 and was not touched by the old trail that ran through Obispo on its way to Panama. In 1908, Las Cascadas had 2,425 inhabitants—957 whites, 1,424 blacks and 44 others.

In 1911 the labor camp near Las Cascadas was turned over to the United States Army for a temporary post, and quarters were hastily devised to accommodate Camp Otis. a regiment of infantry hurried down from the States for no particular purpose that was apparent. It was named Camp E. S. Otis, in honor of the Major General of that name.

This village was originally called Emperador, and some American who knows even less Spanish than your guide, translated it Empire. It really means Em-

peror. At this point, prior to the opening of the railroad, the trail from Gorgona to Panama crossed the line of the present canal and the headwaters of the Obispo River, and made off through the hills to join the Cruces trail to the city. Emperador was a stopping place for pack trains. Here the French made their first excavation in Culebra Cut, January 20, 1882, in the presence of a large assemblage of officials of the Canal Company and the State of Panama. The Bishop was present and blessed the work, and some champagne was opened to baptize it. The largest of the French villages was made here, shops were opened for the mounting and repair of equipment, and the place was made the headquarters of the Division Engineer. On the hill overlooking Culebra Cut are several houses erected by the French, now used by their successors on the job. The old French quarters were occupied by the Americans, and the machine shop was rebuilt. In this shop are now repaired all the steamshovels working on the canal and railroad. On top of the hill is the office of the Division Engineer, Lieut. Col. D. D. Gailard, and the homes of the Resident Engineer, Mr. A. S. Zinn, and other canal officials. From the observation platform in the Division Office, may be obtained the best single view of Culebra Cut, showing how it winds like an elongated letter "S," following the contour of the ground in order to minimize the amount of excavation. A closer view may be obtained from the suspension bridge over the Cut, built

for the purpose of carrying air and water mains to the east side of the trench, from the source of supply on the west side.

In Empire are all the features of a canal village, and it is taken as the type described elsewhere in this book (Page 42.)

Culebra means "the snake." It should have been called Emperador, because it is from this point that the dictatorship of the Canal Zone is wielded. It is the capital, the home of the Chairman and Chief Engineer, of the President of the Railroad, the Governor of the Canal Zone, the resident member of the Fortification Board, and of a dozen prominent officials, including the Assistant Chief Engineer, the Assistant to the Chief Engineer, two Division Engineers, the Electrical and Mechanical Engineer, the Chief Quartermaster, and all the designing engineers.

It was a little hamlet nestling among the hills near the summit of the divide when the Panama Railroad surveyors ran across it in 1850. In 1854, it was the terminus of the railroad and enjoyed a brief prosperity as the place where travelers stayed overnight and paid exorbitant prices for food and bed. Then it sank into insignificance until the French took up the Canal work, when it was made one of the centers for excavation in Culebra Cut. It was a typical Canal village with quarters for officials, labor barracks, storehouses, and Chinese stores. A force of 700 men was at work in the Canal at this point when the Americans took charge in May, 1904, and the village has therefore been a canal-worker's lodge since 1881.

In 1906, the Chief Engineer, John F. Stevens, moved his headquarters from Ancon to Culebra, and since then it has been the real center of the official life of the canal. On the top of the hill is the administration building, a long two-story barrack-like structure, and on the slope towards the canal were erected the quarters of officials and employees.

But since 1909 Culebra has gradually been sluffing away, for it is here that the largest of the celebrated slides is in movement. The west bank of the canal moves towards the prism according as the toe of the slope is dug out at the bottom, and thus gradually there have disappeared in the Cut whole sections of the village, although never so rapidly but that the houses could be removed. In 1910, the work of digging from the top of

this moving mass was begun, in order that by lightening it, the tendency to move forward of its own weight might be lessened. The village is gradually being rebuilt on the back slope of the hill, as the slide encroaches on the old site.

In 1908, the population of Culebra was 5,516, and it was then the largest of the canal villages. Now it does not number half that many people, and the first place in population has passed to Empire.

Returning now to the east side of the Canal and to the new main line of the railroad, the train stops at Paradise, for that is what Paraiso means. The original line of the Panama Railroad crossed the divide through the pass now used by the canal, and Paraiso was the first station beyond the summit. It was just a stopping place until the French took up the Canal work, when they made it one of their district headquarters, established a small machine shop there, and built quarters for officials and laborers. Later this was the site of one of the proposed high level locks.

The Americans enlarged the shop and added to it a shed for hostling locomotives. In 1908, at the time of the reorganization of the work by Colonel Goethals, Paraiso Shop was abandoned, and the trains ceased to stop at the village. (Just think of living where the trains don't stop.) The old shops are now used for the storage of machinery to be erected in the locks at Pedro Miguel and Miraflores.

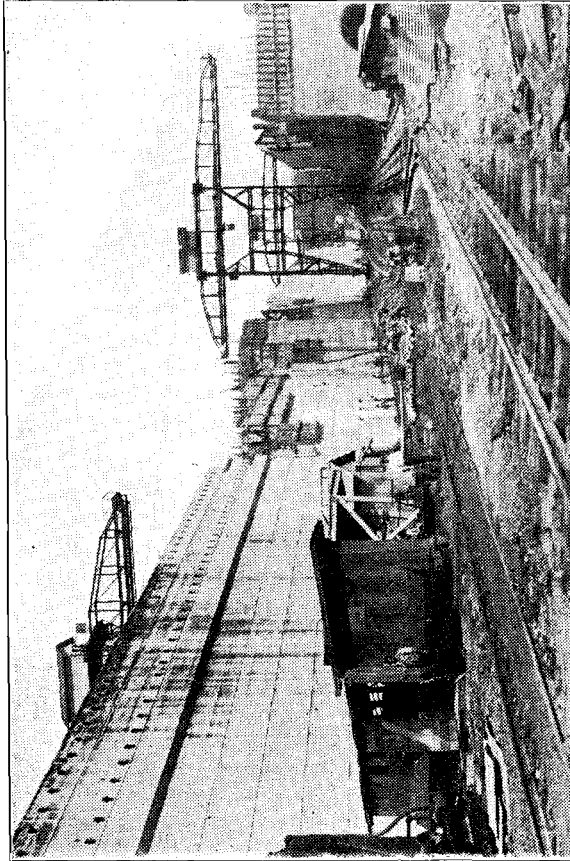
Just before entering Paraiso the traveler gets a view of one of the prettiest interior valleys to be found in Panama.

Yet it is typical of a large number of similar basins among the hills, apparently completely enclosed, but really drained at some inconspicuous spot by a little creek. This is the site chosen for a penitentiary, if it is ever decided to erect a permanent prison on the Canal Zone. It is likely the matter will be left to the military government that almost surely will be established here after the Canal is opened. Paraiso had 2,622 inhabitants in 1908, the time when it was most populous.

There is a hill back of Paraiso, from the top of which one can see the tower in the ruins of Old Panama. It is said that from this hill the pirate Morgan caught his first glimpse of the city. Whether true or not, this is surely less important than interesting.

### From "The Cut" to the Sea

Pedro Miguel and Miraflores date from French Canal times, and bear respectively the names Saint Peter Michael, and Miraflores, a distinguished Spanish soldier. At Pedro

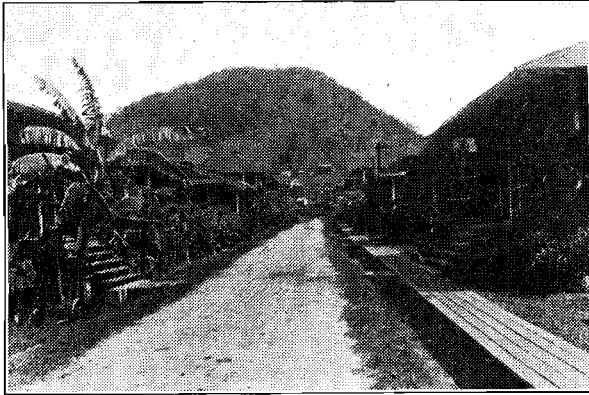


CONSTRUCTION OF LOCKS AT PEDRO MIGUEL.

Pedro Miguel. Miguel the French had two dredges in operation, and there they had made emplacements for their locks. Under the American plan, it is the site of the first flight of locks that will lower ships from the level of Gatun Lake to that of the Pacific. Here

is an engine house where as many as eighty locomotives tie up for the night. One of the most interesting sights on the canal is watching these locomotives leave the engine house for their work in the morning. The first one leaves about 6.30 o'clock, and the last is clear of the yards ten minutes later. Pedro Miguel had 1,623 population in 1908.

At Miraflores also the French had a small settlement, and this has been continued by the Americans, largely as a labor camp. Here are being constructed two of the locks required in completing the descent to the level of the Pacific, begun at Pedro Miguel. These locks will be the last finished and they are therefore the most interesting sight on the Canal work, because more kinds of work are in progress here than elsewhere.

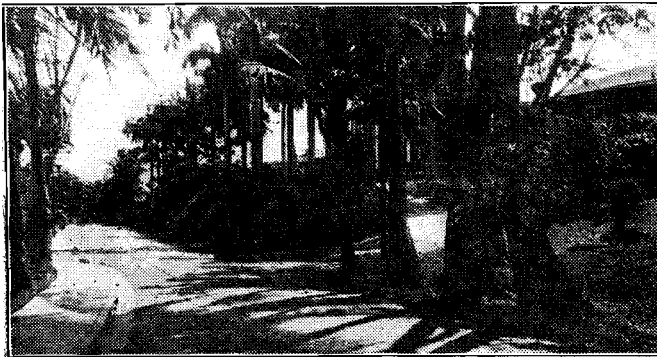


STREET IN CANAL ZONE VILLAGE—PEDRO MIGUEL.

When the lake is filled and ships are moving through the Canal, the Panama Railroad will be one of the prettiest in existence. For thirty miles the train will skirt the borders of a lake; for nine miles more along the side of Culebra Cut, where the masts of ships will show up from the canal and one will be unable to see the ships themselves from the car windows; for many miles through picturesque jungle; then it will look down upon the locks at Pedro Miguel, and run along the edge of another lake. Finally, and fitting climax, it will dash

through a tunnel, and when it emerges one will see, straight ahead, Ancon Hill, the eminence that overlooks the Pacific entrance to the canal, while beneath his eyes will be the locks at Miraflores, and the sea-level channel stretching away to the ocean. This is something to think about as the train passes through the tunnel. The tunnel is 736 feet long, 15 feet wide, and  $21\frac{1}{4}$  feet high above the tops of the rails. It is lined with concrete. It was begun on July 1, 1907, and completed one year later.

This village is the headquarters of the Pacific Division, and the long low building on the knoll east of the railroad is the office of the Division Engineer, Mr. S. Corozal. B. Williamson. Near it is the residence of the Assistant Division Engineer, Mr. J. M. G. Watt. It had 661 inhabitants in 1908 and has about a thousand now. The name means a clump of coroso palms. The village is mentioned before the founding of New Panama.

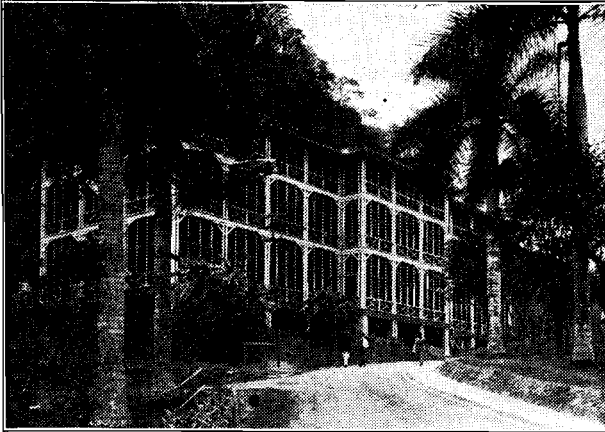


ENTRANCE TO ANCON HOSPITAL GROUNDS.

If your train happens to be the one that enters Panama at night, you will see, as it approaches the city, the lights of what appears to be a scattered village at the base of a big hill. These are the lights of Ancon, the American settlement suburban to the city of Panama. It is named Ancon after the hill on whose terraced slope it is built, and the name means a roadstead or anchorage. It does not appear that there was any settlement here, according to old maps, until the

place was chosen by the French Canal Company in 1881 as the site for its general hospital.

The terracing of the slope was then begun, and many of the buildings one sees there to day were constructed by the French and used by them all during their twenty-three years of canal work. In the light of the time the hospital was well run, the main difference being in the knowledge of the mosquito theory as applied to malaria and yellow fever. When the Americans came to Panama in 1904 some of the beds in the wards were standing in cups of water to keep the ants from crawling upon the patients, and in this water mosquitoes of both the *slegomyia* and *anopheles* varieties were breeding.



ANCON HOSPITAL GROUNDS

More about this hospital will be found in the chapter on Social Conditions and Forces, page 51. It is under the superintendence of Lieut. Col. Charles F. Mason of the Army Medical Corps, has a staff of 33 doctors and 90 nurses, and will accommodate easily 1,300 patients, and by crowding can be made to accomodate 700 more. (See pages 51, 64, 211.)

To the tourist, the most interesting things about the hospital are the pretty grounds, the pajamaed patients sitting on the screened balconies or strolling about the

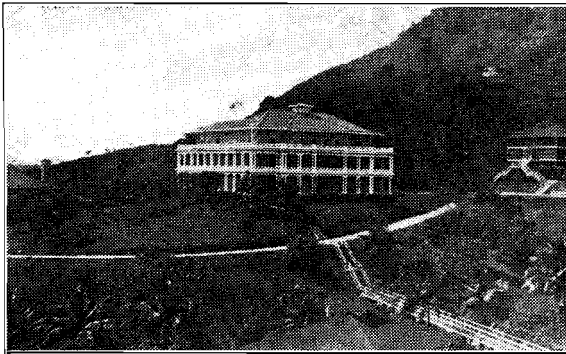


grounds, and the many varieties of tropical plants. These plants have been catalogued by Colonel Mason, and most of the trees and shrubs are labeled. A list of them will be found on page 211.

The atmosphere of the hospital dominates Ancon, because, of course, that is the principal industry of the place.

Well, do you know, there are some well-bathed Some Ancon Americans working in that hospital who have never seen Gatun Locks except from the car People. windows, have an idea that Culebra Cut is the name of a choice piece of meat sold only to high officials, and believe that the United States is constructing a sea-level canal in Panama!

The Administration Building, on one of the knolls at the foot of the hill, is the only good building erected by the



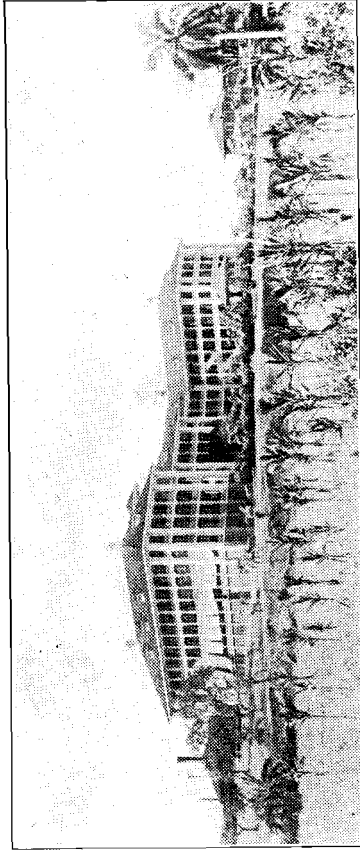
ADMINISTRATION BUILDING—ANCON.

Americans in Panama. It is of concrete block, and was originally designed to be the residence of the Governor of the Canal Zone. This plan was abandoned in 1906 on account of the cost of maintaining such an establishment.

Here are the administrative offices of the Department of Sanitation, the Department of Civil Administration, and the Secretary of the Commission, the publication office of *The Canal Record* and the Official Handbook. The view from the upper balcony of this building is probably the best that can be ob-

tained of the Bay of Panama, the city, and the near by hills without a toilsome climb up Ancon Hill itself.

Supreme                    The office of the Supreme Court is in  
Court.                    Ancon, immediately back of the Post Office



HOTEL TIVOLI—ANCON

The Hotel Tivoli was built for the threefold purpose of furnishing quarters to employes who had arrived on the Isthmus and had no quarters assigned to Hotel Tivoli. them, for the use of persons whose business with the canal administration forced them to come to the Isthmus, and the recreation of employes, whos

chief dissipation is a trip to the city about once a fortnight. To further this latter end, a dance hall containing 3,200 square feet of space was constructed, and an organization of employes known as the Tivoli Club is given the privilege of holding a dance here the second and fourth Saturdays of each month. The building was begun in August, 1905, and opened to the public on January 1, 1907, although a part of it was used in November, 1906, for the entertainment of President Roosevelt, on the occasion of his visit to the Isthmus.

It is situated on a knoll named after the Tivoli Hill of Rome, and overlooks the city of Panama and part of the bay. It is built in three sides of a rectangle, the main part being the base, and the two wings the sides. The open court in front is occupied by a carriage-way and flower-bed. In 1912 an addition was made, which increased the sleeping accommodations from 180 guest-rooms to 220, and the dining-room accommodations from 400 to 700 persons. The building is 314 feet long, wings 156 feet deep, and courtyard in front 193 feet across and 91 feet deep. This hotel has lately become more for transients than for people resident on the Isthmus, because the tourist trade has increased so rapidly in the past two years. Yet it is still the place where bachelors from the canal villages come to get a different kind of meal from that served in the messes, where concerts are given by the official band once each month to balconies crowded with canal workers, and where the best dances on the Isthmus are held.

Ancon Hill is 664 feet high above mean tide. After one climbs half way to the top it seems like six thousand feet, and by the time he has reached the

Ancon Hill. summit it feels like six million. The climb is worth while, however. Start about day-break, spend half an hour on the ascent, an hour on the top, and half an hour on the descent, and you will be home in time for breakfast, and none the worse for the trip. It is a rapid ascent that tires one. From the top there stretches such a view as can not be equaled on the Isthmus, and I am told that it can not be surpassed anywhere. Out to sea is the waveless bay, dotted with islands; farther away are Taboga and its sister peaks rising out of the water, with their little settlements at the base of the hills; and towards the east the long line of the coast stretches away to Darien. Behind are the hills, at one's feet the city of Panama and the

entrance to the canal, and northward the eye can follow the valley of the Rio Grande to the point where the line of the canal is lost in the foothills of the cordillera. This view so charmed the first American Canal builders that there was talk of building the village of Ancon on top of the hill and providing moving stairs for the ascent.

Rock for the concrete at Miraflores and Pedro Miguel Locks is quarried from the side of Ancon Hill, where a series of benches or inclines has been excavated Ancon Quarry. from 180 to 375 feet above sea level. The rock is loosened by dynamite, and then excavated by steam-shovel, and loaded upon cars which run down to the crusher-plant which is situated below the 180-foot level. There the cars dump into a hopper, from which the large rock passes by gravity to a crusher capable of taking a piece of rock 36 inches in cube, and the smaller rock passes to four secondary crushers, which also crush the product of the large crusher. From the secondary crushers the rock passes to storage bins, whence it is loaded by gravity upon cars, which convey it to the locks.

The name Balboa, as applied to the village at the Pacific entrance to the Canal, dates from April 30, 1909, when, at the instance of the Peruvian Minister to Balboa. Panama, the Hon. Alfonso Pezet, Colonel Goethals issued a circular directing that the old village of La Boca be called Balboa.

La Boca (the mouth) was the name applied to the hamlet which grew up at the mouth of the Rio Grande, where there was a crossing of the old trail that runs from Panama to the villages west of that city. The French, as the Americans have done, used the valley of the Rio Grande as the southern end of their canal line, and in 1881 they began to erect shops here at which their dredges from Scotland and Belgium (all but one erected on the isthmus) could be set up. The shops were well equipped for the time and the work they had to do. Naturally a village sprang up, composed of the shop and dredgemen.

On the side of Ancon Hill overlooking the Pacific entrance, Jules Dingler, Director General of the canal work, erected a spacious house in 1885, but soon La Folie after his wife and two children arrived here Dingler. they died from yellow fever, before the house was ready for occupancy, so he did not live there, returning to France in June, 1885. It was a big frame

structure that is said to have cost \$125,000. It was used later as a hospital for Colombian troops, and from 1904 to 1910 was used by the Americans as a quarantine station. In February, 1910, it was sold for \$525, on condition that the buyer would remove it. This was to make way for Ancon Quarry. The house was called "Dingler's Folly."

In 1899 the terminal pier of the Panama Railroad was opened to traffic, and since then the village has been both a canal and railway settlement. The Ameri-

Present and can Canal work required the enlargement of Future of Bal- the marine shops and this was begun in 1905  
boa. for the purpose of rebuilding some of the old French dredges. The dredging and machine-shop work are now carried on under the direction of Mr. W. G. Comber, resident engineer, and James Macfarlane, superintendent of dredging.

At this point there is now in progress the erection of terminal docks, and the construction of a dry dock and coal supply station. In the course of 1913 construction of the buildings for the Army and Navy headquarters will probably be begun. While most of the canal villages are looking backward on their glory, Balboa is looking forward to a larger population, more work, and greater importance than it has yet known.

### A Canal-Builders' Village.

At the headwaters of the Río Camacho, there is a broad basin between the surrounding hills, half a mile in width and several miles long, but gradually becoming narrow at either end. At the broadest part of this basin is situated Empire, most of its houses on the low flat ground, but a few built on the sides of the hills. It is taken as the typical Canal village because here are all the features of any of the settlements, many that are not included in some. A road runs across the valley and climbs the hills on either side, and at right angles to it runs another highway connecting the village with Culebra on the south and Las Cascadas on the north. Along these roads the village has built up, although there are a few short side streets. There are four distinct sections of this village—that where the white Americans live; that occupied by local merchants and those natives, Chinese and negroes, not at work on the Canal; the negro settlement; and the European labor camp.

The best part of the village the Americans have naturally monopolized for themselves. Their homes and bachelor quarters are built along the principal streets, and there also are the public buildings. The homes of the better-paid officials are really handsome structures, all of wood, two stories high, and so openly constructed that the air can blow through and keep them cool.

A typical house has a veranda on two sides, two big airy rooms in front, an open room at the back with only mosquito screen between it and outdoors, used as a dining-room, alongside it on one side a kitchen, and on the other a servant's sleeping-room. Upstairs are bed-rooms, bath, and toilet. The house will comfortably accommodate four or five persons, and the occupants usually number a man and his wife and a child or two. One who receives a salary of \$400 a month or more is assigned such a house as this or a better one. Another typical house is a one-story bungalow, with a veranda across the front, two living-rooms, a bed-room, a dining-room, kitchen, and bath and toilet. All the rooms are tiny. They are built for young married people presumably; but more frequently than not they are occupied by a man and his wife and four or five children, because, somehow or other, poor people breed most. One who draws a salary or wage of \$200 or less lives in such a house, or perhaps he has one of the four apartments in the four-family houses; if so, his accommodations are about the same as those in the cottages. All the houses, large and small, are of this type, unless it happens that there are left some of the three-room cottages provided by the French for their employes, and irreverently called by the Americans, "dog houses."

There are two features of the housing that are rather unique—the broad verandas which are used almost entirely as sitting-rooms (the families practically live there), and the lack of cellars. The houses are built on piers of concrete and sticks, and if one lives on a hillside there is left a good place under the house for the children to play. Altogether the housing effect is good, and the accommodations excellent. Electric lights are furnished.

The commissary is situated in the center of the American village—a long low building, neatly divided into departments; for this is a general store of the type known as “country store” in the United States, only better. Here every morning meet the housewives of the village to select the food for the day. Here all day long people straggle in to buy food, clothing, and toilet articles, or perhaps to invest in some of the pretty china exposed for sale. The prices are lower than in the States, generally speaking, and the service is just as prompt. You must carry the goods home. Every morning, however, the order boy calls at the house and takes your order for the day, if you choose to buy that way. This order is delivered to the house before noon. But it is better to go down to the store, because one meets others there, and if there is any news floating around it is there that one hears it.

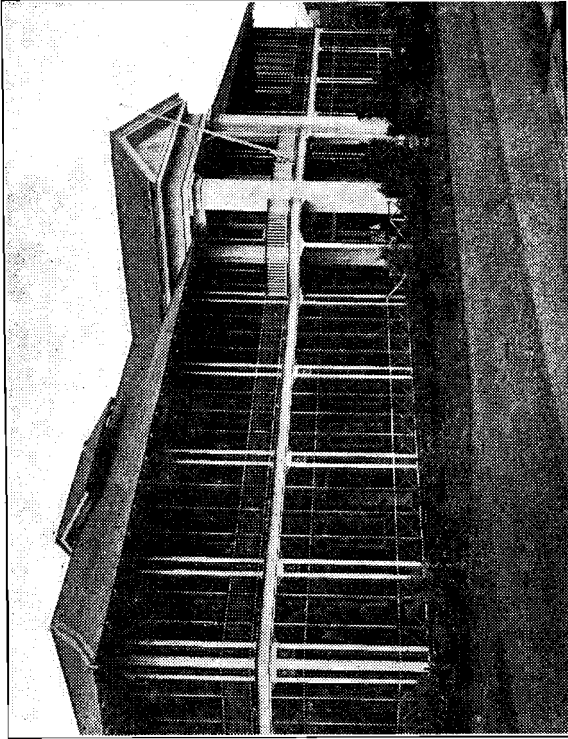
The other stores are run principally by Chinese. They are situated outside the American village, and are patronized chiefly by the native, non-Canal worker element, although the Canal worker often finds there articles that are not carried in the commissary. One of these stores is run by East Indians, and is a fancy-goods shop where there are sold very pretty articles of oriental make, such as fans, silks, brasses, and fancy crockery.

The Commission clubhouse, conducted by a secretary of the Y. M. C. A., is the chief center of the village life.

This building is two stories high, roomy, Social Centers. and cool. In the center is a broad lobby, on one side of this a pool and billiard room, on the other a reading room with magazines and books, behind it a quick-lunch counter. In the annex at the back are barber shop, locker and toilet rooms, baths, bowling alleys, and a pavilion in which soft drinks and ice-cream are served. Upstairs is the assembly hall, with a stage at one end, and here are given moving-picture and other shows, and are held the bi-weekly dances. Also on the second floor are retiring-rooms for women, and a game-room, where mighty battles are fought by bishops, knights, and pawns, to decide the old foolish question as to which king shall live.

A building used as a church and lodge hall stands a little distance away from the main street, and there meet the religious organizations that have no meeting places of

their own; and upstairs, over the chapel, such secret societies as are established here. Among these are the Kangaroos, Odd Fellows, Pythians, Red Men, Rebekahites, Knights of Columbus, and Masons.



COMMISSION CLUBHOUSE—EMPIRE

This is really not a hotel but a mess hall, because one can not rent a room here. It is a long one-story building, with a broad veranda (on which men who have their coats on may eat), a big room filled with tables (where eat the coated and coatless), and a kitchen where the food is prepared. An employe pays 30 cents a meal, and kicks; a tourist pays 50 cents, and says it is excellent. Both are right. The meals are much alike every day, and that is why the regular boarder complains; but they are the biggest thirty-



cents' worth of food imaginable. Yet they actually cost only 30 cents, because the hotels are self-sustaining. There are two features that wear on the nerves—the heaped up bottles of catsup, chowchow, jelly, pickles, mustard, chutney, mayonnaise, and other delicacies and relishes in the center of the table; and the clatter of dishes that always characterizes a “hash house.” But this must be expected in a place where a wholesome meal with an abundance of food costs only thirty cents.

The Episcopalians have a church of their own, and so have the Roman Catholics. They are very active Churches. There are five congregations, with something doing three nights a week. The Empire Union Church, the Baptists and other sects meet in the public church and lodge hall, and there are two churches outside the American settlement for negroes,

The baseball park occupies a lot near the center of the village; and here, while the players in the States are tending bar or resting during the winter months, Sports. the Canal Zone nines contend every Sunday for the championship. There are good games, and no end of enthusiasm. At one end of the village are the tennis courts, and here, too, good games are played, with regular tournament series during the dry season.

At noon and at night the trains pass through on their trip across the continent. Scores of men gather here to watch the pretty faces that are poked out of the car windows. Some people get on the trains and others get off, there is an exchange of greetings all around, and then they all go home, in pairs or groups, talking about one another, or discussing the latest news of the Canal Zone and the world, as brought to them by the newspapers.

This typical village comprehends all kinds of workingmen. The engineering and administrative office for the excavation of Culebra Cut is on the hill on the east, at the foot are the shops, at the other end of the village on the toe of the opposing hill are the offices of the Comptroller and of Disbursements. Here live steamshovel, transportation, and powder foremen—laborers, clerks, officials, engineers, and draftsmen—all classes of Canal workers. All told they number quite five thousand people, making the Canal Zone metropolis.

The ordinary economic bar between the laborer and the more advanced economic classes is added to on the Isthmus by the fact that the laborer is either alien European in language and nation, or alien in race. It is natural, therefore, that there is little in common between even the European laborer and the white American. The Spaniard lives in a labor camp apart from the remainder of the village, and has his mess nearby, (where he is served food in a rough fashion for 40 cents for 3 meals), and has his interests in the camp and in the cantinas run by men of his nation. The Government has not been eminently successful in feeding the Spanish laborer, because he does not like the American way of cooking, and anyway prefers the atmosphere of the cantina, where he can have his wine and can sit long over his dinner, discussing with his fellows questions of common interest. There are only 200 Spanish-labor families on the Isthmus living in the small quarters provided for them by the Government. There are probably twice as many more living in privately rented quarters in the various villages and in Panama and Colon. More about the Spanish laborer will be found in the chapter on Social Conditions and Forces, which follows this.

The insurmountable bar of race is between the negro and the other canal workers. He lives alone with his kind and since he is numerically four times as strong as the white men on the force, he is self-sufficient. His labor camp consists of barracks where from 40 to 80 men are housed, a kitchen where he is served three meals for 27 cents, and a clubhouse run by a negro society, church, or church guild. He is distinctly sociable, drinks little, and sings much, and appears in general to enjoy his higher economic status. It is proposed to move all the negroes back to the West Indies when the time for turning the Canal Zone into a military reservation comes. This will be hard on the West Indian planter, because the negro has learned in the Canal Zone that the wage paid in Barbados and Jamaica is about fifty per cent too low. More about the negro laborer will be found in the chapter on Social Conditions and Forces, which follows this.

### Social Conditions and Forces.

**The best analysis of social conditions in the Canal Zone yet made is contained in the book on Panama, in "Porter's Progress of the Nations" series (George Routledge and Sons, Publishers, London, 1912); and, because it is the best, it is quoted here:**

Social institutions and conditions in the Canal Zone can be understood only in view of the nature of their being and the varied class of people that influence them. It is commonly said that the villages along the Canal are well regulated American towns. This is true only in appearance.

The effort of the Government was to transplant the life of American villages to the Canal Zone, but in the truest sense this can not be done, because such life is the result of slow growth and can not be picked up and transplanted, any more than an apple-tree can be made to grow in the torrid zone. Every Canal village has churches, schools, meeting halls, libraries, and social organizations; but they are like similar institutions in the United States in form only. Even the people themselves are different.

Taking as an instance only the white American population, these differences are deeply marked. In a village such as Culebra, the capital of the Canal Zone, there are people from the South, New England, North, and West, of the United States. The analysis of the representatives of these four distinct social sections, made by James Bryce twenty years ago, is still correct in all important respects. Any generalization must fail of the truth, but it is indicative of the diverse background of the people from these sections to say that the New England man is a penurious Puritan tainted with intellectual snobbery, the northern man has a distinct commercial bent, the western man is a trader of strong progressive political thought, and the southern man not entirely free from the belief that the civil war of 1860-65 is still being waged, and delightfully convinced that his people have a monopoly of refinement in America. These people meet one another daily, and learn more in a month, from a social standpoint, than they could have learned in years in their home communities.

In the ordinary American community it is seldom that the son of a merchant fraternizes with the son of a mechanic; and in cities of 25,000 inhabitants or over, lines are usually drawn between the members of various churches, not because of religious convictions, but because the church is a social center. Then there are differences of education, culture, birth, and profession, that tend to make people in long-established communities form little coteries, with a consequent narrowing of both knowledge and sympathy. In the Canal Zone there are not enough people of any one industrial class, with common church, professional, and cultural interests, to form these little cliques for social stagnation, and the result is a broadening of social and intellectual horizon that keeps most of them in a fever of excitement.

Nor should one lose sight of the fact that practically everyone on the Canal work is on a higher economic plane than ever before. This has resulted in a forcing of cultural and social standards,

pathetically evident in the efforts of some women to emulate others, and of a few to emphasize the differences between themselves and their social sisters.

It has been said that social institutions in the Canal Zone are like similar ones in the United States in form only. Canal Zone churches, clubhouses, and meeting halls are furnished by the Government. The benevolent despotism, of which Col. Geo. W. Goethals is head, has been too kind for the social good of the community, although its policy has been justified in the smooth working of the Canal building machine.

There is no participation in politics. The laws are made in Washington and Culebra, without question as to the wishes of the people, and there is a consequent loss of social development. If one wishes to know what to do or how to do it, he consults *The Canal Record*, the weekly bulletin of the despotism, and finds there the law as the despot has issued it. And the people like it. After the political strife of every American city, it is pleasant to live where all is quiet. One who has experienced both kinds of life knows why the "chosen people" longed to turn their backs on Moses and return to the flesh pots of Egypt.

Here there are no elections to determine whether a new school building shall be erected, or certain streets paved, or a municipal water-system installed; and therefore little thought of municipal government or improvement. Here are no mass-meetings to arouse enthusiasm for a new church building, an orphan asylum, or other social palliative. The Government has decided, or will decide. I say this Government has been too kind, because no matter how pleasant it is to have others do one's thinking the effect of five years or more of benevolent despotism in the Canal Zone, has convinced me thoroughly of the educative value of a democratic form of Government.

There are many other similar influences, but those cited are the most important in coloring the social conditions and institutions of the Canal makers. It is patent that they are fundamental, and one of their most frequent results is that grown-up people of convictions long settled find themselves, after a few months of the Canal builder's life, drifting from their conventional moorings.

#### CHURCH WORK.

Under the conditions outlined it will be readily understood how formal religion has suffered loss by the migration to the Canal Zone of people who were regular "church-goers" in the United States. The sudden broadening of mental and spiritual horizon, consequent upon the abrupt change from a highly formalized mode of living to an entirely different atmosphere, has crystallized in many people an impulse, felt everywhere in the United States, towards a rejection of formal religion. Even Roman Catholics in the Canal Zone are indifferent to a greater degree than in the United States.

Another influence in this rejection of formalism is the breaking up of the home routine. In the United States the average middle-class family eats breakfast at 8 o'clock on Sunday morning, adorns itself in holiday clothing at 9 o'clock, and at 10 o'clock goes to church. The church-going is as much a part of the routine as the breakfast. At church one meets his friends, listens to a sermon that is often good and seldom displeasing, takes part in music that is at least as

high-class as the average taste of the congregation, and on the whole is pleasantly diverted. In Canal Zone villages the sermons are poor and the music not so good as the taste of the listeners.

If each congregation of Canal workers had a feeling that it was building up a permanent organization for social advancement; had before it some tangible ambition, such as building a church and paying for it; or if it could feel in some way that it was being persecuted, the handicaps of environment and unattractive services might be neutralized. But there is no persecution, no tangible goal, no feeling of permanency, with the result that the attitude of the average Canal worker towards formal religion is that of indifference.

In the scope of this chapter it is impossible to give more than a suggestion of the admirable work various religious organizations are doing under these adverse conditions.

The longest-established church in the territory of the Canal Zone is the Roman Catholic, which draws no color line, and embraces in its membership, Americans, Panamans, European laborers, and negroes. As an organization its spiritual power over the Europeans and Panamans has been weakened by the fact that it has uniformly stood, both in Spain and Spanish-America, for reaction, and in the minds of the mass, which can not draw the line between church government and the spiritual church, it is identified with political and economic oppression. With this handicap it yet draws to its services men and women of all classes, and every mass on Sunday is said in the presence of scores of people. There are six churches in the Canal Zone, and the pastors of three of them (a Spanish, a French, and an American priest) are men of distinct intellectual and spiritual power.

The second-oldest church organization is the Protestant Episcopal, which opened Christ Church in Colon in 1865. In 1883 when the West Indian negroes came to the Isthmus in large numbers to work for the French Canal Company, the work was placed under the jurisdiction of the Anglican Church, to revert in 1907 to the Protestant Episcopal Church of the United States. Its work among the negroes is of more importance than that among the whites, because the former are more in need of spiritual guidance. There are thirteen congregations of negroes and five of whites.

The change in surroundings and the rise in the economic scale experienced by the West Indian negroes, by reason of their migration to the Canal Zone, has had the opposite effect on them from what it has had on the Americans; and they have become more diligent in their church-going. This assertion is made on the authority of the Rev. Henry Bryan, one time archdeacon of the Canal Zone and Panama, who quotes the undivided opinion of the Anglican clergy of several West Indian islands, scores of whom he questioned on this subject. The most evident reasons are, first, that the negroes on the Canal Zone have their own churches, and there is none of the feeling that they are inferior to anyone in the church work; second, the Government of the Canal Zone has insisted upon marriage as a prerequisite to cohabitation, and there is a distinct increase in the self-respect of the negroes who are living together under the formal sanction of religion and law.

Among the sectarian or evangelical churches the Wesleyan is the most potent. It was established on the Isthmus in 1882 to care for negro laborers of that sect, and now has two ministers and sixteen

lay preachers in the Isthmian mission. The Methodist Episcopal Church maintains a mission and school in Panama city, and works chiefly among the white Americans, although its missionary society has begun to proselytize among the Panamans. The Baptist Church works among both negroes and whites, and one of its missionaries, the Rev. S. M. Loveridge of Culebra, is accorded by the Canal workers the distinction of being the most powerful spiritual influence among the 30,000 negro workmen. A nonsectarian organization known as the Union Church was organized by several Canal employes in 1907, and now conducts services in the Government chapels in five different Canal villages. Among other organizations doing spiritual work along definite lines are the Christian Science, Seventh Day Adventist, "The Remnant of Israel" (Hebrew), and the Chinese temples at Panama and Colon.

Church work was authorized by the Isthmian Canal Commission on October 4, 1905, as one of the means of stabilizing the working force, and promoting social order. Of forty church buildings in the Canal Zone in 1911, seven were Roman Catholic, thirteen Episcopal, seven Baptist, two Wesleyan, and eight undenominational. All but two of the buildings are on land set aside by the Government, and twenty-six are owned by it. Fifteen chaplains are maintained by the Government, of whom four are Episcopalians, four Baptist, three Roman Catholic, one Wesleyan, and one Presbyterian.

Although it is carrying on a more vital class of work than any of the churches, the Salvation Army is classed with them, because of the fact that it also conducts religious services. The work dates from May 19, 1904, and is confined almost entirely to West Indian negroes. A rest house, where free lodging and meals may be procured by the needy, is maintained in Colon in a building erected by the Canal authorities, and outposts are maintained for welfare work in Panama City, and the Canal villages of Gatun, Gorgona, and Empire. The Army emphasizes the fact that it is assisting the laborers by *lending* them meals and a place to sleep, and in consequence at least fifty per cent of the people who accept its aid do not leave the Isthmus before paying the entire indebtedness, while many more make some payment. Services of the characteristic Salvation Army kind are held at street corners, and in the various posts, and they are well attended.

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#### THE SICK AND INJURED.

In every Canal village there is a public dispensary presided over by one or more physicians, and equipped with an emergency operating-room and a good drug-store. The physicians have regular office hours for making calls on patients confined to their homes. Only the simplest cases are treated at the home of the patient, the aim being to send everyone who is likely to become very ill to one of the two main hospitals, situated at Ancon (Panama), and Colon. Emergency cases are treated in the dispensaries only to the extent of giving first aid, and the patient is then sent to one of the main hospitals.

The hospital at Ancon can accommodate 2,000 patients, though the wards are rated for 1,500 only, and the staff is organized for that number of patients. At Colon the hospital is arranged for 200 patients, but in emergency can accommodate half again that number. These hospitals are modern in equipment both for medical and surgi-

cal cases, and at Ancon there is a large laboratory in which tropical diseases are investigated under the distinguished pathologist, Dr. S. T. Darling. On the island of Taboga in Panama Bay is a convalescent hospital, where a few of the patients spend the week immediately following their discharge from the hospital.

This system of free medical treatment has been in effect seven years. With a carefully selected class of employes, and a population where the average age is not above 35 years, the results, viewed from a statistical point, would be misleading. From a social standpoint they are probably typical. There has been no noticeable development of the "chronic," as might be expected where drugs are dispensed without cost. The physicians are not tempted to encourage illness, and the people are not encouraged in it. In consequence there is very little medicine dispensed, outside of quinine for malaria and salts for constipation.

Taking away the incentive of private fortune has had no apparent effect on the physicians employed by the Government. These men are selected after competitive examination, and as a class are above the average of their profession in the United States. They are paid salaries varying from \$1,500 to \$7,000 a year, the average being \$2,800 a year. They have a medical society which holds monthly meetings, and they have maintained an *esprit du corps* no less remarkable than that of the remainder of the Canal force.

The investigations of malaria which have recently won for Dr. W. E. Deeks and Dr. W. McC. James election to various English and American societies of specialists were conducted in connection with regular practice among the patients at Ancon Hospital. Others of the medical profession are doing just as serious work in connection with their other duties; and this spirit of professional enthusiasm is characteristic of the whole staff.

Many of them who entered the Canal service merely as a stepping stone to more lucrative practice, are now frank to say that they would remain in the Government medical service at purely nominal salary, rather than to take up the occupation of a private-adventure physician in general practice.

#### SCHOOLS.

Two schools for primary instruction are maintained in the Canal Zone by Spanish laborers, but except for these the schools are maintained by the Government. There are two distinct systems—one for colored children and one for white children.

Teachers in the schools for white children are recruited in the United States, and the requirements are fully as severe as those in the average small city in the United States, including professional training and actual teaching experience. There are ten primary schools, and one secondary or high school.

Teachers for the colored schools are recruited with the assistance of the Government of Jamaica, and are chiefly Jamaican negroes who have had professional training in that island. There are sixteen schools for colored children. In addition to the primary branches an effort is made to teach the rudiments of farming to the negro

children, on the assumption that they may remain in the Canal Zone where the opportunities for small farming are good.

A statement of the school attendance in 1911 follows:

Sex.	Enrolled White.	Enrolled Negro.	Total Enrolled.
Male.....	682	775	1,457
Female.....	728	793	1,521
Total.....	1,410	1,568	2,978

The work is directed by a Superintendent, assisted by two inspectors, 43 white teachers for the white schools, and 24 for the colored schools. Education is not compulsory. Text books are supplied free of cost.

#### PENAL SYSTEM.

The educative idea does not enter into the penal system of the Canal Zone, the imprisonment of offenders being entirely on the assumption that they owe a debt to the community. Persons convicted of misdemeanors are imprisoned in local jails at Ancon, Emire, Gorgona, and Cristobal, and are made to do work about the jails and police stations, and sometimes on the municipal roads and streets. Persons convicted of crimes are imprisoned at the penitentiary in Culebra, and the majority of the men are set at work on the Canal Zone highways. Their services are valued at 10 cents an hour. In the year 1910, when the Canal Zone population was largest (approximately 65,000) there were 6,407 males and 477 females placed under arrest, and 80 per cent of these were convicted, the majority of misdemeanors, for which the sentence was a fine or imprisonment for not more than 90 days. One hundred and thirty-seven felony convicts began sentence at the penitentiary during that year. There were sixteen homicides, in which cases there were five convictions, eight acquittals, one dismissal, one sent to the insane asylum, three awaiting trial. Capital punishment is by hanging, and is inflicted only for premeditated murder. The policing of the Canal Zone, a territory of four hundred square miles inhabited by 65,000 people, is done thoroughly by a force consisting of one hundred and forty-six white and one hundred and eleven negro policemen, directed by a chief and assistant chief of police.

#### MISCELLANEOUS ORGANIZATIONS.

In six of the Canal Zone villages the Government maintains public clubhouses for its white American employes. The buildings contain waiting, reading and game-rooms, billiard-

**Y. M. C. A.** room, bowling-alleys, and dance-hall that is also used for public entertainments. When the policy of establishing these clubhouses was determined upon the only trained conductors of such institutions in the United States were the secretaries of the Young Men's Christian Association. The Association was called upon to take charge of the Canal builders' social centers for the dual reason that it had the machinery and men ready, and that it makes a good impression in the United States to have Government functions under the guidance of an organization definitely



opposed to such social evils as alcoholism and gambling. It is a disadvantage that the clubhouses are furnished free (although ten dollars a year is charged for each person using them regularly, as a maintenance fee) because it is human nature to feel less interest in things given than in things striven for.

Part of the effort to establish home life, was the organization of women's clubs under the American Federation of Women's Clubs.

#### **Women's Clubs.**

These organizations flourished for a period of eighteen months; but soon the novelty wore off, and the difficulty of making the meetings attractive to scores of women of divergent interests and ideas could not be overcome. In an American city these clubs are organizations of women of comparatively similar tastes and interests and therefore are self-cohesive. In the Canal Zone they were started by the Government, and gradually their membership has diminished until it numbers less than two hundred. These few, however, belong to the clubs because they wish to, and they make a much stronger organization than the larger numbers of 1908 and 1909 did. The meetings are devoted largely to discussions of questions of current interest, regular study courses are pursued, and domestic problems are discussed. A tropical cook-book, sanitary drinking cups in the schools and railway trains, free lectures on tuberculosis and other diseases prevalent in Panama, public playgrounds in Colon, Panama, and Gatun, and essay competitions in the schools are among the more tangible results of the organization.

#### **Fraternal Societies.**

Friendly or fraternal societies, such as the Masons, Odd Fellows, Knights of Pythias, Foresters, Knights of Columbus, and Kangaroos, have lodges and hold regular meetings. Their influence is negligible.

The prime object of the trades unions, that of increasing wages and bettering the conditions of employment, is anticipated in work for the American Government by the enforcement of an eight-hour working day, and by higher wages than are paid in private employ. Therefore the trades unions represented among the Americans on the Canal and Panama Railroad are practically restricted to presenting petitions of the employees, and keeping alive the spirit of organization against the time when the men shall again enter private employ. Committees of the men are always at liberty to present grievances to the Chief Engineer, whether they represent a regularly organized union or only a local organization. Individuals are accorded a like privilege, although it is naturally much better to consider grievances of a whole class and decide them at one time than to take up individual cases. The unions represented among the Canal workers include the International Brotherhood of Steamshovel and Dredge-men, the Brotherhood of Locomotive Engineers, the Machinists, Boilermakers, Molders, and Electrical workers. There is a local organization of railway conductors. Meetings are held regularly, and contributions are made to the central organizations in the United States. In every case where there has been a threat of strike the central organization has advised the Canal men not to leave their work, because the conditions of it are so much better than in the United States.

The Spanish laborers have a political organization made up of men of various radical beliefs, called variously liberals, socialists and anarchists. Their meetings are held openly and the discussion

is largely confined to such questions as temperance, gambling, and political conditions in Spain. In the only concerted movement of Spanish laborers that has taken place on the Canal or railroad, the leaders of the liberal clubs were the leaders of the men.

Such organizations as they had in the West Indies, the English-speaking negroes have transplanted to the Canal Zone. One is the West Indian Protective Association, which endeavors to present the claims of the negroes as a body, and its influence is unquestionably good, because its weekly bulletin emphasizes the need of right living. "The Land Ship" is an organization with several lodges, its claims on the men seeming to be like that of many of the American fraternal organizations, largely self-improvement and the joy of holding high-sounding offices, such as Admiral, Commodore, and the like.





FERDINAND VICOMTE DE LESSEPS

Ferdinand Vicomte de Lesseps. Born Versailles, 1805. Died 1894. Began Suez Canal project 1854; canal opened 1869. Panama Canal project 1879 to 1894. Lesseps was not an engineer but a promoter. Although convicted with his son of misappropriation of Panama Canal funds, it is believed he knew nothing about the frauds. His name was capitalized. He was not in actual charge of the administration.

Theodore Roosevelt. Born, New York, 1858. Harvard College, 1880. President of The United States, September 14, 1901 to March 4, 1909. During his administration the independence of Panama was realized, and canal work organized.



THEODORE ROOSEVELT



WILLIAM CRAWFORD GORGAS.

William Crawford Gorgas, (Colonel, Medical Corps, U. S. A.) Born Mobile, Alabama 1854. Bellevue Hospital Medical School, 1879. First lieutenant, Medical Corps, 1880. Colonel by special act Congress 1903 for work as health officer of Habana. Chief Sanitary Officer, Isthmian Canal Commission, since June 1904. Member Isthmian Canal Commission, since March 4, 1907.

John F. Stevens. Born West Gardiner, Me., 1853. Builder, engineer manager of railroads. Chief Engineer Panama Canal, July 20, 1905 to April 1, 1907, Chairman of the Commission, February and March, 1907.



JOHN F. STEVENS.

# The Panama Canal

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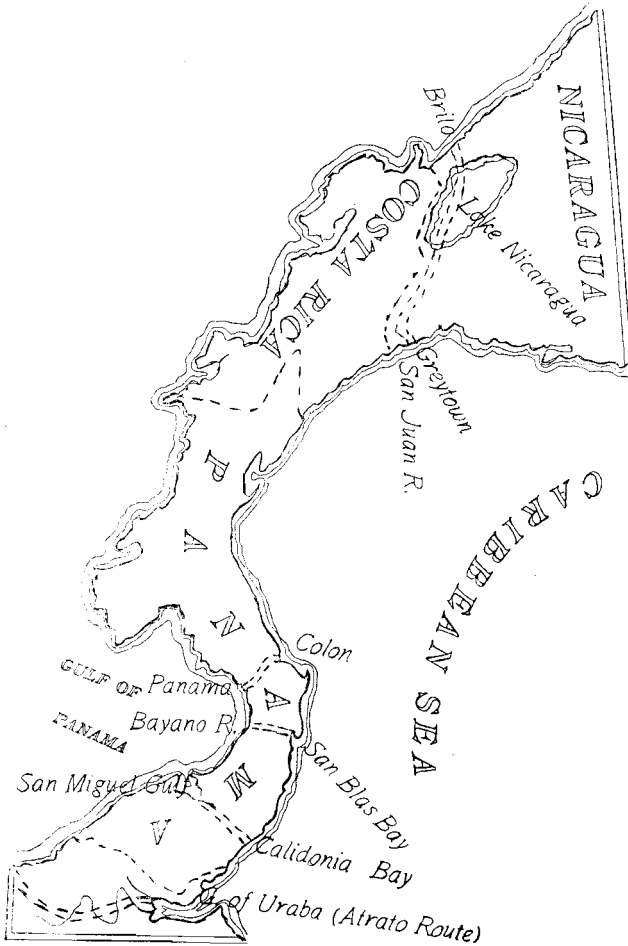
When the Panama Canal is opened to navigation in 1915, it will be three hundred and eighty-one years since the first survey for a Canal was made; for neither the Americans nor the French were the first to dream about a canal across the Isthmus, nor even to investigate its possibility. Columbus touched at Nombre de Dios and Porto Bello, quite likely sailed into Limon Bay, in 1501, and he died believing that such a route existed. There were traditions of it among the Indians, or of what sounded like it to the Spaniards; and Balboa, Pizarro, and others of the conquistadors, must have thought many times of the advantage of such a passage, as they toilsomely drove the enslaved natives, overladen with parts of ships and other cumbrous freight, over the mountain passes and through the jungles of Darien. As early as 1530 the Chagres River was used as a means of crossing to within 15 miles of the old city of Panama on the Pacific; and in 1534 Charles V of Spain had a survey made for a canal from the end of navigation on the Chagres to the Pacific. This is the route of the present Canal. At regular intervals from that time forth the project was discussed, and in 1814, Spain actually took active steps to construct a canal, but the revolution of her colonies put an end to the plans. The discussion, renewed by Von Humboldt in the closing years of the 18th century, has never ceased.

Although the Spaniards were the first to make a survey, and to consider as a national measure, the construction of a canal, the interest of the United States has been constant since 1825, and more has actually been done by that Government in Atrato, San Blas, Calcutta, and the Indian Ocean than by all others together. Of the many routes surveyed between Tehuantepec and Colombia, the Nicaragua and Panama are the only ones ever seriously considered, and yet there are three others that have been made the subject of several investigations.

The Atrato route is the most commonly known of these. There is an Indian legend that at a point on the headwaters of the Atrato a canoe can be carried for a distance of a mile and then floated on a river through which it can go without danger or interruption to the Pacific. The idea is that there is a point in the cordillera of Colombia at which the headwaters of the Atrato are very close to those of the Traundo, Napipi, Doonado, Bando, and San Juan. This is true. But the obstacles in the way of building a Canal on this route are greater than on any of the others. They include continual dredging along the Atrato River for a hundred miles, a cut through the continental divide that is greater than the cut at Culebra, and the canalizing of rivers on the Pacific side which for many miles are rugged mountain torrents. It is a dream of the Colombians that some day they will build a barge canal along this route, thus connecting their eastern with their western domain.

A glance at the map will show that the Gulf of San Miguel on the Pacific side, and Calidonia Bay on the Atlantic are so close to one another that a route for a canal would seem to be possible there. This route has been surveyed, and the amount of excavation required makes the project many times more difficult than the Panama route. The same is true of the route from the Bay of San Blas on the Atlantic to the Bayano or Chepo River. The Isthmus at this point is at its narrowest, 35 miles, but the excavation required is so great that the only projects ever suggested included a tunnel 4.2 miles long, through which ships with masts 180 feet high must pass. The project has long been regarded as chimerical.

The Nicaragua route became the subject of actual investigation in 1825, when the newly federated state of Central America, having established its independence from Spain, advised the United States that it would encourage in every way any project by Americans for the opening of a canal from the Atlantic to the Pacific by way of Nicaragua. A company was immediately formed in New York, but it failed to raise the money for the surveys. An effort made by an English capitalist from 1826 to 1838 to interest capital in the project resulted in a reconnaissance survey, but no actual construction work. In 1839 the United States Government sent John L. Stephens to report upon a canal route, and after an examination of the isthmus both in Nicaragua



ISTHMIAN CANAL ROUTES.

Nicaragua, Panama, San Blas, Calidonia Bay, and Atrato.

and Panama he reported in favor of Nicaragua, as being the less expensive. He later became one of the organizers of the Panama Railroad.

The canal projects were given a definite status by the ratification on July 5, 1850, of the Clayton-Bulwer treaty, by which the United States and the United Kingdom agreed to enforce the neutrality of any canal. Under this treaty, and an agreement with Nicaragua, a survey was made in 1850-1852 by an American, O. W. Childs, and a land transit route was opened, which carried on an extensive business by steamer and stage coach for several years, while the plans for a canal advanced. The concession was forfeited in 1858, and was renewed for a Frenchman, Felix Belly, who in turn forfeited his rights, for nonaction, ten years later. Another Frenchman, Michel Chevalier was given the franchise, but he also failed to begin the work.

In 1869, upon the recommendation of President Grant, the United States Government began a systematic survey of all the isthmian routes from Tehuantepec to the Atrato River, and in 1876 the commission, under which the surveys were executed, reported in favor of Nicaragua. A more complete survey of this route was made in 1885 by A. G. Menocal, and in February, 1889, the Maritime Canal Company of Nicaragua was incorporated under concessions from Nicaragua and Costa Rica. It was an American company with enough capital to make a beginning, and results of its work are still evident at Greytown and along the San Juan. It failed for lack of funds in 1893. The United States Government had meanwhile become interested in the project of its citizens, and on March 2, 1895, the Nicaraguan Canal Board was appointed to make further plans, it being understood that if the work were ever to be done the Government itself must do it. On November 16, 1901, this board, later known as the Isthmian Canal Commission, reported in favor of the construction of a canal across Nicaragua, providing the property of the New Panama Canal Company of France on the Isthmus of Panama, could not be purchased at \$40,000,000, about one-third of the price actually asked.

The Panama Canal project went through much the same course of development as the Nicaraguan. Surveys were made and remade, none of them thorough, until 1890, and each resulted in the verdict "feasible," and estimates now known to have been grotesquely small. Bolivar in 1827 sent

Panama  
Route.

an English surveyor, J. A. Lloyd, to the Isthmus of Panama to survey a route for a wagon road or a canal. He recommended a wagon road from Limon (Navy) Bay to Panama, along the line of the Chagres River, knowing that the cost of a canal was far beyond the resources of the government.

In 1835, Charles Biddle, sent by the United States Government to investigate routes across the isthmus, obtained from New Granada a concession for a railroad, but the prosecution of his plan was not deemed expedient at that time. In 1838, New Granada granted a similar concession to a company of Frenchmen, and a misleading report of a pass 37 feet above sea level caused the French Government to send Napoleon Garella to make a survey. He corrected the error, but recommended that a canal be built with summit level at 48 meters above the sea, a tunnel  $3\frac{1}{2}$  miles long, through the continental divide, and 18 locks to make the lift from the sea to the summit level. The opening of California and Oregon to settlement and the discovery of gold in California in 1849, gave the isthmian crossing new value, and the United States made a treaty with New Granada in 1848 to guarantee an open transit across Panama. The construction of the railroad (1850-1855) had a deterrent effect on canal enterprises in Panama for some years, although surveys were made under direction of the United States Government in 1854 and 1866.

In May, 1876, the Government of Colombia (formerly New Granada) granted a concession for a canal to a French company, and under this concession the first work was done.

### The French Attempt.

Surveys made for this company by Lucien Napoleon Bonaparte Wyse were the basis of the decision (May 15-29, 1879) by an international congress at Paris, in favor of a sea-level canal from the Bay of Limon to Panama Bay by way of the pass at Culebra. In 1881, The Universal InterOceanic Panama Canal Company, with Ferdinand de Lesseps as nominal head, took up the work. The canal was to be constructed, as the Suez Canal had been, as a business venture. On January 10, 1881 a ceremonial breaking of ground was performed by Lesseps himself at the Pacific entrance. Then followed a period of hasty surveys, assembling of machinery, and organizing and housing a working force. The first excavation was begun (January



20, 1882) near the summit of the continental divide, at Empire, in the section now known as Culebra Cut. That was thirty years ago, and, barring three years, from 1888 to 1891, work has been carried on at that point ever since.

Their occupation was of much the same nature as the Americans, except that the French employed West Indian negroes in many positions where white men are now employed, and the proportion of French to the total force was therefore less. The work was done by contract, as the barge canal in New York State is now being constructed, and scores of Americans were employed in that way.

Right from the start they were handicapped. Yellow fever found the non-immune French easy victims, and malaria attacked both negro and white man.

Failure of The administration was hampered by interference of the Colombian officials, the plans were incomplete, and it was found at an early date that the estimate of cost (\$127,600,000) was ridiculously low, and that more money must be raised. Meanwhile, the reports of death and sickness, the real magnitude of the enterprise, and the extravagant use of money in France, were making a bad impression on the French people; and the bonds of the company sold at a continuously lower price. In 1887 the sea-level project was abandoned for the time, as too costly, and a lock-level canal, to be deepened gradually to sea level, was decided upon.

On February 4, 1889, the company went into the hands of a receiver, and in the investigation that ensued great frauds in the administration of the company's affairs in France were disclosed. Ferdinand de Lesseps and others were convicted of fraud, although there is little evidence that Lesseps the elder was more than a figurehead, and it is likely that he knew nothing of the dishonesty. At the time of the disclosures, he was 86 years old, and he died soon after having been found guilty.

Little work was done on the isthmus until 1894, when The New Panama Canal Company, a receiver organization, began in earnest to complete the cut through the continental divide. It made extensive studies, and proceeded on the plan of a lock canal at two levels above the sea, to be reached by four locks on either side of the summit level. This canal was to have a ruling depth of 29 feet 6 inches, and a least width of 98 feet, as compared with  $41\frac{1}{3}$ -foot depth and 300-foot least width of the present canal. The French continued

to work in Culebra Cut until the Americans took possession on May 4, 1904. In all they had spent \$255,000,000 procured from securities of a face value of \$435,000,000. The loss was distributed among 200,000 bondholders, chiefly members of the French middle-class.

The value of the work done by the French was estimated in 1901 by the Isthmian Canal Commission of that time at \$40,000,000, and on this basis the rights of Work Done by the French company were acquired. An the French. estimate made by the present Commission in 1911, based upon the known value of the French excavation and equipment is \$42,799,826, divided as follows:

Excavation—	
Dry—23,138,000 cubic yards at \$1.03.	\$23,832,140
Wet—6,770,000 cubic yards at \$0.23...	1,557,100
Total.....	\$25,389,240
P. R. R. stock, 68,888 shares at \$140.....	9,644,320
Maps, drawings and records.....	2,000,000
Material and equipment.....	2,112,063
Buildings.....	2,054,203
Lands.....	1,000,000
Use of Pacific ship channel.....	500,000
Roadmaking and clearing.....	100,000
Grand total.....	\$42,799,826

At the Pacific entrance the French had dredged a narrow channel from deep water three miles inland and this was used by ships going to Balboa (La Boca) docks. At the Atlantic entrance they had dredged a channel to Bohio, a distance inland of 15 miles, but it was navigable only by small boats of about seven feet draft. As far as Gatun, seven miles inland, it was fifteen feet deep, and the channel is used today in hauling materials between Cristobal and Gatun. All along the line of the Canal, work had been done, and one of the reminders of the failure up to a year ago were the old dredges and excavators which the tourist saw along the banks of the Chagres River as his train passed through the bottomland of the lake region.

The French canal line was practically the same as the American, utilizing the valleys of the Chagres and Rio Grande, in order to avoid excavation. The failure to build a canal was due mainly to the failure of the Paris management to retain the confidence of the French people. In four other ways the Americans have an advantage which the

French did not possess—political control of the canal region, modern methods of maintaining health, more effective methods of excavating, unlimited money. In view of these differences Americans should be the first to join with the present Canal engineers in admiration of Lesseps' bold dream, and praise of the results accomplished by the men in the field.

### The American Canal.

The story of the birth of Panama as a nation is told in another section of this book. The result of it was that the United States Government took possession of the effects of the French on the Isthmus on May 4, 1904, and the construction of the Canal under American auspices began on that day.

For several years the French had maintained a working force of a few hundred men in Culebra Cut, for the sole purpose of holding the franchise until a purchaser could be found, or until a new organization with greater capital could be effected. Their machinery was stored all along the Canal line in sheds and shops, the larger pieces such as dredges and excavators not housed. All was well cared for, however, and much of it was immediately useful to the new builders. Yet there was much to be done before the work could proceed economically, and at first the Americans showed great lack of good sense in meeting their problem. The Commission in Washington was too cautious for success; and requisitions for material of all kinds were badly handled, because the men on the work were unable to persuade the officials in Washington that large quantities of materials were badly needed, and at once. Out of the conflict that thus ensued there came three definite policies: (1) Effective sanitation of the Canal Zone and the cities of Colon and Panama; (2) Recruiting a force and proper housing and feeding of employes in order to maintain it; (3) Concentration of power on the Isthmus.

### Sanitation and Health.

It was recognized in all comprehensive discussions of the Canal project that the work could not be done by Americans unless measures were first taken for placing the region of the work on a secure health basis. Plans for sanitation of Colon and Panama formed part of the discussion of the Commission of 1899-1901. The discovery and proof that mosquitoes carry yellow fever and malaria came just prior to

the determination of the American Government to build the Canal, and this made the work of sanitation more easy. Yellow fever and malaria (in its worst form malaria was known as Chagres fever) were the diseases that had worked most havoc with the French forces, although there had been comparative freedom from the former for seven years prior to the American occupation.

The theory that malaria is carried by mosquitoes of the *Anopheles* species was demonstrated as true by Sir Ronald Ross of the British Medical service in India, who reached the conclusion after a long series of experiments by himself and others in 1898. The story of the yellow-fever mosquito (*Stegomyia*) discovery is well told in an address delivered by the Secretary of the Isthmian Canal Commission, Mr. Joseph Bucklin Bishop, in 1910. In this case also the demonstration followed a long series of experiments begun by Dr. Carlos Findlay in Habana in 1881. It was made by Drs. Walter Reed, Jesse W. Lazear, James Carroll, and A. Agramonte of the American Army in Habana in 1901.

In January, 1904, the quarantine of Colon and Panama was turned over to the United States, and in June of that year the permanent sanitation organization was established, with Col. W. C. Gorgas, who had been Health Officer at Habana as head; and Dr. H. R. Carter, a yellow fever expert, as director of hospitals. This work like all the others was hampered by scarcity of supplies, notably copper wire screening, which could not be purchased in the United States in large quantities. An epidemic of yellow fever, lasting from July, 1904, to December, 1905, accelerated the delivery of supplies, and made it necessary to expedite the sanitation work, lest the force slowly organizing be depleted. There were 246 cases and 84 deaths, of which 134 cases and 34 deaths were among Canal employes, while all the cases were among the non-immunes who had come to the isthmus on account of the Canal work.

The sanitation has in view the prevention of mosquito breeding and the maintenance of a high standard of cleanliness in all the settlements along the Canal.

Mosquito work      The anti-mosquito campaign is directed against two species, the *Stegomyia*, which carries yellow fever, and the *Anopheles* which carries malaria. The *Stegomyia* lives in and about habitations, breeding in wet places. The measures taken against it

were the fumigation of houses, and the exercise of care that no tins or other vessels in which water might collect be allowed to lie around the yards or houses. It took over a year to stamp out the yellow fever, but it may never again be known in Panama; because, if a rigid quarantine is maintained, there will be no chance for it to get a start here. The method of contagion is for a *Stegomyia* to bite a person infected with the fever and then to bite one not so infected. If the person first bitten is in a certain stage of the disease, and the mosquito biting him is in a certain stage of its development, the disease may be carried.

The *Anopheles* is less easy to control, because it breeds anywhere that there is a damp place—on the edge of pools and streams, in the hoof marks left by cattle in the fields, in cans containing water, and even in high grass into which the sun does not penetrate. It carries malaria in much the same way as the *Stegomyia* carries yellow fever. Measures taken against it are the cutting of all grass and shrubbery around settlements so as to let the sunlight dry the damp places; covering pools, that cannot be drained, with a film of oil, which smothers the larvae before they reach maturity; and pouring into other streams and pools a mixture of carbolic acid, caustic soda, and rosin, known as larvacide, to kill the larvae.

The screening of houses is directed against all mosquitoes, but especially against the *Anopheles*. The ordinary method of treating malaria is with large doses of quinine, while many people take small doses continually for prophylactic purposes. By systematic treatment the type of malaria has been reduced from one of great violence to a very mild one, and the sick rate from 821 cases per thousand employes in 1906 to 187 cases per thousand employes in 1911.

An important part of the sanitation work was the municipal engineering in the cities of Colon and Panama, and in the Canal villages. In Colon it consisted of filling the swampy land upon which the city was built, laying sewers, and installing a general water system, and laying pavements; in Panama the laying of sewers and pavements, and installing water mains; in the Canal villages, sewer and water work, and the laying out and macadamizing of roads. This work was begun in 1905 and finished in 1906. In the cities of Colon and Panama it is being paid for by water rents collected by an American Superintendent of Public Works.

At present a strict quarantine against contagious diseases is maintained; the villages and quarters are kept in the cleanest possible condition; light, air, pure water, and good sewerage are insisted upon. The corollary is that the general health is good. The effectiveness of the public-health work can be best judged from the following statistics of employees admitted to hospitals, rate per thousand of employes, and death rate per thousand of employes for each fiscal year:

YEAR	NUMBER ADMITTED	RATE PER THOUSAND EMPLOYES	DEATH RATE PER THOUSAND
1904*			13.26
1905*			25.86
1906*	31,025	1,169	41.73
1907	31,937	960	39.47
1908	21,361	496	18.32
1909	21,782	492	11.97
1910	20,753	411	10.84
1911	22,832	465	11.34
1912	21,919	438	10.16

These figures would be misleading were they not considered in view of the facts that all employes are given a physical examination before being allowed to enter the service, the force is made up of young men, and chronic invalids are deported to their home countries as soon as their services are no longer available for the Canal work. Making allowance however for these qualifying conditions, the sanitation of the Canal Zone and the cities of Colon and Panama justifies the statement made by Col. Gorgas:

"Natives in the tropics, with the same sanitary precautions that are taken in the temperate zones, can be just as healthy and have just as small a death-rate as inhabitants in the temperate zones. To bring this about, no elaborate machinery is necessary. The result can be attained by any community, no matter how poor, if it is willing to spend sufficient labor in cleaning, and to observe well-known rules with regard to disease. The Anglo-Saxon can lead just as healthy a life, and live just as long in the tropics as he can in his native climate." (*See also pages 37, 51,*)

#### Labor Force, and Housing.

The working force is composed principally of West Indian negroes and Spanish laborers, and white Americans who do the skilled labor and administrative work. When the force was at its highest point, March, 1910, there were at work

\*Calendar year.

38,176 men and 500 women, and the total number of names on the pay rolls was 50,774. These included 5,235 Americans, 5,263 European laborers, and 28,178 negro laborers. The force grew from 700 on May 4, 1904, principally negro laborers, to 3,500 in 1905; 17,000 in 1906; 29,000 in 1907; and is now decreasing gradually, and will decrease until the Canal is opened, when there will be employed about 3,000 men to maintain and operate the Canal, and do the work of sanitation and government.

The development of the force during the first three years depended largely on the rapidity with which quarters could be furnished. Immediately upon his arrival on

Quarters. the Isthmus in June, 1904, the first Chief Engineer, John F. Wallace, began to perfect an organization, and in it was included a division of building construction. Old French buildings were repaired as rapidly as possible, and a few new buildings were erected. Under the second Chief Engineer, John F. Stevens, this work was carried forward, and the quarters as one now sees them on the Canal Zone were practically completed during the first year of the Goethal's regime, 1907. The organization of the labor force was directed by Mr. Jackson Smith assisted by Lieut. R. E. Wood.

Laborers' barracks are one-story buildings in which standee bunks are erected, and where provision is made for the storage of a limited amount of baggage on the lofts. These buildings are screened against mosquitoes and cleaned daily. When the force was largest, 5,000 Spanish laborers and 6,000 negroes were quartered in these bunk houses. Barracks for white American bachelors consist of buildings of from four to thirty-two rooms, where the men sleep usually two in a room. They are furnished with beds, chiffonier, bureau, table, and chairs.

Family quarters of the lowest grade (all quarters are graded according to salary of employee) are two-room houses with kitchen and toilet room, occupied by families of laborers. There are only a few of these. White family quarters are generally of four rooms, kitchen, and bath, except those for the higher officials, which contain more rooms. Furniture is supplied with each house. All quarters are lighted with electricity, furnished with water, and coal is supplied for cooking. It is part of the contract with employes who en-

tered the service prior to January 1, 1908 that their quarters, light, water, and fuel would be furnished without charge. All bachelors are employed on this understanding. The statement that the Government furnishes them *free* is therefore erroneous because many employes have been induced to come to Panama by these little "extras," and they form, therefore, part of the pay. The Quartermaster's Department has charge of the housing and labor recruiting.

Food is supplied through the commissary stores, and messes. See page 99.

### The Canal Zone.

In the treaty of February 26, 1904, Panama conceded in perpetuity to the United States the *use, occupation, and control* of a strip of land 10 miles wide, 5 miles on either side of the center line of the Canal, extending from a line in the Pacific ocean 3 marine miles from mean low water mark to a similar line in the Atlantic, with the cities of Colon and Panama excepted. The rights of sovereignty were conceded, within this territory. In return the United States paid to Panama \$10,000,000 cash, and will pay an annual rental of \$250,000 after February 26, 1913. The territory is 448 square miles in area, about 322 square miles of which is held by the United States Government. (See also Canal Zone census). The government is an autocracy limited by a code of laws based upon the "bill of rights" of the United States Constitution. The Constitution extends to the Canal Zone only by special act of the Congress. All officials are appointed by the President of the United States.

### The Administration.

After the many experiences that the United States has had in its short history to demonstrate the futility of such a policy, it was almost ludicrous to attempt to direct the greatest work it has ever undertaken from the capital at Washington. Yet this was the plan that so independent a thinker as Theodore Roosevelt, and so careful an executive as William H. Taft, as Secretary of War, allowed to be tried in the early days of the canal. They were among the first to see the mistake, and acted as quickly as they could to overcome it. The Isthmian Canal Commission of 1904 was composed of Rear Admiral John G. Walker, U. S. N., chairman; and members Maj. Gen. Geo. W. Davis



U. S. A., W. B. Parsons, W. H. Burr, B. M. Harrod, C. E. Grunsky, civil engineers; and F. J. Hecker. General Davis was sent to Panama as resident agent of the Commission and Governor of the Canal Zone. Under adverse conditions he did good work. This is true also of the first Chief Engineer, John F. Wallace, who for a whole year was not a member of the Commission.

The unwieldiness of the Commission made President Roosevelt and Mr. Taft recommend to Congress that the commission form be abolished and power be given the Executive to appoint a more wieldy administrative body. This Congress refused to do. Roosevelt overcame the difficulties partly by appointing a new commission in April, 1905, of which the Chief Engineer was a member. This consisted of Theodore P. Shonts, chairman; Charles E. Magoon, Governor of the Canal Zone; John F. Wallace; Rear Admiral Mordecai T. Endicott, U. S. N.; Brig. Gen. P. C. Haines, U. S. A.; Col. O. H. Ernst, Corps of Engineers, U. S. A.; and B. M. Harrod. On June 28, 1905, Mr. Wallace, the Chief Engineer, resigned, and John F. Stevens was appointed in his place. This organization continued until March, 1907. Under it the work of preparation was completed, and excavation in Culebra Cut was begun on an extensive scale, and on the plan since pursued.

The first concentration of power came in the appointment of an executive committee composed of the Chairman, the Governor of the Canal Zone, and the Chief Engineer, and the latter two, residing on the Isthmus, had power to bind the Commission with regard to purely isthmian affairs. In September, 1906, Mr. Magoon was made Governor of Cuba, and the organization was further concentrated by placing all affairs of the Canal in the United States under the Chairman of the Commission, and all those on the Isthmus under the Chief Engineer. Early in 1907, Mr. Shonts resigned, and Mr. Stevens was made Chairman and Chief Engineer, with practically unlimited power.

On April 1, 1907, Mr. Stevens resigned, and a new commission was appointed composed of Geo. W. Goethals, Chairman and Chief Engineer; D. D. Gaillard, W. L. Sibert, of the Corps of Engineers, U. S. A.; W. C. Gorgas, of the Medical Corps, U. S. A.; H. H. Rousseau, of the Civil Engineer Corps, U. S. N.; Jackson Smith, who had organized the working force and quartering system under Mr. Stevens; and Jo. C. S. Blackburn, as Head of the Department of Civil

**Administration.** Mr. Smith resigned in June, 1908, and was succeeded by H. F. Hodges, Corps of Engineers, U. S. A. Mr. Blackburn resigned in December, 1909, and was succeeded by M. H. Thatcher.

On January 6, 1908, President Roosevelt made an executive order further increasing the administrative power of the Chairman. By law and the development of conditions, the Chairman has exercised since that time a practical dictatorship over the Canal work and Canal Zone Government. The organization of the work as now carried on under him is as follows:

#### ISTHMIAN CANAL COMMISSION.

Col. George W. Goethals, U. S. A., Chairman of Commission, Chief Engineer of Canal, Governor of Canal Zone, President of Panama Railroad, Resident member of Panama Fortification Board.  
Col. H. F. Hodges, U. S. A., Assistant Chief Engineer, Vice President Panama Railroad.  
Lieut. Col. D. D. Gaillard, U. S. A., Division Engineer.  
Lieut. Col. Wm. L. Sibert, U. S. A., Division Engineer.  
Mr. H. H. Rousseau, Civil Engineer, U. S. N., Assistant to the Chief Engineer.  
Col. W. C. Gorgas, U. S. A., Chief Sanitary Officer.  
Mr. Maurice H. Thatcher, Head of Department of Civil Administration.  
Mr. Joseph Bucklin Bishop, Secretary of the Commission.

#### DEPARTMENTS AND DIVISIONS.

##### **Construction and Engineering.**

Headquarters, Culebra.  
**Col. Geo. W. Goethals, Chairman and Chief Engineer.**  
William Howard May, Secretary to the Chairman.  
C. A. McIlvaine, Chief Clerk.  
Ad. Faure, Chief Accountant.  
H. S. Farish, Surveying Officer.  
Lieut. Geo. R. Goethals, U. S. A., Assistant Engineer.

##### **Col. H. F. Hodges, Assistant Chief Engineer.**

C. O. Carlson, Secretary.  
Edward Schildhauer, Electrical and Mechanical Engineer.  
Henry Goldmark, L. D. Cornish, T. B. Monniche, Designing Engineers.  
Walter F. Beyer, Assistant Engineer.

##### **Civil Engineer H. H. Rousseau, Assistant to the Chief Engineer.**

J. C. Parsons, Secretary.  
Maj. T. C. Dickson, U. S. A., Inspector of Shops.  
A. B. Nichols, Office Engineer.  
Civil Engineer U. S. N., F. H. Cooke, Assistant Engineer.  
James G. Craig, D. E. Irwin, Traveling Engineers.

##### **Atlantic Division.**

Headquarters, Gatun.

##### **Lieut. Col. Wm. L. Sibert, Division Engineer.**

Major Chester Harding, U. S. A., Assistant Division Engineer.

Ben Jenkins, Chief Clerk.  
Maj. J. P. Jervey, U. S. A., Maj. G. M. Hoffman, U. S. A., Resident Engineers.  
Geo. M. Wells, Office Engineer.

##### **Central Division.**

Headquarters, Empire.

##### **Lieut. Col. D. D. Gaillard, Division Engineer.**

W. I. Beam, Chief Clerk.  
A. E. Bronk, General Inspector.  
A. S. Ziun, Resident Engineer.  
Mark W. Tenny, Assistant Engineer.  
J. W. Sneed, J. M. Hagan, Joseph Little, W. T. Reynolds, Superintendents of Construction.  
A. Sessions, Superintendent of Transportation.  
William H. Bates, Superintendent Steam-shovel Repairs.  
Dan E. Wright, Superintendent Municipal Work and Pipe Lines.

##### **Pacific Division.**

Headquarters, Corozal.

##### **S. B. Williamson, Division Engineer.**

John M. G. Watt, Assistant Division Engineer.  
J. C. Keller, Chief Clerk.  
W. G. Comber, H. O. Cole, Resident Engineers.  
Frank Cotton, H. D. Hinman, W. L. Thompson, Assistant Engineers.  
James Macfarlane, Superintendent of Dredging.

# ISTHMIAN CANAL COMMISSION—DEPARTMENTS AND DIVISIONS (Continued.)

## **Mechanical Division.**

Headquarters, Gorgona.

**A. L. Robinson, Superintendent.**  
William Taylor, Chief Clerk.  
Henry Schoellhorn, Mechanical Engineer.

## **Subsistence.**

Headquarters, Cristobal.

**Lieut. Col. Eugene T. Wilson,**  
**U. S. A., Subsistence Officer.**  
Capt. Frank O. Whitlock, U. S. A.,  
Assistant Subsistence Officer.  
John Burke, Manager of Commissaries.  
W. F. Shipley, Chief Clerk.

## **Quartermaster's.**

Headquarters, Culebra.

**Col. C. A. Devol, U. S. A., Chief**  
**Quartermaster.**  
Capt. R. E. Wood, U. S. A., Assistant  
Chief Quartermaster.  
Lieut. Walter D. Smith, U. S. A., Con-  
structing Quartermaster.  
C. H. Mann, Chief Clerk.  
Capt. Courtland Nixon, U. S. A., Depot  
Quartermaster, Mount Hope.  
C. L. Parker, Assistant Depot Quartermaster,  
Mount Hope.

## **Civil Administration.**

Headquarters, Ancon.

**Maurice H. Thatcher, Head of Department.**  
G. A. Ninas, Chief Clerk.  
C. L. Luedtke, Assistant Chief Clerk.  
Tom M. Cooke, Chief, Division of Posts,  
Customs, and Revenues, Ancon.  
Arthur McGown, Deputy Collector,  
Ancon.  
Jno. L. Storla, Deputy Collector, Cristobal.  
Capt. Chas. W. Barber, U. S. A.,  
Chief of Police, Ancon.  
C. E. Weidman, Fire Chief, Cristobal.  
Chas. F. Koerner, Assistant Fire Chief,  
Ancon.  
M. E. Gilmore, Superintendent of  
Public Works, Ancon.  
J. J. Reidy, Assistant Superintendent  
of Public Works, Colon.  
F. A. Gause, Superintendent of  
Schools, Ancon.  
Edgar P. Beck, Treasurer of Canal  
Zone, Empire.  
W. G. Comber, Chairman; James Macfarlane,  
C. J. Anderson, Board of  
Local Steamboat Inspectors.

## **Canal Zone Judiciary.**

Headquarters, Ancon.

**Supreme Court—H. A. Gudger,**  
**Chief Justice.**  
Walter Emery, Clerk, Ancon.  
Thomas E. Brown, Jr., Associate Justice.  
William H. Jackson, Associate Justice.  
Circuit Court, First Circuit—H. A.  
Gudger, Judge.  
Circuit Court, Second Circuit—William  
H. Jackson, Judge.

Circuit Court, Third Circuit—Thomas

E. Brown, Jr., Judge.

M. C. Rerdell, District Judge, Cristobal.

S. E. Blackburn, District Judge, Ancon.

Edgar S. Garrison, District Judge, Empire.

J. B. March, District Judge, Gorgona.

## **Law.**

Headquarters, Ancon.

**Frank Feuille, Counsel and Chief**  
**Attorney.**

William K. Jackson, Prosecuting Attorney.

Chas. R. Williams, Assistant Prosecuting Attorney.

A. A. Greenman, Land Agent.

## **Sanitation.**

Headquarters, Ancon.

**Col. W. C. Gorgas, Chief Sanitary**  
**Officer.**

Col. John L. Phillips, U. S. A.,

Assistant Chief Sanitary Officer.

Maj. R. E. Noble, General Inspector.

Harry E. Bovay, Chief Clerk.

Lieut. Col. Charles F. Mason, U. S. A.,

Supt. Ancon Hospital, Ancon.

Surgeon Wm. H. Bell, U. S. N., Superintendent Colon Hospital.

Surgeon J. C. Perry, P. H. and M. H. S., Chief Quarantine Officer, and Health Officer, Panama.

Surgeon Claude C. Pierce, P. H. and M. H. S., Quarantine Officer, Colon.

Dr. Fleetwood Gruver, P. H. and M. H. S., Quarantine Officer, Panama.

Joseph A. LePrince, Chief Sanitary Inspector, Ancon.

Dr. M. E. Connor, Health Officer, Colon.

## **Disbursements.**

Headquarters, Empire.

**Edward J. Williams, Disbursing**  
**Officer.**

Wm. M. Wood, Assistant Disbursing Officer.

## **Examination of Accounts.**

Headquarters, Empire.

**H. A. A. Smith, Examr. of Accts.**  
T. L. Clear, Assistant Examiner of Accounts.

## **Purchasing Department.**

Headquarters, Washington, D. C.

**Maj. P. C. Boggs, U. S. A., General**  
**Purchasing Officer.**

C. E. Dole, Chief Clerk.

Capt. Courtland Nixon, Purchasing Agent on the Isthmus.

## **Panama Railroad Company.**

(General offices, 24 State Street, N. Y.)

**E. A. Drake, First Vice-President.**

Headquarters, Colon.

**J. A. Smith, Gen. Supt., Colon.**

R. L. Mock, Chief Clerk.

Lieut. Frederick Mears, U. S. A., Chief Engineer.

A. K. Stone, Master of Transportation.

### Sea Level or Lock Plan.

"I cannot venture to predict the time required and the amount of money necessary for the construction of a sea-level canal," said the present Chief Engineer, Col. Geo. W. Goethals, before a committee of Congress when asked to give an estimate for a sea-level canal. As a matter of fact the only sea-level project scientifically considered was that of the Consulting Engineers of 1906. The estimates for the lock-level project then made were soon found to be grossly inadequate, both as to the cost of the original project and the size of the project itself, so these are of little value in estimating for a sea-level canal. The reasons why a sea-level canal is not being constructed are that it would cost so much, take so much time, and in the end be of less value than the present Canal, with its broad lake channels.

The question was settled in January, 1906, when the International Board of Consulting Engineers, by vote of 8 to 5 decided in favor of a sea-level canal, and President Roosevelt recommended that Congress adopt the plan for a lock-level canal submitted by the minority. In favor of the minority plan were 5 of 7 members of the Isthmian Canal Commission and Chief Engineer Stevens. The Board consisted of Geo. W. Davis, U. S. A., Messrs. Alfred Noble, W. B. Parsons, W. H. Burr, Brig. Gen. Henry L. Abbott, Corps of Engineers, U. S. A.; Frederick P. Stearns, Joseph Ripley, and Isham Randolph of the United States; W. H. Hunter of England, Eugene Tincauzer of Germany, Adolph Guerard of France, E. Quellennec of France, and J. W. Welcker of The Netherlands. The report in favor of the canal at sea level was signed by Messrs. Davis, Parsons, Burr, Hunter, Guerard, Tincauzer, Welcker, and Quellennec. President Roosevelt summed up the case as follows:

"A careful study of the reports seems to establish a strong probability that the following are the facts: The sea-level Canal would be slightly less exposed to damage in the event of war; the running expenses, apart from the heavy cost of interest on the amount employed to build it, would be less; and for small ships the time of transit would probably be less. On the other hand, the lock Canal at a level of 80 feet or thereabouts would not cost much more than half as much to build and could be built in about half the time, while there would be very much less risk connected with building it, and for large ships the transit would be quicker; while, taking into account the interest on the amount saved in building, the actual cost of maintenance would be less. After being built it

would be easier to enlarge the lock canal than a sea-level canal. Moreover, what has been actually demonstrated in making and operating the great lock canal, the Soo, a more important artery of traffic than the great sea-level canal, the Suez, goes to support the opinion of the minority of the Consulting Board of Engineers and of the majority of the Isthmian Canal Commission as to the superior safety, feasibility, and desirability of building a lock Canal at Panama."

### Lake-Level Plan.

The essential features of the plan adopted, and now nearing completion, are a lake at 85 feet above mean sea-level, and two approaches to it at sea level. The lake is held at its high level by two dams, one at Gatun and one at Pedro Miguel, and ships will pass from one level to another in locks. The route chosen is 50 miles long, and it follows the bed of the Chagres River on the north side of the continental divide, and that of the Rio Grande on the south side, thus making use of the natural lay of the land to minimize the amount of excavation.

In trying to understand the plans for the work the tourist should keep in mind that the isthmus runs east and west, that Colon and the Atlantic terminal of the Canal are north and west of Panama City, which is near the southern or Pacific terminus. With the directions in mind suppose yourself on a ship bound from New York or Liverpool to San Francisco, then the general direction of your voyage, which is from east to west, will be changed when you reach the Panama Canal to a north to south direction.

The ship will enter the Canal in Limon Bay, and under its own steam proceed to Gatun. The place on the isthmus where the plan can best be seen is at Gatun, where the Atlantic entrance, the locks, the partly filled lake and the ship channel through it, all lie before the eye. Gatun Locks are seven miles inland. At the entrance to the locks the ship will anchor and wait until it is taken in tow by four electric towing locomotives, two ahead pulling and two behind exerting such back pull as will keep the ship steady between lines of taut hawsers, while it moves through the locks. It makes its ascent in three steps each lifting it  $28\frac{1}{3}$  feet, the total of 85 feet representing the difference between the level of the sea and the lake level.

Entering one of the sea-level chambers, the gates will be shut behind the ship, and water will be let in from the



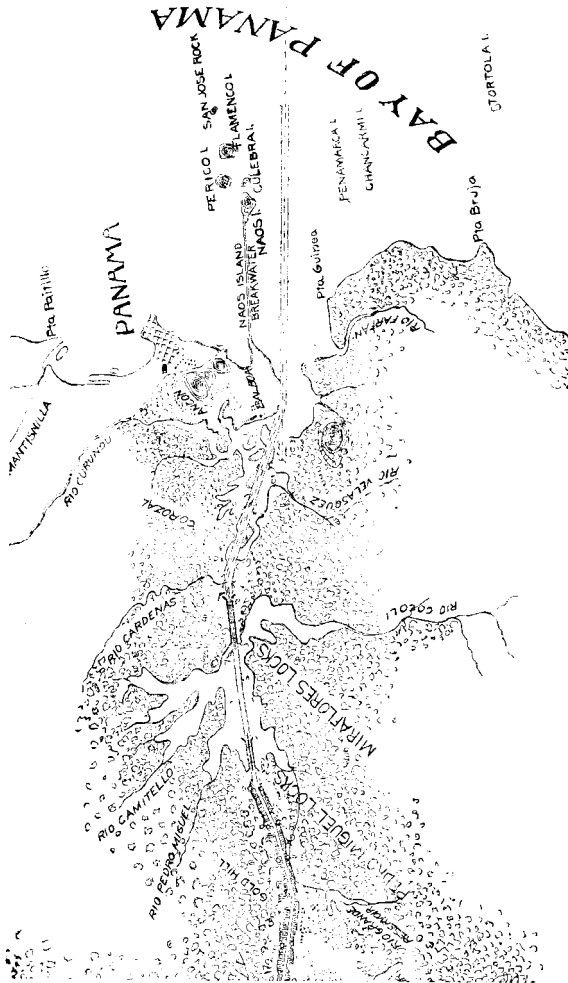
lake through a system of culverts in the lock walls and under the floors, until the ship has been raised  $28\frac{1}{3}$  feet above sea-level. It will then be towed into a second lock chamber, the gates will be closed, and the water let in from the lake will raise it another  $28\frac{1}{3}$  feet. In a third lock chamber, this process will be repeated, and the ship will then be at 85 feet above sea-level, when it will be towed out from the locks into Gatun Lake.

Under its own steam the vessel will proceed up a broad channel past scores of little islands, green with the unfailing verdure of the tropics, past native hamlets and isolated huts, for a distance of 16 miles, when the broad waters will be left behind, and the hills will close in, leaving a channel only 500 feet wide. Six miles farther on, the channel will narrow to 300 feet, and the ship will enter the pass through the continental divide, commonly known as Culebra Cut.

In this section, nine miles in length, the hills will rise sheer at places, and again will slope gradually away, but at no point will one be able to see the surrounding country from the deck. At Culebra the opposing hills will rise five hundred feet above the water level, great masses of igneous rock. This is the summit of the divide, and within sight is the lock at Pedro Miguel, where the descent to the Pacific is begun. After leaving this lock, the ship will sail through a small lake called Miraflores Lake, a distance of one mile, at an elevation of 55 feet above sea level; and then entering the double flight of locks at Miraflores will be lowered to the sea-level channel, through which it will sail a distance of seven miles to deep water in Panama Bay. The time of passage need not exceed eleven hours, at least three of which will be used at the locks.

### Sea-Level Channels.

The sea-level channels or approaches will have a bottom width of 500 feet. That at the Atlantic entrance will begin at a point in Limon Bay, 41 feet below mean sea-level, about four and one-half miles from the shore line. The maximum tidal oscillation in this bay is two feet, and the channel will therefore be 40 feet deep at the lowest stage of the tide. A breakwater extending from the west shore of the bay in a northerly direction guards the entrance against the heavy winds that blow from the north during November, December, and January. The excavation here is done by two elevator-dredges brought to the Isthmus by the French, a dipper dredge of American make, and a sea-going hopper



PACIFIC ENTRANCE—MIRAFLORES AND PEDRO MIGUEL LOCKS.

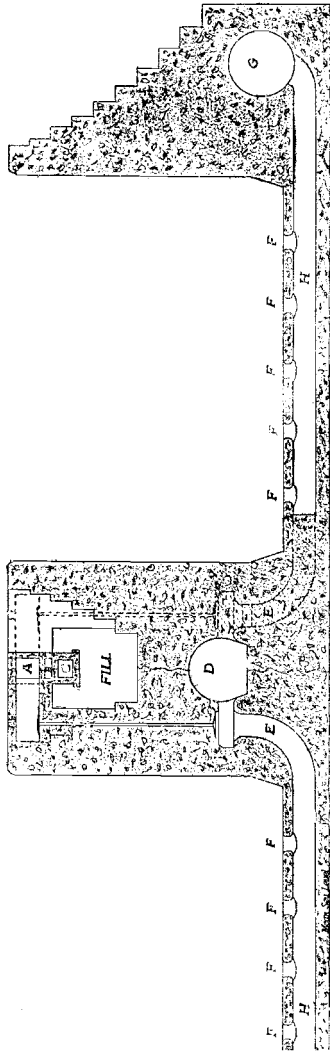


suction-dredge, also made in the United States. Inside the shore line the channel location ran through two small hills, and these have been dug out by steam-shovels to a depth of 41 feet below sea level.

The Pacific entrance or sea-level channel is subject to a maximum tidal oscillation of 20 feet, and therefore the depth has been made 45 feet below mean tide. At the lowest stage of the tide this section of the canal will be 35 feet deep. The channel begins in Panama Bay about four miles from the shore line, and, excepting a mile at the outer end, follows the line of the French canal to Miraflores Locks, a distance of 7 miles, utilizing the French excavation almost the entire distance. The excavation in this section is accomplished by two elevator-dredges of the Belgian type and two Scotch-type elevator-dredges left on the Isthmus by the French, a modern Scotch elevator-dredge built at Renfrew in 1911, and a subaqueous rock breaker of the Lobnitz-ram type. A breakwater extending from the mainland to an island in the bay, parallel with the canal, protects the channel in the bay from cross currents.

### The Locks.

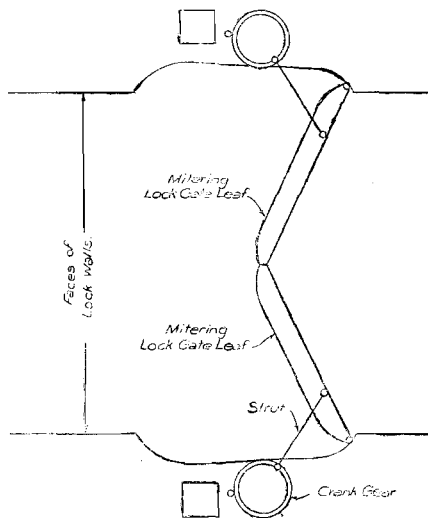
There are three flights of twin locks on each side of the Isthmus, to accomplish the lift from sea level to the lake level, and vice versa. Thus ships can be locked both up and down at one time, and a stoppage of traffic on account of an accident in one series of locks is anticipated by having a duplicate series. Each lock is a concrete chamber that can be closed at either end by steel gates, so that a ship can be raised or lowered in it simply by admitting or withdrawing water. Each chamber will admit a ship 1,000 feet long and 110 feet wide with a draft of 40 feet. This draft is provided for by a depth of fresh water over the gate sills of  $41\frac{1}{3}$  feet. This is also the greatest depth at which a vessel can enter New York harbor, and thus there are two factors that will be potent in making it the maximum draft of future ships. The largest ship now projected can easily use the locks of the Panama Canal. Most of the vessels in the isthmian trade or that are likely to be in it for many years to come, in fact 95 per cent of the ocean vessels in the world, are less than 600 feet long; and in order to save water and time in making lockages each lock is divided by intermediate gates into two chambers 400 and 600 feet long, respectively.



CROSS SECTION OF LOCKS.

Showing one chamber and method of filling chambers by side and lateral culverts. (A) Operating gallery. (B) Wire Conduits. (C) Drainage culvert. (D and G) Supply culverts. (E and H) Lateral culverts (F) Outlet of Lateral culverts.

A cross section of the locks is shown herewith. The main features are the large culverts in the side and center walls through which water is conveyed from the lake level to any part of the locks. From the large culverts it is allowed to flow into or out of the chambers by culverts which open through wells in the floor. The flow into and out of the locks is regulated by valves at the beginning of each culvert. The gates are of the miter type, built up of steel trusses covered with steel plate, forming a series of water-tight bulkheads. Each leaf is 65 feet long, 7 feet thick, and they vary in height from 47 feet to 82 feet, according to the position in the locks. The gates are set in two pairs, one pair being guard gates for use in case the other gates become damaged or can not be operated, because of repairs to machinery, or from other causes. The arrangement of the gates in the locks is shown by the drawing herewith. In all there are 41 gates



POSITION OF MITERING LOCK GATES.

of two leaves each. They are opened and closed by a steel rod attached to the top of each leaf and to the rim of a large wheel mounted on the lock wall. By rotating the wheel through an arc of 190 degrees the gate is opened or closed, just as one would reach out his arm and open or close a door. (See pages 284 and 285.)

At both entrances to each flight of locks a fender chain is stretched across the channel to prevent ramming of the

gates in case a ship should become unmanageable and enter the locks under its own steam. These chains are lowered to allow a ship in tow of the electric locomotives to pass over them into the locks. In case all the precautions to prevent accident to the gates fail, or if for any reason it is desirable to let the water out of the locks for repairs to the gates, an emergency dam of steel has been placed above each flight of locks, which can be swung across the channel, as a swing bridge is thrown over a waterway, to keep all water from the lake out of the locks. Caissons are also provided.

The gates, fender chain-pumps, emergency dams, towing locomotives, culvert valves, and all accessory machinery will

be operated by electricity generated by water-power at the spillway of Gatun dam, and all

Operation of Locks. but the towing locomotives and emergency

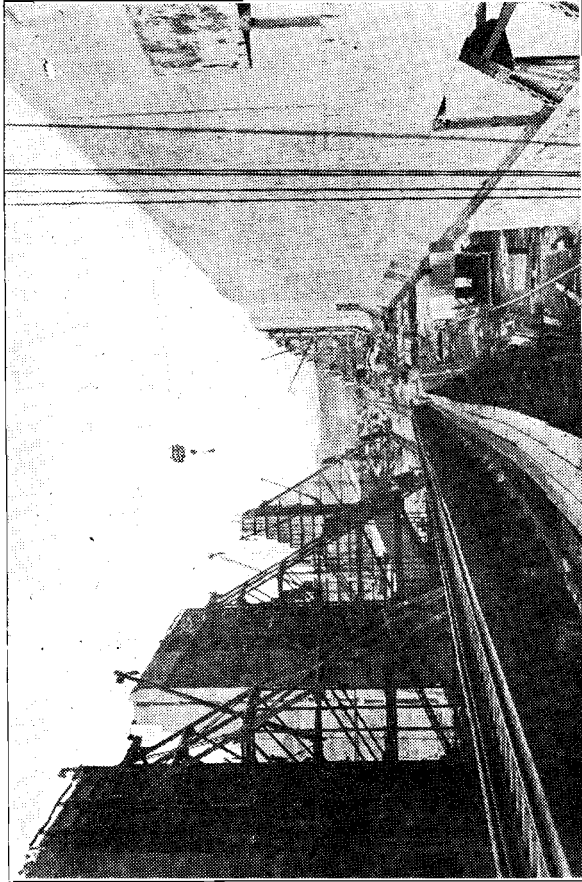
Material. dams will be controlled from a central station

on the center wall from which all parts of the locks will be visible. The locks are constructed of concrete, of which it is estimated about 4,500,000 cubic yards will be used. The proportions are one of cement, three of sand, and six of rock, and about one barrel of cement is used to each cubic yard. The thickness of the floor depends on the underlying material; in one part of Gatun Locks the floor is 23 feet thick and in another part only 3 feet. The walls are of uniform size; the side walls 50 feet wide at the floor of the locks and graduating to 8 feet at the top, and the center walls 60 feet wide at the floor with an operating tunnel for machinery and power cables at the top.

The locks at Gatun are built through the hill that forms the east abutment of the dam, and are on rock foundation.

The emplacement required six million cubic yards of excavation. They are six in number, three steps of twin locks; each step representing a lift of  $28\frac{1}{3}$  feet, a total lift of 85 feet. Rock was quarried and crushed at Porto Bello, and sand dug at Nombre de Dios, both historic ports a few miles east of Colon on the Caribbean. These materials were towed in barges to Gatun where they were assembled, and mixed with cement in a concrete plant of eight 2-cubic-yard mixers, that can turn out 400 cubic yards of concrete in an hour. The materials were unloaded at the docks on the French canal, by one set of aerial cableways, and the concrete placed by another,

the latter extending over the lock site from opposing movable steel towers. There were four duplicate cableways in the concrete-placing plant and two duplicate and one simplex in the unloading plant. An auxiliary mixing plant of two 2-cubic-yard mixers was also used, and concrete from it



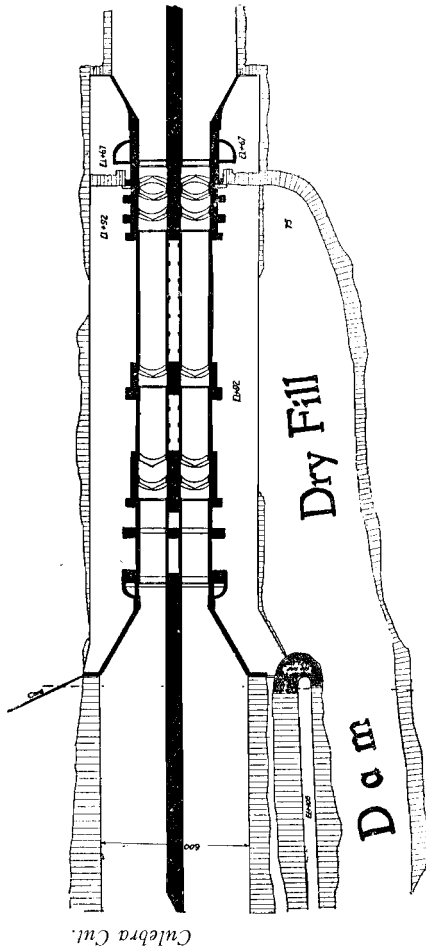
CONSTRUCTION OF GATUN LOCKS.

was delivered by cars on a narrow-gage railway running through the locks. In all 2,085,000 cubic yards of concrete will be placed at Gatun. The estimated cost per yard was \$7.75

and when the work was only 60 per cent completed this had been reduced to \$6.70 a yard.

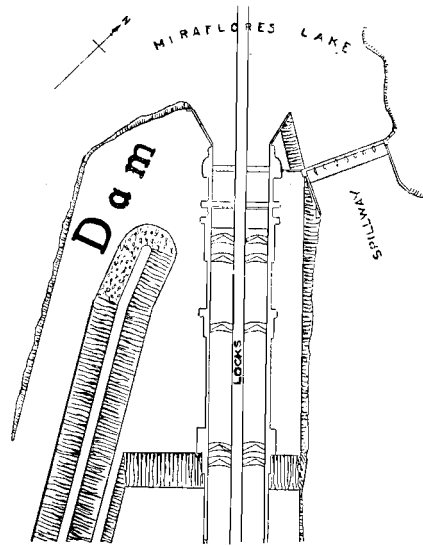
The locks at Pedro Miguel consist of a single flight or step of twin locks, two in all, by which a drop of 30 feet,

*Miraflores Lake.*



PEDRO MIGUEL LOCKS AND DAM.

from Culebra Cut to Miraflores Lake, or a reverse lift, is accomplished. They are built through a hill, on rock, and 1,150,000 cubic yards of excavation were required for the emplacement. The total amount of concrete required is 837,500 cubic yards.



MIRAFLORES LOCKS, DAM, AND SPILLWAY.

Miraflores Locks are located in low ground, the river bed of the Rio Grande, and yet are on solid foundation. The emplacement required five million cubic yards of excavation. There are two flights or steps of twin locks, each step representing a lift of  $27\frac{1}{2}$  feet, a total lift of 55 feet. In all 1,362,000 cubic yards of concrete are required. At the lower or sea-level locks in this flight it has been necessary to anticipate the great differences in pressure due to the variation of 20 feet between high and low tide; and because of this difference these locks are the largest on the canal in point of depth, the maximum lift being nine feet more than in the sea-level locks at Gatun. The lower gates at Miraflores are 82 feet high.

The rock for concrete at Pedro Miguel and Miraflores is quarried and crushed at Ancon Hill, a few miles from the

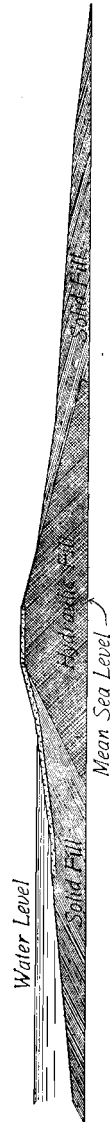
lock sites, and the sand is dredged at Chame beach a few miles west of the Pacific entrance to the Canal, whence it is carried in barges to Balboa and by train to the locks. The cost of concrete runs from \$4.50 to \$6.00 a cubic yard. At both locks the materials are taken from storage piles by cantilever cranes and mixed into concrete within the body of the cranes, whence it is hauled in cars to any part of the locks, to be placed by other cantilever cranes.

### Dams.

There are three dams on the Canal—one at Gatun and one at Pedro Miguel, to hold the water of Gatun Lake at 85 feet above sea-level; and one at Miraflores to hold the water of Miraflores Lake at 55 feet above the sea.

The dam at Gatun, closing the valley of the Chagres River, extends from the hills on the east to those on the west of the valley, is  $1\frac{1}{2}$  miles long, 115 feet high, and tapers

from 2,500 feet broad at bottom to 100 feet at the top. The process of construction is to dump spoil from the canal excavation in two parallel ridges clear across the valley. Between these ridges suction dredges pump a light clay from the river bottoms nearby. This clay hardens as the water drains out, and forms a core that can not be penetrated by water. Halfway across the valley the dam encounters a small hill rising about 120 feet above sea level, and through this the spillway, an opening 280 feet wide, was located because it offered a rock foundation with little excavation. The purpose of the spillway is to regulate the surface of the water in the lake, and to this end sluice-gates are erected on a concrete foundation, by the opening of which



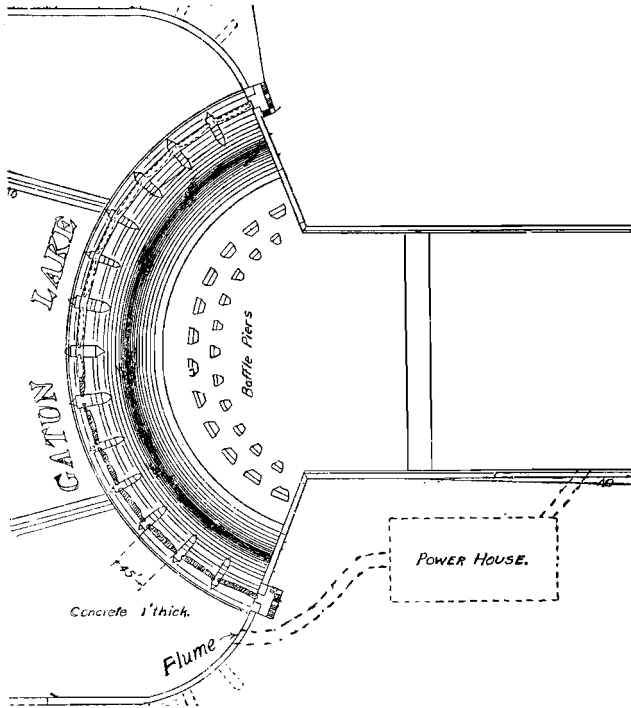
CROSS SECTION OF GATUN DAM.

Showing Earth and Rock Fill, Water Borne Fill, Rock paving on lake side, and surface of Gatun Lake.



the lake can be kept constantly at any given level, no matter how severe the rains may be in the lake region.

At the spillway there is an intake for water which will be passed through culverts to a power house below the regulating works, where it will turn turbines that will generate



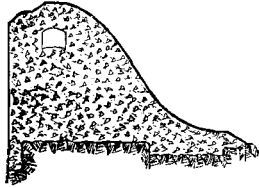
GATUN SPILLWAY.

Showing concrete dam with crest on a curve, Hydraulic Power Plant and Intake.

enough electricity to run all the machinery on the canal, operate the Panama Railroad, and light the whole Canal Zone.

The Pedro Miguel Dam is an earth-fill with puddle core, which extends from a hill west of Pedro Miguel Locks to the locks, and keeps the water of Gatun lake Pedro Miguel at a level of 85 feet above meantide. It is and Miraflores 1,700 feet long and the top is 105 feet above Dams. sea level. A similar office is performed at

the Miraflores Locks for the small Miraflores Lake by a dam 2,700 feet long, which joins the west hill to the locks, and a concrete wing wall 500 feet long extending from the locks to the east hill. On this wing wall are erected regulating gates, like those in the spillway of Gatun Dam, and the wing wall is thus made to serve as both dam and spillway.



OGEE CURVE OF SPILLWAY DAMS.

The concrete dams across the spillways of Gatun and Miraflores Dams are built on an ogee curve so that the force of the water will be broken as it rushes over.

### Gatun and Miraflores Lakes.

Gatun Lake will extend from Gatun Dam to Pedro Miguel Locks, through Culebra Cut, a distance of 31 miles on the center line of the canal. It is formed in the basin of the Chagres River by raising the surface of the river to 85 feet above sea level. The water, therefore, will extend into every part of the valley below that elevation, make islands of what are now hills, and deep inlets of the scores of streams that pour their waters into the river. Its area will be 164 square miles, and it will contain two hundred and six billion cubic feet of water when the surface is at 85 feet above sea level. Every rainy season enough water is poured into the Chagres basin to fill the lake one and a half times. At the close of each rainy season the surface of the lake will be at 87 feet above sea level, and evaporation, use of water for lockages and electric power, and waste may reduce it to the 85-foot level before the dry season (January to May) is over. Throughout the dry season there is a considerable run-off in the Chagres River, and freshets sometimes occur; so that there will be a constant addition to the great storage reservoir even during the driest months, probably enough to counterbalance the evaporation, which is estimated at about four feet a year. The ship channel through the

lake from Gatun to Culebra Cut varies from 1,000 to 500 feet in width, and necessitated an excavation along the course of the Chagres River of about thirteen million cubic yards.

Miraflores Lake will be a pond about 2 miles in area, in which will collect water used in lockages at Pedro Miguel Locks and the run-off of the Cocoli River. Its surface will be at 55 feet above sea level. The ship channel through this lake will be 500 feet wide and a little over one mile long.

### Culebra Cut.

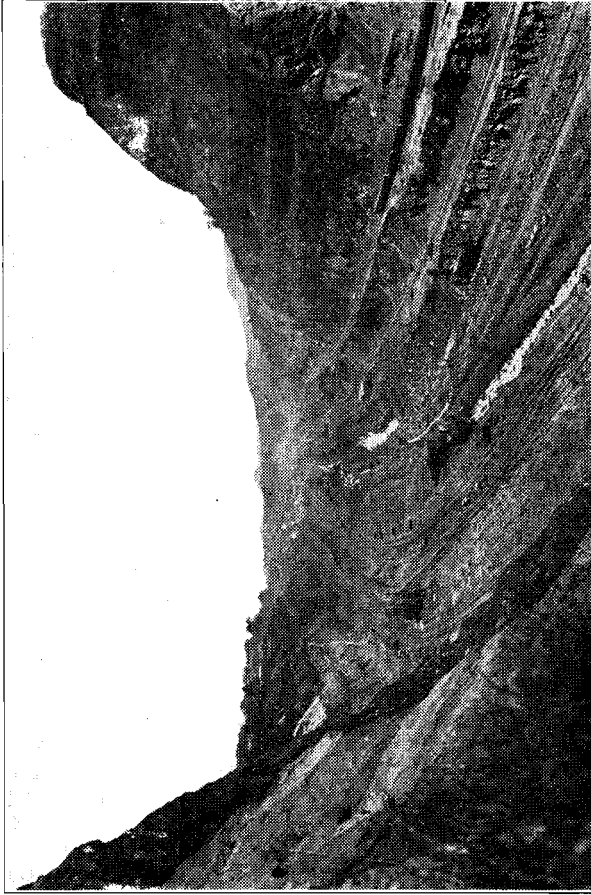
The part of the Panama Canal on which most work has been done, and which will be the last completed, is the cut through the hills of the continental divide, known as "Culebra Cut." This section is 9 miles long, extending from the point where, in its descent to the sea, the Chagres River turns at a right angle from an easterly course to one almost exactly north, to Pedro Miguel Locks where the line of the canal runs into the valley of the Rio Grande. Excavation was begun here by the French on January 20, 1882, and has continued with only three years' interruption (1888-1891) up to the present time. The *Bulletin du Canal Interocéanique* (issued in Paris by the old French company) published the following cable message from Panama, under date of January 20, in its issue of February 1, 1882:

"The first work on the great cut of the maritime canal was formally inaugurated to-day at Empire in the presence of the dignitaries of the state, the leading citizens of the city, and the great assemblage of the people. The first locomotive has arrived at the newly opened excavation. The city of Panama is celebrating the event with a grand fete."

The French were working in Culebra Cut on May 4, 1904, with 700 men, when the United States Government assumed control. In this section they had excavated about nineteen million cubic yards of earth and rock useful in the present canal, leaving eighty-four million yards to be excavated under the American regime.

The digging here, as at other points, is done by steam-shovels, and it is here that the superiority of modern methods of excavation has been shown. Steam-Shovels. Forty-five steam-shovels dig, and load upon cars, 60,000 cubic yards of material each 8-hour day. This quantity is said to represent about 120,000 two-horse wagon-loads. Trains of 20 cars, each car hold-

ing 20 cubic yards of rock and earth, hauled by 100-ton locomotives, carry away the spoil to be utilized in the dam at Gatun, the breakwater at the Pacific entrance, the new line of the Panama Railroad, or to dumps where it is



CULEBRA CUT AT GOLD AND CONTRACTOR'S HILL—SUMMIT OF DIVIDE.

merely wasted. The method of work is to drill holes in the rock, fill them with dynamite, and then shatter the material into such fragments as a steam-shovel can handle. Four main lines of railroad track with numerous spurs enable

an endless chain of trains to pass through the cut, top beside shovels for their load, and when loaded pass out to the dumps.

The long trench is kept dry by two methods. Diversion ditches on either side prevent water from the side hills from flowing into the excavation. The dig-

Drainage. ging is carried on from a center point or summit on a downward slope toward either end of the cut. A center drainage ditch carries the water by gravity to a sump at the north end, whence it is pumped over a barrier into the Chagres River; and to Pedro Miguel Locks at the south end, whence it flows by gravity through the locks into the old channel of the Rio Grande.

A troublesome but not serious feature of the work are the slides from both banks, 22 in number, and in amount about twenty million cubic yards. Masses of

Slides. earth and rock, from which the supporting toe has been removed by excavation, slide into the prism of the canal, and must be dug out. On account of these slides it may be necessary to excavate the last ten feet of the rock in Culebra Cut by dredges, after the canal is opened to navigation; but this will not be allowed to prevent the opening in 1913, although it may retard the actual completion. There are no ships in the Panama trade that could not use the canal with a minimum depth of 35 feet of water, and none in the American Navy that might not be taken through with perfect safety.

### Supplies and Equipment.

Practically all the supplies and equipment in use on the Canal are purchased in the United States, because a law, passed by the Congress in 1905, makes home purchases obligatory, unless the President should deem prices asked by United States manufacturers exorbitant in comparison with those quoted in foreign countries. This law has had the effect of keeping American manufacturers within bounds in their bids. In only two cases has it militated against them—one in the purchase of the largest dredge in use on the Canal, which was built in Scotland at 50 per cent of the price asked by the only American bidder; and the other in the purchase of Mannesman tubes for the stems of valves in the lock culverts, after the only manufacturer of this class of material in the United States had arbitrarily increased the price with direct reference to the Canal work.

Under the law, any article or supplies of a value not exceeding \$10,000 may be purchased in the open market without advertisement or bid. In practice this privilege is seldom used, and nearly all equipment and supplies are purchased on competitive bid, after due advertisement. The award must be made to the "lowest responsible bidder." This system does not always procure the best machines or materials, but it is the most economical in the end; because any other would be a constant nuisance by giving endless opportunity for charges of unfairness by bidders, and of dishonesty by a vigilant and not overscrupulous sensational press.

In making purchases the methods long used by the United States Army, Navy, and other Government departments are followed. Since 1907 the administration has been able to determine from year to year about what amount of materials and supplies is necessary during the following year; and standard articles are purchased in sufficient quantities to last twelve months. The contract entered into obligates the contractor to furnish more of a given article up to 50 per cent, in case the Canal authorities so wish, and absolves the Canal Commission from purchasing within a certain per cent (usually 20) of the estimated amount required. Inspection of materials is made by the technologic bureaus of the United States Government, or, in case such knowledge is not required, by inspectors in the Canal service. Only materials that comply with specifications are accepted. All supplies are handled by the Quartermaster's Department, Colonel C. A. Devol, Chief Quartermaster; Capt. R. E. Wood, Assistant Chief Quartermaster; Capt. C. Nixon, Depot Quartermaster.

It is difficult to find terms that will convey a true impression of magnitude where one is dealing with such quantities as are required in the canal work. One easily senses a barrel of cement, less readily a thousand barrels; but 4,500,000 barrels are beyond visualization. Broadly speaking, 3,500 barrels of cement were required every day while the lock building was at its height; and the delivery of this material from New York took all the time of two 10-thousand-ton ships, and several smaller ones aggregating ten thousand additional tons. So with steel, dynamite, and other supplies; the amounts are so large as to mean little, because they baffle familiar comparison. In 1910, the year when the work was at its height, there were purchased 350,000 tons of materials, valued at \$10,000,000.

The dry excavation is done by steam-shovel and the wet by dredges of various types. When dry excavation was at its highest point, in 1910, 560 drills were used in drilling the material for blasting, Equipment in Canal Service. 100 steam-shovels dug the earth and rock and loaded it upon cars, 3,600 cars carried it to the dumps, and 158 modern locomotives hauled trains. In addition to these there were 700 cars in general service, and 1,470 freight cars on the Panama Railroad, 112 old French locomotives, 32 narrow-gage locomotives, and 12 electric locomotives in use. Miscellaneous equipment for the dry excavation consists of 25 machines for spreading spoil on the dumps, 10 machines for shifting track, 30 for unloading spoil from the large flat cars, 57 locomotive cranes, and 20 pile drivers.

In the wet excavation there are in use 7 ladder or elevator-dredges left by the French, one modern ladder-dredge, 3 dipper-dredges, 2 sea-going suction-dredges, and 1 clam-shell dredge, 1 subaqueous rock-breaker, 11 self-propelling barges (clapets) left by the French, 2 drilling barges, 1 pile-driver, 14 launches; and, in the wet-excitation and rock-and-sand services, 12 tugs, 1 tow-boat, 1 crane-boat.

This equipment is supplemented by that used in mixing and laying concrete in the locks, which is referred to under the section on Locks.

Among the manufacturers supplying materials are the following:

<i>Name</i>	<i>Materials</i>	<i>See Page</i>
Bucyrus Co.....	Steamshovels.....	291
Dupont Powder Co.....	Dynamite, etc.....	292
General Electric Co.....	Motors, etc.,.....	294
Globe-Wernicke Co.....	Office Supplies.....	288
Keystone National Powder Co..	Dynamite.....	290
Trenton Iron Co.....	Wire Rope.....	281
Western Wheeled Scraper Co....	Dump Cars.....	286
Wheeling Mold and Foundry Co.	Lock Gate Machines, etc..	284-5

### Commissaries and Messes.

The United States Government is in the department store business on the Isthmus, runs hotels, has a cold storage and manufacturing plant, and in general carries on a great provision and clothing establishment. It does this work so much better and more economically than similar enterprises are conducted in the United States, that the time

one spends in investigating this branch of the canal work will be profitable as well as interesting. The men who manage this branch are Lieut.-Col. E. T. Wilson, Chief Subsistence Officer; Capt. F. O. Whitlock, Assistant Subsistence Officer; Mr. John Burke, Manager of Commissaries, and Mr. W. F. Shipley, Chief Clerk.

The subsistence branch has the work of feeding all the employees not living in family quarters. There are three classes of such employes and a separate system of messes is maintained for each—(1) hotels for white Americans; (2) mess halls for European laborers; (3) kitchens for negro laborers. The hotels are really mess halls, because no sleeping accommodations may be obtained by transients. They consist of a large room set with tables, a balcony arranged in the same way, and a kitchen and ice box. The meals cost 30 cents each to employes and 50 cents to transients. They are good meals for the price and the service is good, considering that most people want their food in a hurry and must be accommodated. The messes for Spanish laborers are conducted in halls, and the laborers sit down at long tables upon which the food is placed with a great clatter. Meals cost 40 cents for three, and they are usually good. Negro laborers get their food in pans or pails at the mess kitchens, and three meals or rations cost 27 cents. There are 19 hotels, 16 messes, and 14 laborers' kitchens. About 3,000 employes eat at the hotels, 3,000 at the messes, and 6,000 get food from the kitchens. The negro laborers do not patronize the kitchens regularly because no provision is made for service, the food being dished out to be eaten elsewhere. The Spanish laborers who do not eat at the mess halls patronize some cantina run by one of their own people, where they can get wine, and take as much time as they please for their meals. The subsistence branch maintains itself and pays a small profit. See also "A Canal Builder's Village" and "Social Conditions and Forces."

The present commissary system is an outgrowth of the old railroad commissary store. It maintains an ice plant where 100 tons of ice are made daily, a bakery Commissary, which produces six million pounds of bread a year, an ice cream factory, a cold storage plant, meat cutting shop, soup factory, corned beef plant, coffee roaster, butter printery, and laundry. There are 18 retail stores,



of the character of a country general store, situated in various Canal Zone villages, and they are supplied with stocks of food and clothing from the warehouses at Cristobal. The total annual business amounts to about six million dollars, and 90 per cent of this money is spent in the United States, 5 per cent in Panama, and 5 per cent in Europe.

For five years the Commissary has succeeded to the extent that it has paid an annual dividend, paid living wages to its employes, and sold meat, bread, butter, ice, coffee, sugar, shoes, underwear, and other necessities at a lower price than they could be bought at retail in the United States. It handles no "cheap" stuff, works off no bad foods or shoddy clothing, strives always to "give the money's worth," and it usually succeeds. It is the most striking instance in history of the economy of collective effort in meeting the common problem of "how to live."

