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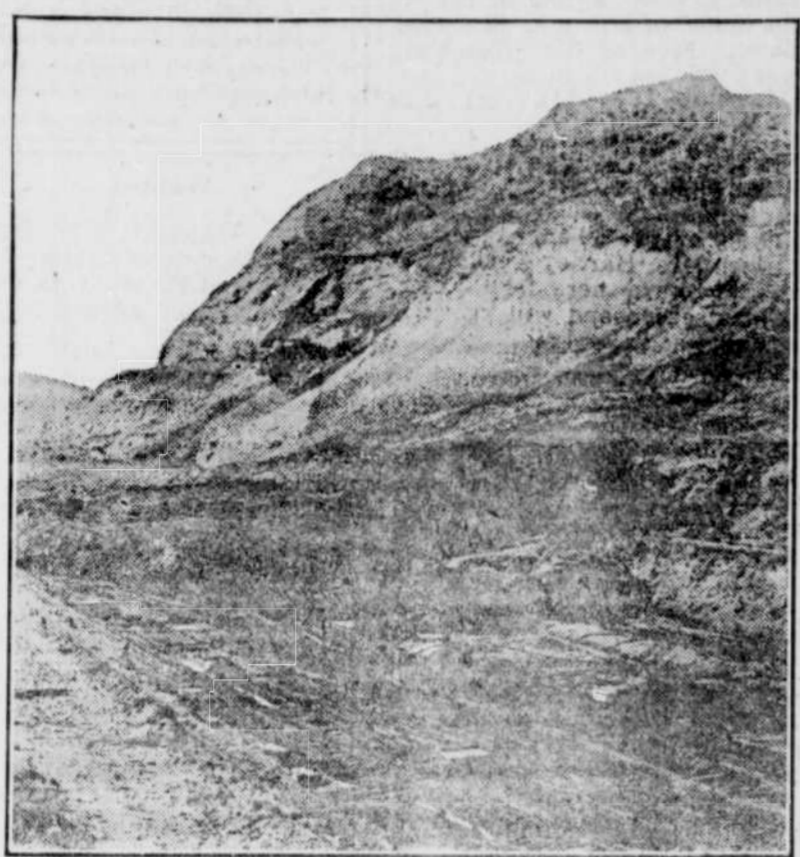
Pacific Drug Co.

Forest Grove - Oregon

N. B. Lacourse and the firm of S. E. Williams & Co., have placed their book accounts with me for collection. Are you indebted to them? Better see me about it. 212p W. J. R. Beach.

The Americans In Panama

Story of the Panama Canal From Start to Finish.



CUCARACHA SLIDE IN CULEBRA CUT, INVOLVING FORTY-SEVEN ACRES.

The slide at Cucaracha, near the town of Culebra, involves forty-seven acres and is the most troublesome of the numerous slides in Culebra cut. The French noted this earth movement as far back as 1884. Cucaracha in Spanish means cockroach.

By Wm. R. Scott.

(Continued from last week.)

line onward the slides have been the bane of the organization, not because they were insuperable, but from the extra work they involved and the possibility that they might delay the completion of the project.

Right then it was realized that the canal involved more excavation than the majority of the board of advisory engineers had estimated. Several important changes in the plans for the canal came within the first eighteen months of the Goethals administration to make the job far more stupendous than contemplated in the plans of 1903. Colonel Goethals recommended and President Roosevelt approved on Dec. 20, 1907, a change in the location of two of the Pacific locks. The revised plans changed two locks from La Boca, on the Pacific coast, to Miraflores, about seven miles inland, which not only would make them safe from bombardment, but was a more practicable engineering plan. A mile and a half farther inland were the Pedro Miguel locks, which would raise ships the final height to the great Gatun lake at its Pacific terminal, and between the Pedro Miguel and Miraflores locks was a small artificial lake. From Miraflores to the Pacific a sea level channel 500 feet wide was to be dug.

Another change in the plans was approved by the president on recommendations by the navy board on Jan. 15, 1908. The locks were ordered enlarged from 95 by 900 feet to 110 feet by 1,030 feet, usable dimensions, to meet the anticipated increase in the size of commercial and war vessels.

The Pennsylvania of our navy will be ninety-seven feet wide, or six and a half feet on each side of the ship in the locks. The Imperator of the Hamburg-American line is 96 feet wide and 919 feet long, so that it appears that the locks may become too narrow before they become too short. The cost of the locks was increased \$5,000,000 by the change in plans.

A third vital change in the original plans came on Oct. 23, 1908, when the president authorized the widening of the Culebra cut for five miles from 200 feet to 300 feet at the bottom. This would enable ships to pass going in opposite directions anywhere in the cut and increased the cost of this part of the canal by \$14,000,000. Since these three important changes there have been no substantial changes in the canal plans except the decrease in the proposed height of the huge Gatun dam. Additional excavation to the extent of 70,871,594 cubic yards was necessitated by the new plans over the estimate of 103,795,000 yards made in 1906, or a total of 174,666,594 yards for the completed canal. But slides that later developed and further changes to the plans since 1908 have added 47,000,000 yards to that total, bringing it up to 221,666,594 yards. Thus Colonel Goethals has had to dig more than twice as much dirt as Mr. Stevens expected to take out and has done it in less time than was estimated for the original yardage.

Basing his figures on the revised plans, Colonel Goethals in 1908 issued the following estimate of the cost of the Panama canal:

ATLANTIC DIVISION—SEVEN MILES Breakwater in Limon bay..... \$1,025,000

Gatun locks.....	17,736,000
Gatun locks, three twin locks.....	25,824,000
Gatun dam.....	13,572,000
TOTAL.....	\$57,132,000
CENTRAL DIVISION—THIRTY-TWO MILES	
Channel from Gatun locks to Bas Obispo.....	\$7,977,000
Culebra cut, nine miles, Bas Obispo to Pedro Miguel lock.....	80,451,000
TOTAL.....	\$88,428,000
PACIFIC DIVISION—EIGHT MILES	
Pedro Miguel lock.....	\$12,023,000
Pedro Miguel dam.....	251,000
Miraflores locks.....	15,715,000
Miraflores dam.....	2,156,000
Channel, Pedro Miguel to Pacific.....	13,170,000
TOTAL.....	\$43,355,000

New Panama railroad.....	\$4,250,000
Land damages.....	\$8,150,000
TOTAL.....	\$12,400,000
GENERAL ITEMS	
Municipal improvements.....	\$12,114,000
Buildings.....	14,021,500
General expenses, salaries, subsistence, etc.....	3,739,000
Loans to Panama railroad.....	8,300,000
Contingencies.....	20,000,000
Lighthouses, ships, wharves.....	3,800,000
Double tracking, land and stock purchases.....	1,400,000
TOTAL.....	\$63,020,000
Grand total cost of construction.....	\$227,768,000
ALL OTHER ITEMS	
Sanitation.....	\$30,053,000
Civil administration.....	7,382,500
Paid for French property.....	40,000,000
Paid for canal zone.....	10,000,000
TOTAL.....	\$87,435,500
Total cost for completed canal.....	\$315,203,500

CHAPTER X. Goethals a Great Administrator.

BEGINNING July 1, 1908, Colonel Goethals initiated changes in the organization, which was to be the final one for the canal. The department of engineering and construction was divided into three grand divisions, to be known as the Atlantic, central and Pacific. In the central division the main excavation of the canal has been made, as the mountain chain had to be pierced with a cut, the bottom of which would be only forty feet above sea level, necessitating digging down from the high point on the surface, a depth of 72 feet, between Gold and Contractor's hills.

The equality with which Colonel Goethals has met every unexpected development in the construction work is a distinguishing feature of the man's mental processes. If he ever has for the moment entertained the shadow of doubt of the success of the lock type and he has not allowed his fears to be manifested. The slides, the slip in the Gatun dam, the volcanic evidences in the Culebra cut, the cracks in the lock walls, earthquake disturbances and a host of lesser troubles have not shaken his faith.

The mammoth Gatun dam had been begun in 1906 and by 1908 was taking form under the constant dumping of rock and earth from the Culebra cut. On Nov. 20, 1908, a toe of the great dam slipped where the dam intersected the old French canal channel, carrying about 200 feet of the structure away. The hostile press and those who had consistently opposed a dam at Gatun immediately raised a storm of criticism against the stability of the proposed artificial mountain. The old wound, caused from the battle of the levels, was reopened, and so violent was the outburst that President Roosevelt

took a characteristic step to quiet the issue.

He asked President Elect Taft to go to the isthmus, accompanied by Frederic P. Stearns, Arthur P. Davis, Henry A. Allen, James D. Schuyler, Isham Randolph, John R. Freeman and Allen Hazen, all eminent engineers, to make an investigation. The report made on Feb. 16, 1909, completely vindicated the plan for a dam at Gatun with the statement that if any error had been made it was on the side of precaution. They found the dam started along lines so excessively stable that they recommended that the height be cut from 135 feet above sea level to 115 feet, which would still leave the top of the dam thirty feet above the level of Gatun lake.

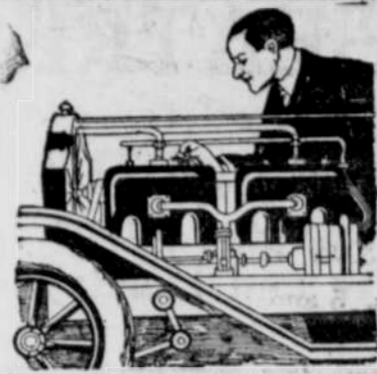
The six years from Jan. 1, 1907, to Jan. 1, 1913, constitute the main construction period of the Panama canal. Colonel Goethals has been chief engineer all but three months of that time. Steadily, foot by foot, the walls of the locks crept up and the bottom of the Culebra cut went down. By October, 1908, the preparatory work, substantially accomplished by Mr. Stevens, passed its highest point, and all energies were centered on the work of construction. Quarters, municipal work, roadmaking, subsistence and commissary were solved problems, and the "No Help Wanted" sign was displayed, the labor problem, too, being substantially worked out.

Sixty-three steam shovels in 1907 were increased to 100; the mileage in the canal zone was increased from 185 to about 500 miles for the Panama railroad and commission tracks; the number of unloaders, bank spreaders, track shifters and pile drivers was increased from a third to three times the number left by Mr. Stevens; twenty dredges were put in service, besides much other machinery and equipment not so noteworthy. Practically all repairs and creative mechanical work were concentrated in the Gorgona and Empire shops, with capacities commensurate with the equipment. The date when the equipment reached a maximum is fixed by Colonel Goethals as July 1, 1910. About 350,000 tons of coal and 500,000 barrels of oil have been used annually.

Dredging had progressed in the Pacific (Continued next week)

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