

Landslides May Delay Opening of the Panama Canal

An Associated Press dispatch, dated Washington, Nov. 24, says: No definite date for the official opening of the Panama canal is set in the annual report of Colonel George Goethals, chairman and chief engineer of the canal commission, which has just been submitted to Secretary Garrison. Neither is there any prediction of when the ships may first pass from ocean to ocean. The first day of the canal's actual operation still depends upon the treacherous slides of Culebra cut and how well the dredges can keep the channels open.

"It has been the general belief that the effect of the water in the cut would tend to retard slides and ex-

perience below the Gatun locks fully justifies this belief," said Colonel Goethals. "On the other hand the geologist is of the opinion that the water may to some extent develop new slides. Again much ado was made in 1909 over the seamy character of the rock on the isthmus, through which water flows quite rapidly, in consequence of which the question was raised that the lake might leak out through seams and crevices.

SOONER THE BETTER

"If these things are liable to occur, the sooner the better, if the official opening of the canal is to occur January 1, 1915; for if water was not admitted this fall, but were deferred until May 1, 1914, the full height could not be reached until October, 1914, leaving little time for the determination of these questions. These considerations led to the conclusion that the water should be turned into the cut at the earliest date practicable for getting the dredges to work on the slides.

"The present plans, therefore, are based upon the blowing up of Gamboa dike on October 10, its removal by dredges immediately thereafter, the transfer of two suction dredges and a ladder dredge to the Cucaracha slide, the smaller dipper dredges to work on the other slide; until the full width of the channel is attained, and the passage of vessels through the canal as soon as channels of full depth and of sufficient width have been secured.

"Before boats can be passed it will be necessary to remove the Gamboa dike by dredges and to remove the slides as already outlined. The passage of commercial vessels is dependent, therefore, upon the time when proper channels can be dredged through the slides; should additional ones occur, they will necessarily advance the date when this will be accomplished."

DELAY BY SLIDES

The canal proper, exclusive of the approaches, the machine shops and warehouses and great ocean docks at either end, would have been completed during the last fiscal year, but for the extensive slides in the Culebra cut. And to deal with the great problems involved in the removal of the slides no effective way was found except the bodily displacement of vast hills. The slides and breaks increased as the cut was deepened.

"No treatment has proven effective for slides when once developed except that of excavating and hauling away material from the moving mass until the slide comes to rest or until the angle of repose for the particular material in motion is reached," said Colonel Goethals.

Last year it was predicted by geologists that the slides had been conquered and that little more activity could be expected because all the loose surface soil and stone had almost slid off, exposing great ridges of solid basalt rock which would act as barriers to further earth movements. Yet, when all was most promising and the canal excavation had gotten within sixty feet of the bottom of the cut on the east side, the rocks broke under the tremendous pressure and 2,000,000 cubic yards of material slid into and closed up the cut. Since then, the canal workers have been digging away that material and though there have been several slides, steady progress was made, for not only did giant dredges work on the face of the slides but powerful hydraulic monitors, such as were extensively used in hydraulic

mining on the Pacific coast, were brought into play to wash away the treacherous hills from the rear, carrying the material into unused valleys distant from the canal.

PICKED WET METHOD

A great engineering problem was involved in the solution of the question of continuing the excavation of the canal by steam shovels or by hydraulic dredges and Colonel Goethals for the first time makes an official statement of the reasons which impelled him to choose the wet method. In brief, these were based on the apprehension that Gamboa dike would not be strong or high enough to keep the water out of the cut as the Gatun lake rose in the wet season. Also, steam shovel operations would be retarded by the seasonal rains which would not affect the operation of the dredges and finally the measure was one of economy. It would have been possible with the shovels to have removed all of the slides by January 1, 1914, next except the Cucaracha slide which could not have been entirely carried off before April, 1914.

The financial operations of the canal are told in big figures: The disbursing officer has paid out \$20,524,705 on pay rolls alone. Congress so far has appropriated \$349,505,223

for canal construction of which \$10,676,950 went for fortifications.

HOW THE LOCKS WORK

In great detail Colonel Goethals tells the story of the engineers' work during the last year and with particular satisfaction it is reported that the mechanism of the vast locks and dams was tested with perfect success. The gates at Gatun were swung in one minute and fifty-one seconds for each leaf. The heavy iron chains which are depended upon to prevent an unruly vessel from crashing into the locks were raised and lowered in ample time to meet any emergency, and demonstrate their ability to check or stop any vessel unless of very great size and moving at excessive speed. The locomotives which will tow the ships through the locks were tried out and proved their ability easily to handle the largest of vessels and the electric installation which will involve the use of a current of 44,000 volts was completely successful.

Altogether the technical sections of the report seem to demonstrate the accuracy of Colonel Goethals' statement that practically nothing but the great slide at Cucaracha remains to prevent the successful operation of the canal.

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