

## HARBOR IMPROVEMENTS.

SEA WALL AND CREEK DREDGING.—The improvement of the San Antonio Creek, so that large ships can be brought within a convenient distance of the mainland, has been advocated by those who were fully conscious of the great advantages Oakland has on account of her location on the eastern shore of the bay, being naturally the center of the railroad system of the Pacific Coast. The forty-second Congress directed an examination of the San Antonio Creek, with a view to its improvement. The Board of Pacific Coast Engineers, consisting of Major G. H. Mendell, Col. C. S. Stewart, and Col. Alexander, submitted their report in March, 1874. They made a thorough examination, and reported favorably. They ascertained that the tide rises a little higher and falls a little lower in San Leandro Bay than it does in San Antonio Estuary, the difference in range being four tenths of a foot. The times of high and low water are also earlier in San Leandro Bay, by about one hour. The San Antonio Estuary is supposed to be filling up on account of the smallness of the tidal basins which supply water for the stream in the channel. But with the present tidal area, the channel is twenty-two feet deep at Hibbard's, or the old Alameda Wharf, and that the depth elsewhere ranges from fourteen to eighteen feet, at low water. At the mouth of the Estuary, where the water is distributed over a large area, a bar exists, on which there are about two feet of water. Hence the conclusion that if this channel were sufficiently contracted its depth would become greater, on account of the power exerted by the ebb tides. In this case the great scouring effect of the ebb tides is specially due to the tidal peculiarities of the bay. The first practical step was to contract the water way over the bay, to be done by two parallel training walls of stone, to extend from the mainland to the deep water of the bay. To afford the necessary room for navigation they are one thousand feet apart. But this basin is not large enough to open and maintain a wide and deep channel between the training walls. Rather than incur this annual cost of dredging that would be necessary, a plan, almost provided by nature, has been adopted. It is proposed to double the amount of water flowing through the creek by connecting it by a canal with San Leandro Bay. A dam across the mouth of the bay will be necessary. The current will then be doubled in velocity, and it is estimated that the depth of water in the channel will be maintained at eighteen or twenty feet at low tide. The order in which the several parts of the work are to be done is as follows: first, the training walls; second, the canal to connect with San Leandro Bay; third, the dam at the mouth of the San Leandro Bay; and fourth, the excavation of the tidal basin at the head of San Antonio Creek. The estimated cost of the whole work is \$1,736,985.20.

The great work throughout the years 1876 and 1877 was prosecuted with commendable alacrity, under the direction of the Board of Pacific Coast Engineers. Louis J. Le Conte, son of Professor Joseph Le Conte, of the State University, has had the immediate supervision of all operations.

During the last year fifty men on an average have been employed. Seven schooners have been in active service bringing over rock from the quarries on Telegraph Avenue and Angel Island. Fifty tons are a load for each craft, and four hands are required in loading and dumping the stone. Three loads per week is about the quantity transported. Twenty hands are employed in the quarries. The rock gotten out is regarded as the best and most suitable for the wall.

The last contract for building was let by the U. S. Government at \$1.19 per ton, the amount of rock required being forty-seven thousand