

COLLEGE OF ENGINEERING MANUAL.

IRRIGATION WORKS

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PREFACE.

WHEN the original College text-book on Engineering went out of print, it was decided that it should be re-written in the form of several manuals. The first to be undertaken was one on Hydraulics which was published in 1887. A Manual of Building Materials and Construction was issued in 1894.

The want of a Manual on Irrigation Works was felt by the College, and in 1896 a small work, adapted for the most part from Mullins' "Irrigation Manual" by permission of the Government, and with the late General Mullins' consent, was published.

Experience showed, however, that this work required revision and amplification to fit it for College requirements, and it has accordingly been re-written. The present publication does not aim at being a comprehensive treatise on irrigation, it is merely a manual compiled for the use of students.

I have to acknowledge the courtesy of Mr. R. B. Buckley in granting permission to make use of his book "Irrigation Works in India and Egypt," to Mr. Herbert M. Wilson in regard to extracts from his "Manual of Irrigation Engineering," to Mr. James D. Schuyler for leave to reproduce several illustrations from his book on "Reservoirs for Irrigation, Water Power and Domestic Supply," and to Messrs. Ransomes and Rapier for the notes on Stoney's sluices.

I also express my gratitude to His Excellency Lord Amphill, Governor of Madras, for graciously accepting the dedication of this work.

MADRAS,
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B. O. R.

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SURPLUS ESCAPES, SLUICES.

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176. Pacoima Submerged Dam.—One of the most novel and interesting masonry dams erected for impounding water in California, where so many novelties and experimental works have been carried out, is a slender little reservoir wall built across Pacoima Creek in the San Fernando Valley, 20 miles north of Los Angeles, for the purpose of forming an underground reservoir, whose storage capacity consists solely of the voids in the gravel bed filling the valley of the stream.

The creek drains a watershed whose area is 30.5 square miles above the point where it issues from the mountains. Here it flows over exposed bed-rock, and the normal summer flow, which diminishes gradually from about 2 cubic feet per second to less than one-tenth of that quantity is entirely diverted by a pipe-line and used below for irrigation. The dam in question is located $2\frac{1}{2}$ miles further down where the channel of the stream is contracted to a width of 550 feet by a ledge of sandstone which

crosses it at about right angles. Between the dam and the mouth of the canyon is a continuous bed of gravel, in places half a mile wide, which, though lying on a heavy grade, constitutes the storage-reservoir. The dam was constructed by excavating a straight trench, 6 feet wide, from side to side of the channel, down to and into the sandstone bed-rock. In the centre of the trench a wall of rubble masonry was laid, 3 feet wide at base, 2 feet at surface, using the cobbles excavated from the trench, and a mortar of Portland cement and sand. The mistake was made of not filling the entire width of the trench with concrete, thoroughly rammed between the side walls, which would probably have insured satisfactory water-tightness. As it was, the space each side of the wall was refilled with gravel, and the wall was not thick enough or sufficiently well pointed to be entirely water-tight. The general height of the wall is 40 feet, the maximum being 52 feet. Plan, profile, and section of the dam are shown in Figs. 120 and 121. Two gathering wells are provided in the line of the wall, each 4 feet inside diameter, reaching from bottom to top.

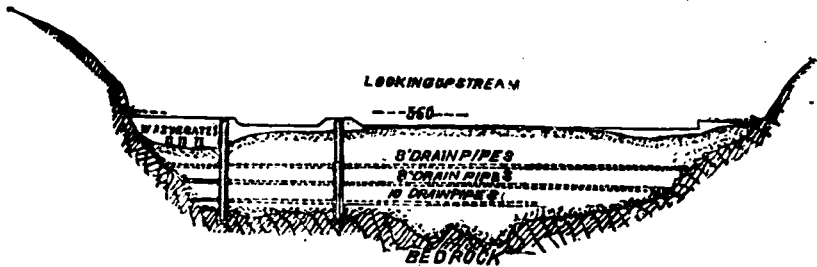


Fig. 120 Profile Paoima Submerged Dam.

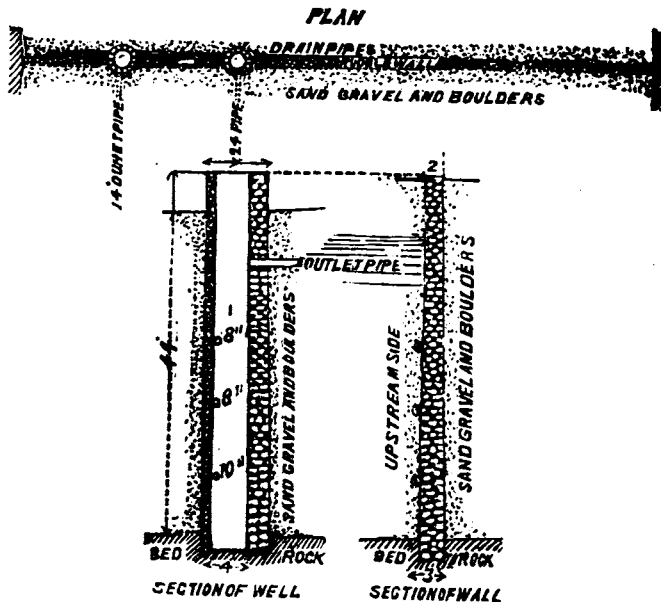


Fig. 121. Sections of Paoima Submerged Dam.