

concrete, composed of one portion of Portland cement to eight of broken stone, gravel, and sand, run in solid to fill the interstices between a base of clean rubble spread evenly over formation-level for a depth of 9in., so that the concrete shall be thoroughly incorporated with the stone, and that the entire surface on which the blocks are to be formed shall be finished to an even, true, and smooth face.

The lifting and stacking steam Goliath of 55ft. gauge, centre to centre of rails, will run on whole timbers of colonial growth, firmly bedded on the rubble base before described. The longitudinal sleepers for the portable concrete mixers, one on each side of the block-making floor are likewise to be of colonial growth, 10in. by 10in., all to be in convenient lengths, and packed hard underneath the bed. Proper drains and culverts to be provided throughout the yard for unwatering its surface. The service and other lines shown on the drawings are to be of the colonial gauge of 3ft. 6in., and to be laid at the radii indicated on the plan, Fig. 3, drawing No. 5. Service main-pipes, consisting of 4in. pigot and faucet pipes, in 9ft. lengths, with well caulked and leaded joints, to be laid along the seaside of the block-making floor, with hydrants conveniently arranged for attachment by means of a flexible hose to a vertical delivery-pipe, connected with the machines for supplying with fresh water the service-tanks on each of the mixers, the source of supply to be the stream 200 yards westward of and parallel to Barrett's Road.

It will be observed that the concrete materials are to be conveyed over an incline of 1 in 35 at the back of the workshops, and at the top thereof shunted on to a level line, the stone being tipped therefrom on to an upper floor for the purpose of feeding three of Blake's 15in. x 9in. patent stone-breakers, arranged for crushing different sizes of material. The cement would be discharged from trucks in casks into the cement-shed, and the sand and shingle tipped on to a special high-level floor. The cement may be retained in the casks until required for use, the latter being rolled to a hopper and the contents discharged therein. There would be three of these hoppers in the shed, placed 25ft. from each end, and 50ft. apart, centre to centre, each fitted with a rectangular trunk proportioned to contain 4 cubic feet of Portland cement, being the exact quantity required for 1 cubic yard of concrete at the proportion of one of cement to eight of broken stone, shingle, and sand.

The top and bottom of this trunk to be fitted with slides, so as by withdrawing the upper and closing the lower one the said trunk can be filled and discharged upon the application of a reversed process. The floor of the cement-shed to be finished with concrete in the manner previously described for the blockyards. The masonry foundations of the shed to consist of flat bedded rubble-stone, laid in local lime mortar. The copings to be of concrete formed *in situ*, and the floors also of concrete, laid on *débris* filling, in layers, well punned. The depths of the foundations of the walls indicated on the drawings are subject to variation, dependent upon the nature of the bottom, as demonstrated when the excavations are made. The sea-face of the yard to be formed on the line shown on Fig. 3 of the same sheet, and also on the general drawing No. 1, care being taken to select the largest of the stones for deposit on the outer face. The details of the timber work of cement-sheds, shops, and offices to be prepared by the Resident Engineer in the colony.

The dry materials to form the concrete would be conveyed from the cement-shed and floors to the portable concrete-machines in special wrought-iron skips, each to contain 1 cubic yard, two skips being placed on each truck. The truck, with the empty skips thereon, would be drawn to the sand-floor, where each skip would receive its due proportion of sand and shingle, to be ascertained by gauging with a special rod the depth of the unfilled portion of the skip above the surface of the sand. After being thus partially filled with sand, the skips would be pushed underneath the cement-hoppers previously described, where each would receive its proper supply of cement, after which they would be further moved on and filled with broken stone, the object being to confine the cement between the layers of sand and stone, so that the wind would not act thereon, either whilst standing in the yard or during the process of tipping into the hopper of the mixer.

Root.

Simultaneously with the execution of the workyard, and as soon as practicable after the return of the Resident Engineer to the colony, arrangements should be made for proceeding with the execution of the root of the pier, as shown on drawing No. 2. This root to consist of a sea-wall of the section on Fig. 3, commencing at a point 50ft. landward of high-water spring-tide, and extending therefrom for a length of 335ft. in a line with the sea-face of the pier, from whence there would be a return or abutment of the section indicated by cross-lines on Fig. 4, and from the latter, running landward in a curved direction, there would be a harbour-wall of the dimensions shown on Fig. 3, 250ft. in length, finishing at the inner end with a short return. The sea-wall to be stiffened with four counterforts, 6ft. thick at the top, and 8ft. at the base, placed 30ft. apart, centre to centre, as shown. The sea- and harbour-walls and the counterforts throughout to consist of cement-concrete, composed of one portion of Portland cement to eight of broken stone, shingle, and sand, the latter in such relative proportions, dependent upon the respective quality of the materials, as will insure a perfectly compact mass, free from voids and vacuities, all to be deposited *in situ*, in courses of 4ft. 9in. in height, to correspond in length with the courses of the masonry of the pier. Clean rubble may be incorporated into the heart of the courses of concrete, care being taken that the stone is well rubbed into and packed around with the concrete material. The face-joints, both horizontal and vertical, to be chamfered in the manner indicated, to correspond with the joints of the blocks in the pier. The bottom course will rest on a foundation of compact boulders, which it is assumed will be obtained throughout the width of the foreshore, between high and low water, underneath the sand, which latter must be removed so as to lay bare the compact foundation, this, having been prepared and freed from gravel or other friable material, is to form the bed for the concrete superstructure. Should the bottom, in the opinion of the Resident Engineer, be of such a character as to justify the anticipation of disturbance, or scour, through rebound or otherwise, from the face of the wall on the seaside, he will, simultaneously with the putting-in of the lower courses of the sea-