

any part of the line of coast, would afford a resting-place for the moving mass, would be speedily overwhelmed by it. To this subject, therefore, our inquiries were mainly directed. The weight of the oral evidence which we have taken, as well as our own observations, have led us to the conclusion that the impact of the waves on the shore is, on the average, in a direction very nearly perpendicular to it, and that the ordinary movement to which the shingle is subjected is to be carried outwards towards low-water mark and a short distance beyond it, under the influence of the south-east seas, which are the heaviest which occur on the coast, and to be replaced near high-water mark during the fine weather, with winds from north-east, which prevail during the greater part of the year. It seems certain that the result of these excursions is a general movement to the north; but we find nothing to convince us that the quantity so travelling is so large as seriously to endanger harbour works on a considerable scale, within such a period as it is necessary to look forward to in a colony.

The plan proposed by Sir John Coode is to construct a solid breakwater, by means of barges, at a considerable distance out, which would only be connected with the shore after its completion, by an open viaduct. The adoption of this scheme would involve a cost far beyond the means likely to be available, since the breakwater would necessarily have to be of the great size designed by him to afford sufficient shelter; and the plan would be liable to the further objection, that it would afford no facilities to the commerce of Timaru during the long period which would be required for its construction. On the whole, then, we are led to conclude that a solid mole, carried out from the shore to a distance of about 900 feet, and terminating in a breakwater similar in character and direction to that proposed by Sir John Coode, but of smaller dimensions, would best meet the requirements of the port, would be the least expensive to construct, and that such a work would not be exposed to greater risk of failure from shingle or any other causes than necessarily attaches to any harbour works on an exposed coast; but in the course of executing such work, experience would be acquired such as we do not now possess. At least a year would be consumed in carrying out the mole to a distance of 300 feet: if, during that period, an accumulation of shingle should take place in the southern angle between it and the shore, such as should threaten injurious consequences, an opening might then be left, which we believe would be as efficacious as one commencing from the beach, while the portion already executed would shelter the present landing-place, and would afford considerable facility for carrying on the commerce of the port with appliances similar to those now in use. The two plans selected by the Harbour Board are both framed on the principle of starting with solid work from the shore. We are unable to approve absolutely of either of these, in terms of the 28th clause of "The Timaru Harbour Board Act, 1876." The one to which the first prize was awarded is inconvenient in form, provides insufficient wharfage accommodation, and the construction it proposes, of *pierre perdue*, would certainly not resist the transporting action of the sea. The other, with a better form and a safer mode of construction, is proposed to be placed in a position where the harbour would be inconvenienced by rocky ground, and the strength of the structure would have to be somewhat increased. The estimate of cost of both is certainly too low. One other plan, marked "A Mon Cr ," is, in our opinion, a very superior one, and the report accompanying it shows that the difficulties have been carefully weighed; but its extensive character—the outer breakwater being connected with the shore by a mole no less than 1,326 feet long—would make its construction so necessarily costly as to put the adoption of it quite out of the question. This plan would make use of the rocky ledges running off Patiti Point, both to lessen the cost of the mole carried out on them, and also as a sheltering breakwater for the work, since the heavy seas are broken on them and their power much lessened; the outer point of the reef would even give some protection to the finished work, such as the Cape does to the Oamaru Breakwater, though necessarily less efficiently, since the reef has a considerable depth of water on it, even at low water. Accepting, then, the general form of the work as shown in the plan marked "Panagathos," we think the most suitable situation for it would be to project the mole in a nearly north-easterly direction from the point on which Mr. Balfour's breakwater was constructed, carrying it out with the greatest rapidity solid to the extremity of the rocky bottom, about 300 feet. If, by the time that was completed, the accumulation of shingle should be but small, the work could be proceeded with in the same manner; but if, contrary to expectation, the southern angle should be found to be extensively filling up, it would be prudent to construct a timber framing over the executed portion, to carry platform and rails at a height of 20 feet or 21 feet above high-water mark, to be continued by a work on the same level on piles over a space of 300 feet further, from which point again the solid work would recommence, formed as before from the shore end. We think that the curl of the sea round the end of the shore work would be certainly sufficient to carry inshore the shingle, should any pass it, and that the greater facility the shingle has in travelling in a westerly direction would prevent it from lodging till near the turn of Caroline Bay. It remains to consider the mode of construction; and here, unfortunately, we are met by some uncertainties which preclude our giving any confident opinion. We have been unable to learn that any borings have been made to ascertain the substratum of the bottom outside the rocky ledge, which is marked on the map as "fine sand," but which several of the nautical men whom we examined called mud or clay. The shore in the neighbourhood of Timaru consists of sandy clay of moderate depth, lying on beds of what appear to be streams of basaltic lava. This flat-lying rock forms the ledges which everywhere line the shore, and inland it is seen in some places that several beds of it occur, separated by moderate thicknesses of clay soil. It has been stated by several witnesses that the fine sand in the roadstead is only a shallow deposit on such rock; but we have no certain evidence of the fact. Should a flat rock-bottom lie at accessible depth below the clay, it would render practicable a construction on the same principle as that on which the work is being carried on with such signal success at Oamaru; and before any final plan can be resolved upon, it is absolutely necessary that the bottom should be tested by borings, carefully executed along the line of the proposed works. It has been suggested that gravel may underlie the thin coating of sand. Should this really be the case, it would greatly increase the risk of constructing any work at all, as the supply of shingle would be inexhaustible. Should the sand or mud be of considerable depth, the only construction suitable would be random blocks. Very convenient quarries, at no great distance, would furnish an