with vertical, or nearly vertical, sides—namely, in effect, a mole of rock or concrete, enclosing, or nearly enclosing, a space of more or less magnitude, connected with the mainland by a bridge of more or less length.

The size, location, and shape of such island, in relation to the length of the bridge and the direction of the preponderating winds and currents, are questions requiring the most careful study and consideration in each several case, no two sets of circumstances being quite alike, or, probably, even nearly alike; but, given a reasonably careful study of the circumstances, and a design conforming thereto, there is no reason why such a harbour as this should not succeed; while, on the other hand, the results from a solid wall running out from a sand or shingle beach, without, as before stated, a large river or estuary to maintain deep water alongside of it, are almost impossible to predicate.

The principal arguments used against Sir John Coode's design, and in support of the river-side alternative adopted in its stead, were, so far as I can gather from the various reports on the matter, as follows:—

(1.) That the site of Sir John Coode's design was further from the town, and consequently not so convenient as proposed site at river side.

(2.) That, as Sir John Coode's work for some distance out from low-water mark, was in the form of an open iron viaduct, affording no shelter to shipping, it could not be utilised "step by step" as it progressed, and would only become really efficient when carried out to nearly its full extent.

(3.) That the existence of a river at the proposed alternative site was a great advantage, as it would enable ships to get close up to the sheds, and also because deeper water (for a given expenditure) would be attained by the action of the river alongside the works, than could be expected to result without the aid of a river.

(4.) That the probable cost of Sir John Coode's design was beyond the resources at the disposal of the Board.

I do not think, however, that any of these contentions can stand the test of close examination.

As regards argument No. 1, which occurs very frequently in the various treatises on the subject, I cannot forbear from saying that I think too much importance altogether was given to that aspect of the question, and that, in view of the interests of the town itself, as well as those of the district as a whole, a mere difference of half a mile or so, either way, in the position of the root of the breakwater, was a matter of utter insignificance, in comparison with getting the most efficient harbour procurable for the available funds.

The same reasoning applies, to a great extent, to argument No. 2. All other things being equal, the mere temporary advantage of being able to utilise the work step by step, as it progressed, might properly, perhaps, have been allowed some little weight. Unless it could have been shown, however, that this advantage could be obtained without incurring *any* additional risk, and that, in fact, the design embodying it was as capable of meeting all the possible contingencies of the situation, and therefore just as likely in every way to continuously succeed as Sir John Coode's design, which did not embody this temporary advantage (a fact which has not been, and I do not think could possibly be, demonstrated) it must be evident that to risk anything in the way of ultimate success, for the mere temporary advantage of being able to utilise a work step by step as it advances, is somewhat shortsighted. That such a risk was incurred in this case, and that the obvious possibilities of this situation included a sand accumulation, which an open viaduct would probably have obviated, must, I think, be evident to any one acquainted with the locality, or glancing at the plans herewith; and it is scarcely necessary to say that such sand accumulation has duly ensued.

Argument No. 3 is a little catching at first sight, but, when carefully examined into, it seems to have really very little in it. Firstly, as regards the loading and unloading. The sheds for the receipt and delivery of goods would probably eventually be at whatever is found to be the most generally convenient place, wherever the harbour may be; and, as it is not possible that any large proportion of the goods could be delivered directly from the ships into these sheds, the majority having to be put into trucks, and run into the sheds on railway-lines, and *vice versâ*—that being, in fact, the almost universal practice in connection with breakwaters—it seems practically immaterial whether the ships load and unload within, say, ten chains of the sheds, or a few chains nearer or further. Then, secondly, as regards the deeper water alongside the works, anticipated from the action of the river, there is very little force in that either. The effect of the river, in fact, in the way of producing scour, seems to be scarcely, if at all, appreciable except in floods, and these occur so seldom as to be of but very little practical utility. Thus, for instance, the sandspit alongside of breakwater, which caused the entrance to be very shoal indeed, remained unaffected by the river from before August last till quite recently, and if intervals like that are to occur, during which no practical benefit is attained by river scour, it is scarcely worth considering the river as an element in the question at all. The insignificance, in fact, of this river, as an element in the question of harbour-works, can be easily appreciated from the following figures.

The Hokitika River, which is, I believe, the smallest of those dealt with in New Zealand, with any reasonable measure of success in connection with harbour-works, has a drainage-area of 382 square miles, with rainfall averaging 120in. per annum, and frequently reaching from 2in. to 4in. per day. This has been calculated by Sir John Coode to be likely to produce a discharge, in extreme floods, of 9,500,000 cubic feet per minute; in ordinary floods 5,000,000 cubic feet per minute; and at other times about 360,000 cubic feet per minute; and it should also be mentioned, that floods, of at least the ordinary type, occur very frequently.

As compared with this data, the figures for the Turanganui River, including all its tributaries, are as follows. Drainage-area, 116 square miles; average rainfall, 46in. per annum; extreme rainfall recorded in twenty-four hours, from 5·48in. in 1880 to 1·92in. in 1888; average