

opposite to the inner end of loading-wharf. This deposit is several feet in depth, being generally greatest next the breakwater, and decreasing towards the wharf, at which it has not yet affected the facilities for loading.

An opinion has been expressed that the accumulation of sand above described is due to the manner in which the works connected with the quarries and the roads leading to them were carried out—that is, that a large amount of excavated material from the roads and of *débris* from the quarries was thrown into the sea, thus forming material from which sand was produced, and which has thus caused the evils now under consideration.

It would be well for the interests of the harbour that this were the extent of the evil, but it is a view of the question with which I do not agree: not that the *débris*, &c., above mentioned did not produce a certain amount of sand, &c., but the quantity was insignificant, and has long since been carried away, and has ceased to bear its part in the operations now going on. These are far more extensive, and the supply of sand threatening the existence of the harbour comes without doubt from the long stretch of sandy beach lying to the south and west of Paritutu and the adjoining islands, which, from their rocky character and the deep water existing outside of them, were, when the works were designed, thought to form a barrier sufficient to prevent the passage of sand from the southern beaches.

In evidence of the fact that the sand does travel from the southern beaches around Paritutu and the other rocky islands, and proceeds thence northwards, it may be stated that gradually, since the breakwater was commenced, its formation barred the movement of the sand to the east and north, and thus cut off the supply which kept the beach covered with sand between the breakwater and the Town of New Plymouth; the effect of this being that between these points the beach has been denuded of sand almost entirely, the sand having travelled northwards, and all the reefs are laid bare; the foreshore, being thus deprived of its natural protection, has at certain points been attacked by the sea, rendering necessary extensive protection works, particularly in the vicinity of the new railway-station at New Plymouth.

Had the weather of the past twelve months been of an ordinary character it is doubtful whether the sand-difficulty would have yet made its appearance; but an almost uninterrupted course of strong westerly and south-westerly winds has doubtless precipitated the result. As an evidence of this, it may be stated that, in the opinion of the Engineer to the Harbour Board, it would not have been possible to have constructed more than one or two 18ft. sections of the breakwater during that time had it been desired to do so. The first appearance of the sand beyond the end of the breakwater was in September, 1887, and since then the formation of the spit has been continuous and is still slowly progressing, the rate of progress depending on the direction and force of the wind and sea: as before said, these have been such as to accelerate the formation of the sandspit.

As far as this has already extended, it is of very slight detriment to the easy and safe navigation of the harbour, but, should its growth proceed at the same rate as heretofore, it will, at no very distant date, render it difficult for vessels to enter or leave the harbour with ease or safety in bad weather.

To avert such a contingency it will be necessary to prevent the further passage of sand around the end of the breakwater; and this can be temporarily secured by the construction of a groin or wall to connect the Island of Mikotahi with the mainland, which work could be performed at a moderate cost, and should at once be undertaken. This work would have the practical effect of interposing a barrier of about 900ft. long against the movement of the sand (that is, 450ft. of artificial work and 450ft. of the island itself), but there is little doubt that sand would still find its way round the end of the island, and a further means must be sought, by which, after this minor work is done, a complete stoppage of the sand could be effected: this could be accomplished by a prolongation of such groin or wall beyond Mikotahi to the Lion Rock, a distance of about 1,400ft., and eventually from thence to Moturoa, a rocky island about 250ft. farther, thus making a protective groin, including the island last mentioned, of about 3,000ft. long.

Such a groin would form a complete barrier against the movement of the sand, and would indefinitely postpone the occurrence of any further trouble from such a cause.

The groin between the islands would rise from the bottom to about high-water level, and would be composed of heavy rockwork tipped from a staging. It would have the additional effect of sheltering the breakwater itself from the heavy seas rolling in from the west.

I have made an approximate estimate of cost of the various works enumerated, as follows, viz. :—

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| 1. Erection of rubble-stone groin or wall between the block-yard and Mikotahi, including the laying of a line of rails to connect with the present line leading to the quarries | £ | 1,000 |
| 2. Construction of heavy rubble-stone groin from Mikotahi to the Lion Rock, including road and line around Mikotahi, staging, &c. | £ | 56,000 |
| 3. Construction of heavy rubble-stone groin from Lion Rock to the Island of Moturoa | £ | 10,000 |
| 4. Wagon stock (additions to), cranes, &c. | £ | 4,000 |
| Contingencies, say | £ | 7,000 |
| Total | £ | 77,000 |

Of the above items, No. 1 is the first that should be carried out, and the work could be completed out of funds now in the hands of the Harbour Board, viz., £1,838. The works under the heads 2 and 4, amounting to £60,000, might be spread over several years—say, for the year after No. 1 is completed £10,000, and for each succeeding year, say, £6,000 to £8,000—until the gap was