Enclosure 3 in No. 7.

TIMARU HARBOUR WORKS.

Mr. CARRUTHERS to the CHAIRMAN, Timaru and Gladstone Board of Works.

SIR,— Timaru, 29th October, 1871.

I have the honor, in accordance with instructions, to submit the following report on the Roadstead of Timaru:—

In November, 1865, and in September, 1868, the late Mr. Balfour wrote two valuable reports on the same subject: these, together with his plan of the roadstead and a very elaborate survey made by Lieutenant Woolcombe, have been placed at my disposal, so that I have had considerable facilities for acquiring information. I have also examined the beach for some miles on each side of the town, and have gathered by personal inquiry of persons acquainted with the roadstead such information as could be procured. Above all, I have carefully observed the experimental breakwater constructed by Mr. Balfour.

It is agreed, by every one acquainted with the subject, that the prevailing seas come from the south-east, and this is fully corroborated by the trend of the coast at points where the beach does not seem to travel.

The trend of the coast between the Waitaki and Timaru and for some miles to the north is somewhat east of north, so that the seas break on the beach, not at right angles, but obliquely, at an angle of about 50 degrees. It is to this obliquity that the motion of the shingle is due which makes Timaru so difficult a port to improve. When a wave coming from the south-east breaks on the beach, it carries the shingle forward with it in a north-west direction; the retreating wave does not, however, travel back on the same path, but runs down the slope of quickest descent, which is at right angles to the beach, or nearly east. Each piece of shingle, therefore, travels northwards in a series of zig-zags. It is evident, since the motion of the shingle is due entirely to the breaking of the waves on the shore, that any work, such as a breakwater, which would make still water on the beach, would deprive the shingle of all northward motion. It is not necessary that the breakwater should be attached to the shore: still water is as effectual a barrier as a masonry wall.

The shingle being thus stopped, it would collect on the south side of the breakwater, until in the course of time it had pushed out to the end of the latter, when the northerly motion would begin again. In the meantime the shingle to the north, beyond the protecting influence of the breakwater, would have been still moving northwards. As no new shingle could come to supply the place of that which had moved on, the coast would soon be bare, and the sea would begin to cut down the sub-beach.

These remarks apply as well to an imperfect as to a perfect breakwater. In the former the effects would be slower to show themselves, as, owing to the imperfect stoppage of the waves, a part of the shingle would continue to move along the beach; but the final effect would be the same.

The practical question to be solved is, at what rate does the shingle travel? Mr. Balfour found that some blocks of wood loaded with lead, which he threw into the beach, travelled as much as a mile in a day, even in fine weather.

This would indicate a very rapid rate of travel.

The experimental breakwater consisted of a concrete wall thirty yards long, placed on a reef below low water, and detached from the shore. It was hoped that the shingle would continue to travel along the beach, as the landward end of the breakwater was further to seaward than the line to which the shingle was drawn back by the undertow of the receding waves, and the breakwater was also so small that it was not expected to offer any perceptible protection from the beat of the waves on the shore during rough weather. It was found, however, that the protection given by this small work was sufficient to prevent the shingle from passing across the stiller water behind it. It was heaped up between the breakwater and the shore, and then behind the breakwater. To leeward the shingle was all carried on to the north, and the sub-beach cut away sufficiently to endanger the large store at the landing-place. This effect was perceptible at the foot of Caroline Bay, half a mile from the breakwater, and would have been much greater than it was if it had not been for the basaltic rock which forms the sub-beach over a part of the bay. This was all done in one storm, and no more convincing proof could be desired that the shingle travels with very great rapidity.

The breakwater was partially carried away, giving the shingle free vent, when the beach to leeward was at once restored nearly to its original shape.

There are open to the Board three methods of improving the harbour accommodation—

1. By erecting a breakwater on a large scale, completely stopping the shingle;
2. By endeavouring to give partial protection, and at the same time letting the shingle pass;
3. By improving the boat service.

Plan No. 1.—The first thing to be done on this plan would be to construct a breakwater straight into the sea. It would have to be nearly at right angles to the average direction of the waves; for, if it were made very oblique to it, the shingle would pass along it and cross the mouth of the harbour, turning the latter into a lagoon with a detached shingle beach. It would have to be carried out to deep water, which would require a length of about 1,000 feet, and would have to be constructed in the most substantial manner, as it would have to resist the direct force of the very heavy seas which occur at Timaru. This part of the work would somewhat improve the boat service. A comparison with the Port of Oamaru shows that it would not do much more. At that port Cape Wanbrow takes the place of this first breakwater. It projects in the best direction for a distance of about 2,500 feet from the shore, but gives very little protection in heavy weather to any point behind it, of which the destruction of the Oamaru Jetty is a proof. The Timaru Breakwater would give still less, as it would be much shorter, and would not be carried above high-water mark; but, as the holding-ground is better, small vessels might perhaps ride out a storm behind it: they would, however, probably prefer getting to sea.