

REPORT OF ROBERT WILSON, Esq., F.R.S.E., M.INST.C.E., AND C. NAPIER BELL, Esq., M.INST.C.E., ON HARBOUR IMPROVEMENTS AT TIMARU.

SIR,—

Christchurch, 1st June, 1891.

In accordance with your instructions to report on the accumulation of shingle at the breakwater of Timaru, and the best means of dealing with it, we went to Timaru by the express on the 20th of May, and until the evening of the 22nd of May were occupied in examining the works, the beach to the south and north, in looking over the previous reports on this subject, and in taking the evidence of your Engineer and Harbourmaster.

The accumulation of shingle caused by these works is quite in accordance with the known effect of works of this character on beaches where the materials composing them are permanently in motion in one direction.

Sir John Coode, foreseeing this result, recommended an island harbour, which, if placed at a proper distance from the shore, would doubtless have been perfectly safe from travelling shingle. The Board, seeing the practical difficulties attending the building of such a harbour sought the advice of Messrs. Henderson and Heale, who in their report dated the 13th December, 1877, ignored the evidence previously obtained as to the travel of the shingle, and recommended the adoption of the present design. The result has inevitably followed, and the works are now threatened with destruction unless immediate means are devised to stop the accumulation of the shingle.

Messrs. C. Y. O'Connor and Goodall, in their report of the 2nd of April, 1891, have given full details of their observation of the rate of accumulation, and of the probable time when the works will be blocked up by it. We have investigated these calculations and fully agree with their view as to the urgency of the case. There is no doubt that in a few years the shingle will have advanced to the kant, or bend in the breakwater, and when this is the case a very short time will elapse before the entrance will be blocked up.

Mr. C. Y. O'Connor estimates about four years as the time it will take the shingle to reach the head of the breakwater; on the contrary, Mr. Goodall thinks the danger to be much further off, partly on the ground that the line of the beach is daily getting more at right angles to the "stroke of the waves." We attach no importance to such a trifling circumstance as the inclination of the beach in presence of so small an obstacle as the breakwater, and the great quantity of shingle yearly accumulating; we therefore agree with Mr. C. Y. O'Connor, that in view of the uncertainties and contingencies involved in the question, immediate steps should be taken to place the work in security.

The beach for many miles to the north of the breakwater shows abundant evidence that the safety of the breakwater is not the only consideration which your Board should attend to, the sea having stripped the beach of its covering of shingle, has now exposed the soft clay underneath, and is rapidly scouring it away, with the result that the sea will not be long before it encroaches on the fields and cultivated land, and no one can tell where this damage will stop if the original condition of things is not restored.

In considering the remedies which must be adopted to place the harbour in safety, and restore the north beach to its original condition, we have given careful attention to all the documents on the subject which were submitted to us, and to the well-considered report of Mr. C. Y. O'Connor.

Notwithstanding some yearly variations in the estimated quantity of accumulation, we consider the evidence is sufficient to prove that 900,000 cubic yards have accumulated in twelve and a half years, and that the average yearly accumulation is 72,000 cubic yards, or 108,000 tons. We consider it is only trifling with the danger to attempt to prolong the safety of the harbour by erecting additional works to stop the shingle. Mr. O'Connor has very clearly set forth the reasons he had against extending the works with this object. Opinions have been expressed in the papers, and are partly supported by Mr. Goodall in his supplementary report, that by extending the works further to sea the growing shingle-beach may adjust itself to the "strike of the waves" so as to stop further advancing accumulation at the breakwater, or that the backwash, supposed to have been destroyed by the random blocks thrown in to protect the foot of the breakwater, may be restored to beat back the shingle in its advance. We consider that to rely on such contingencies would be illusive; the adjustment of the line of beach to the "strike of the waves" would only be effectual in stopping the advance of the beach provided the shingle were turned into sand by the grinding action of the waves, and washed away by the shore currents as fast as the supply was brought up from the south, and we do not consider the breakwater, even when extended as far as the means of the Board may allow, would present an obstruction of sufficient magnitude to bring about such a result. For the same reason we consider the backwash of the reflected wave, even if allowed its utmost power by omitting the random blocks, would offer but a trifling obstacle to the advance of the shingle, which if driven in-shore by the reflected wave would form a spit along the neutral line where the direct and reflected waves meet; this advancing spit would soon shelter the hollow made by the backwash, and as soon as shelter was made the spit would close in on the breakwater, and thus the advance of the shingle along the breakwater would ultimately take place in spite of the backwash.

As to the fact of the beach to the north being stripped of its shingle, we notice the expression of opinion by a writer in the *Timaru Herald* of the 15th of May, which still attempts to dispute the continual travel of shingle in a northerly direction, and gives, as proof that it does not, the fact of Banks Peninsula not being surrounded by shingle.