

large stone a quantity of such small stone has to be removed, and your Engineer is stacking it in a suitable position to be reloaded for the construction of the training-walls. This is advisable, and it will be economical to have this stone thus stacked rather than throw it away. The price at which it is stacked—that is, 1s. per ton—seems high compared to the present contract price for quarrying and filling first-class stone—viz. 5d. to 8d. per ton—but the latter is so low a price that I doubt if the contract could be carried out unless assisted by the price obtained for the smaller stone which is removed and stacked when quarrying the larger.

Stone for Repairs.—When the breakwaters are completed the question may arise of lifting the rails and sleepers of the low-level quarry to be used in constructing the training-walls in the river, for which about $2\frac{1}{2}$ miles of permanent way will be required. Before doing so the further supply of heavy rock for repairs and maintenance of the breakwaters must be considered, and the road kept to such parts of the quarry as are likely to furnish such stone.

Permanent-way not to be lifted.—Mr Inspector Barrowman is of opinion that there is a quantity of good stone at the extreme south end of the bay, in the high granite cliffs which surround the shore at this place, and if the supply of stone wanted in the future for repairs has to come from this place the whole length of the quarry permanent-way must be kept in place.

Railway to Quarry.—The main line of railway to quarries, which is about $7\frac{1}{4}$ miles long from the west, and $10\frac{1}{4}$ miles from the east breakwater, is maintained in good order, and is very little the worse for wear. The bridges also are in good order, and will last many years. Taking into consideration the heavy and rough character of the traffic which this line has had to carry it has been maintained in excellent condition at a cost of about 50 per cent. over the cost of maintenance of the railways carrying coal. The traffic of stone is exceptionally severe on the road, as trucks on a short-wheel base carry loads of stone from one and a half to three times the weight of ordinary coal-trucks, but the excellent rolling-stock of tip-trucks on springs have enabled five years of this traffic to be carried on without damage to the permanent-way.

Stone Tip trucks.—There are 109 stone-trucks, of which ninety-seven are on springs. These trucks have been in use on an average about four years, and are still in good condition with the exception of the flooring, which is always subject to damage by the friction of the stones. A few have also been damaged by falling stones, or breaking axles, and a number of spiral springs which support the load on the trucks are now weakened by the great weights carried for over four years. The side-tip trucks on springs carry up to 35-ton stones, and the end-tip, up to 14-ton stones, and run with the speed and steadiness of an ordinary goods train.

Cranes.—There are in all fourteen cranes, which are in very good condition, and still fit for many years' work. There are three 25-ton, one 20-ton, five 10-ton, two 7-ton, and two 5-ton cranes. The 10- and 25-ton cranes have given great satisfaction. The 10-ton cranes often lift stones weighing 14 tons, and the 25-ton cranes stones weighing 30 tons, but on one or two occasions they have lifted 35-ton stones.

Locomotives.—There are four locomotives of Class F, and two of Class C. These have undergone many repairs, and are now in good order. Two locomotives of Class F have been lent to the Railway Commissioners, who have had them in use for general coal traffic for over two years.

Buildings.—The buildings are in good condition, with the exception of roofs of engine-sheds, corroded by steam of the locomotives. There are twenty buildings situated at the quarries, the junction of the granite and limestone lines, or at Westport; these include engine-sheds, stores, smith-shops, weighbridge-houses, Inspectors' offices, weigh-clerk's cottage, 7th class railway-station, and magazine.

Dredges.—The Priestman dredge, mounted on its barge, is still in first-rate working condition, and is at present used to pull out snags and logs from the river-bed. It is not nearly so efficacious as the ladder-dredge for excavating gravel, but it is generally found useful for dredging in confined positions, where the ladder-dredge cannot work. No harbour of this description should be without one of this kind of dredge.

Ladder-dredge.—The ladder-dredge and two steam hopper barges, recently purchased by the Board, are a valuable acquisition to the plant of the port. Without some amount of dredging this port cannot be placed and maintained in the position which the deepening of the bar should enable it to hold as an accessible harbour for a large coal trade, and the result of dredging already done proves this dredging plant to be very suitable for the work required.

Cost of Dredging.—On a general average, taking delays and stoppages into account, the dredge lifts 30,000 tons a month, and the hoppers discharge the material two miles out at sea, the cost, including repairs and all charges, being $7\frac{1}{2}$ d. per ton, equal to $11\frac{1}{2}$ d. per cubic yard, which compares favourably with dredging done in other places in similar material.

Effect of Works.—The works, so far as carried out to this date, have chiefly been directed to the improvement of the sea-bar, which, when these works were first commenced, was the principal obstacle to the development of the coal traffic.

Depth of Bar.—As soon as the west breakwater had reached a length of 2,800ft., and before the east breakwater had been commenced, the bar began to deepen, and the depth has steadily increased with the extension of the breakwaters until within the last two years, when it has apparently become stationary, averaging within a few feet according as the river is low or flooded. The following table, prepared by your Engineer from records kept by the Harbourmaster, shows very clearly the influence of the works upon the depth of water on the bar. From this it appears that before the works began the usual depth of water on the bar was from 9ft. to 14ft., and since the completion of the works the usual depth is from 18ft. to 25ft. These depths are taken at high water, the rise of tide being from 6ft. to 10ft.