

east side of the river I have placed the entrance to this basin much nearer to the town than is shown on Sir John Coode's plan. This is unavoidable, with the change in the line of the training-walls now adopted, but it has the additional advantages of placing the entrance in deep water, and in a convenient position to get to and from the fairway channel, without having to keep open a dredged channel from the fairway to the entrance and steamers will have no difficulty either entering or leaving the basin.

*System of Loading.*—The dock has a swinging-basin 450ft. wide. The body of the dock is 300ft. wide, and 1,200ft. long, suitable for eight of the largest steamers. I have adopted the system used in Newcastle, New South Wales, of having the vessels alongside, and not at projecting jetties, as the latter construction is very costly, and not so suitable for loading from cranes as the alongside construction.

*Ample Loading-room.*—With the present length of staiths, and 2,400ft. of berthage in the floating-basin, I think there will be ample loading facilities for any future extension of the coal traffic of this port. There would be room for eight cranes, which could load 800 tons an hour if all were working, and I believe this would be in excess of what the mines could supply.

*Alternative of a Groin in the River.*—Mr J P Maxwell asked me, before deciding on the position for the training-walls, to consider his suggestion to construct a piled groin in the river, parallel to and 200ft. outside of the wharf and staiths. This suggestion was adopted by Mr C. Y. O'Connor, but, on his referring it to Sir John Coode, he did not recommend it. It occurs to me that the principal reason Mr C. Y. O'Connor had for recommending the groin was that by its means deep water could be preserved along the wharves, irrespective of the state of the river outside, and that vessels would be sheltered from the violence of floods. Mr Maxwell favoured it because it would obviate the necessity of having two loading-places.

*Reasons against It.*—Against its adoption there is evidence, so far, to show that the necessary depth will be maintained along the wharf and staiths by natural scour, and the violence of floods has not hitherto proved dangerous to vessels. It was not proposed to make the groin wide enough to be used as a wharf. Of course it could be made wide enough for that purpose, but it would be hardly possible to accommodate on such a structure all the lines of sidings which would be required to serve, say seven cranes and, if it were raised so as to make it into staiths, I believe it would prove very inconvenient, and would be blocked for room when the whole line of it was full of ships loading. If, therefore, it could not be used for loading ships, then, when the groin was built, there would be no more loading-room than the present extension of staiths affords, consequently if more loading-room is not wanted, neither the groin nor the floating-basin is required, but, if more room is wanted, the groin would not give it, and we are driven to adopt the floating-basin. Lastly, the groin is a precarious structure of wood, liable to decay and destruction by worms it is, besides, an objectionable feature in the river, and in very heavy floods might tend to cause injurious changes in its channel. The floating-basin is open to none of these objections, it is capable of being made small for present, and extended for future, requirements. The estimated cost of it, for 1,200ft. long, is about £100,000.

*Estimated Cost of Walls.*—The estimated quantity of stone in the training-walls is 110,000 tons, which, at 5s. per ton, amounts to £27,500, exclusive of the cost of approach-roads from the main line to the walls.

*Estimated Cost of Dredging.*—The amount of dredging is about 230,000 tons, which, at 8d., amounts to £7,680.

The Chairman, Harbour Board, Westport.

I have, &c.,

C. NAPIER BELL, M.Inst.C.E.

## No. 22.

*Report by Mr L. H. Reynolds on the Half-tide Training-walls and Railway-approaches.*

SIR,—

Westport, 13th June, 1892.

In accordance with your instructions, I have duly considered the location of the training-walls for the improvement of the river-channel, and railway-approaches thereto, and have now the honour to forward you my report, accompanied by a tracing compiled from plans and data furnished by the Board's Engineer, showing the direction and extent of the training-walls which I have to recommend.

*Tidal Compartment and River Discharge.*—The quantity of tidal water, together with the normal discharge of the Buller River which flows out between the breakwaters in an ebb-tide during springs, is about 230,000,000 cubic feet, which is, approximately, at the rate of 640,000 cubic feet per minute. The normal discharge of the river, apart from tidal water, is about 170,000 cubic feet per minute, whereas during a fresh of 2ft. the river-discharge amounts to nearly 800,000 cubic feet per minute. A fresh of 4ft. would discharge over two and a quarter millions of cubic feet per minute. It will be seen from these figures that the scour during freshes, apart from tidal water, is considerably greater than that due to normal scour during ebbing tides, especially in the upper reaches of the river. Were the present waterway confined by training-walls the velocity of the current and the depth between the walls maintained by scour would be greatly increased. The position of the training-walls therefore requires careful consideration, more especially in the upper portions of the channel.

*Line of Training-walls proposed by Sir John Coode.*—Sir John Coode in his report recommended that the west training-wall should commence at a point about 3,700ft. above the Buller Bridge, and sweep towards the east bank by gentle curves, until the proposed channel would be confined to a breadth of 500ft. abreast of the wharves. From this seaward the wall would run parallel to the wharves and staiths, and at a distance of 500ft. out from them. In recommending this line above the wharves, Sir John Coode had in view the desirability of forming the river-bed between the walls to gradients and levels as would admit of the tidal level at low water extending