

artificial works, must of necessity be subject to obstruction to a serious extent, and sometimes to being absolutely blocked.

We are thus led up to the important question whether the entrance, and the river within up to the second reach opposite the Marine Parade, can be so far improved at a reasonable outlay as to be rendered uninterruptedly and permanently navigable by such small coasting steamers as might be expected to frequent the port were the requisite facilities afforded.

After careful consideration, I am of opinion that this question may be answered in the affirmative, and that it will be quite practicable, by the execution of the works about to be described, to form and keep open a permanent entrance, having such a depth as will meet all the reasonable requirements of the case.

Works Recommended.

The works I have to put forward for execution are shown by red colour on the accompanying drawing. They may be carried out in two instalments: the first with the object of confining, training, and fixing the run of the tidal and fresh-water currents, and thus of utilizing them in scouring and permanently keeping open a channel and entrance through the shingle spit; the second instalment, to be undertaken hereafter when the requirements of the locality may justify the further expenditure required, would consist of the prolongation seawards of the training and controlling works, with a view to the creation of an increased depth in the entrance channel.

First Instalment of Proposed Works.

These would consist of a training-bank of fascine works, having its top about 2 feet above flood-level, commencing at the point A on the west side of the entrance, and extending therefrom for a length of 2,400 feet to B; from this latter point to C, a length of 500 feet, the works on this side of the channel would consist of two parallel rows of close piling driven about 15 feet apart, having battered faces, and connected at each bay by suitable diagonal and horizontal ties. This structure would be generally similar to the inner portions of the east and west moles at Napier; except that at Wairoa, in the absence of rubble-stone, I would fill in between the piling with faggots and clay up to low-water level, and with clay and shingle, well rammed and consolidated, above that level.

On the east side the works would commence at the point E, starting from the left margin of the river, and extending therefrom as a training-bank of fascine work similar to that on the west side for a length of 2,450 feet. There would then be an opening of 160 feet in width to drain the bight inside or to the northward of the shingle spit, and the low lands which discharge their drainage waters therein. Seaward of this opening there would be a further length of 350 feet of fascine embankment, terminating at the point F; but the top, in this case, would be carried to half-tide level only, to aid the opening just described in the drainage of the bight. From F, for a length of 400 feet seaward to G, the work would consist of a piled structure formed and filled in as described for the corresponding portion on the opposite side of the channel. In this manner a permanent entrance would be formed of 530 feet in width between points C and G on the plan, being the outer terminations of the works recommended for construction as a first instalment of the proposed improvements.

I estimate the cost of the foregoing as follows:—

<i>Works West Side of Entrance—</i>		£	£
Fascine training-bank, 2,400 feet in length	..	15,177	
Inner portion of pier B to C, 500 feet in length	...	15,323	
			30,500
<i>Works East Side of Entrance—</i>			
Two fascine training-banks, together 2,800 feet in length	...	16,612	
Inner portion of pier, F to G, 400 feet in length	...	12,366	
			28,978
			<u>£59,478</u>

For the expenditure of, say, £59,500 upon the works I have described above and shown on the accompanying drawing, it will thus be possible to form a permanent entrance to the river having a depth of from 12 to 14 feet at high water of spring tides, assuming the rise of those tides to be 7 feet 3 inches. Such an entrance would be ample for all the present requirements of the locality, and could not fail to be of immense service in the development of the fertile tracts of land which abut on the Wairoa and its tributaries. Upon the completion of the first instalment of the improvements, the depth in the entrance would inevitably be subject to some fluctuations; but, nevertheless, I am of opinion that the scour of the tidal and fresh waters could be relied upon for the maintenance of a depth in the opening to about the extent above named.

The embankments of fascines would be deposited in layers, each weighted down by clay and grass sods, and would form compact and thoroughly satisfactory training-barriers on the silt and shingle bottom existing at the mouth of the river; moreover, they would be far more economical than any other satisfactory form of embankment, in the absence of suitable rubble-stone in the locality.

Second Instalment of Proposed Works.

The second instalment or extension of the proposed works of improvement would consist of the prolongation of the piers on each side of the entrance—viz., from C to D, for a length of 550 feet on the west side, and from G to H, 330 feet, on the east side. It will be observed that the western work would overlap the eastern to some extent, and that the clear width between the piers on the completion of the extensions would be 450 feet, the aspect or direction of the opening being south-south-east. There would be a small cast-iron lighthouse with argand burners and suitable reflecting apparatus at the end of the west pier.