

vessels entering or leaving and lying afloat at all times of tide, and properly sheltered in all states of weather, with adequate quay accommodation—is to be provided at Gisborne, the proper course will be to construct such works as I have shown by red colour in general design on the accompanying Drawing No. 1, and in detail on Drawing No. 2, and more particularly described hereunder.

Works of Improvement

Having regard to the great extent of sandy beach within the bay—extending, in fact, for several miles to the southward of the town and river entrance—and also to aspect and exposure of the bay itself, I am unable to recommend *any* solid structure between the shore and the line of three fathoms at low water, feeling assured, as I do, that a serious amount of sanding up on the inner or western side would inevitably follow, and to an extent that, to say the least, would be highly prejudicial to the present river entrance and to the utilization of the new work.

By referring to Drawing No. 1, it will be seen that I propose to commence the external works at the point *A*, about fifty yards south-east of the salient angle of Maori Point, and to run therefrom in a south-west direction for a length of 550 feet as a solid structure, or root, shaped in plan as shown on Drawing No. 1. The sides of this root would be formed by substantial walls of rubble masonry, set in cement, founded on the bare *papa* rock; this work, being about 120 feet south-east of the “Boat Harbour,” would not interfere with that useful little creek.

From the outer end of the root, and in a similar direction, I would construct an open viaduct of 1,410 feet in length, consisting of wrought-iron piles, supporting a deck formed of three rows of longitudinal wrought-iron girders, with proper cross girders and joists to carry the timber deck, the level of the latter being at least 15 feet above high water of ordinary spring tides. This viaduct will allow the heaviest seas to pass through and underneath it, with almost undiminished force, and, consequently, will insure such an amount of agitation and circulation as will prevent the deposition of sand in the vicinity of the entrance to the river, and shoreward of the proposed outer harbour. As already explained, were a solid structure substituted for this open viaduct, the shelter provided thereby would inevitably conduce to the filling up with sand of the bight north-west of the work itself.

From the outer end of the viaduct I propose to commence a solid breakwater pier, consisting of concrete blocks of about 22 tons each, placed in position by a portable overhanging setting machine, travelling outwards as the pier progressed. These blocks would be founded on bags of concrete, in the manner shown in detail on Figures 4 to 7 inclusive, Drawing No. 2. The inner portion of this pier would extend the viaduct in a south-west direction for a length of 500 feet, bending thereafter towards the north-west by a curve of 300 feet radius, the outer portion bearing W. by S. The quay surface of this pier would be 25 feet in width, and protected throughout on the seaward side by a massive parapet, also of concrete, a “bull-nose” course being provided to throw off the sea during gales.

The level of the roadway on the root would vary from 9 feet 6 inches to 15 feet, the latter being the level of the viaduct deck, as already described, the ascent being made by a gradient of 1 in 100. The coping of the solid pier would be 8 feet above high water, or 7 feet below the deck of the viaduct, thereby necessitating an incline, which I have fixed at 1 in 50, to join these two levels. It is requisite that the viaduct should be kept at the height proposed, in order to raise the deck above the heaviest seas, whilst, on the other hand, the level shown for the surface of the pier will be more convenient and economical than if at a higher level.

Figures 4 to 7, Drawing No. 2, show the pier as a solid structure throughout. It will be seen from Figure 1 of this sheet that this work, shortly after leaving the end of the viaduct, would pass over the Pinnacle Rock. At this point, level benchings for the reception of the blocks would be formed around the Pinnacle by bags of concrete, in the manner indicated. Seaward of this rock the footings of the pier would be protected by an apron of concrete bags, arranged as shown on Figure 7—*i.e.*, for such length as may not be founded on the bare rock.

From the western termination of the pier I have shown a West jetty, of 300 feet in length, running N.W. by N., with a return 120 feet long in a N.E. direction. At the eastern or shoreward termination of the pier I have laid down an East jetty, of 350 feet in length, in a N.N.W. direction, with a kant 80 feet in length pointing S.W. The distance between the terminations of the proposed East and West jetties is shown as 560 feet. The jetties would be formed of cribwork, of the character indicated on Drawing No. 2—*i.e.*, of piling and strongly-braced timber framing, filled with a hearting of rubble stone. The heads of the jetties would in each case consist of a mass of Portland cement concrete. The total length of sheltered quays provided would be 1,600 feet, having a depth varying from 21 to 30 feet at low water of spring tides, the rise of these tides being taken at 5 feet. A light would be provided at the head of the concrete pier, and a small port lantern fixed at the termination of the West jetty.

The viaduct has been proportioned so as to adapt it for carrying the 22-ton concrete blocks required for the construction of the breakwater pier. Railways on the colonial gauge, so that they might be connected with the Government system, would be laid down throughout the works.

Sufficient information is not available here to enable me to determine, with such certainty as is desirable, the line of approach road which it would be requisite to construct from point *A*, at the shoreward end of the works previously described, to the town, including a bridge across the