

*Training Banks or Half-tide Walls.*

With regard to the necessity or otherwise for the half-tide wall or training-bank proposed by the Board's Engineer (No. 2 of the questions remitted to me), I may here observe, as will indeed have been gathered from the foregoing remarks, that I regard such a work as essentially necessary, in order to insure the maintenance of the artificial channel without frequent if not constant dredging; and I am of opinion that the bank should be undertaken contemporaneously with the formation of the channel.

I gather from the documents that the half-tide wall or training bank is intended to be formed of rubble-stone. As to this I would suggest, for the consideration of the Board and their Engineer, whether this training-bank could not be executed with fascines (faggots) at a material saving in cost. If so, it would be equally efficient in performing the work of training the currents, and, in point of durability would leave but little to be desired, seeing that the fascines would eventually become so embedded in and surrounded by sand, &c., that they might be regarded as practically permanent. In one of the rivers on the east coast of England with which I am professionally connected, I know of a case in which fascine-work put down nearly half a century since is still in existence, and acting satisfactorily in preserving the sides of the channel.

Being formed of alternate layers of fascines and clay, with a thin coating of stone on the top, and arranged so as to batter 6 inches for each foot of height, the base would be large, and consequently the weight per superficial foot but small, in proportion to the height of the bank itself, the settlement would therefore be relatively very slight; the sectional area of a training-bank thus formed would be less, and the cost also less, than if composed of rubble-stone. Moreover, in the event of a vessel accidentally touching the bank at any time, the risk of her sustaining damage would be reduced to a minimum as compared with a bank formed wholly of stone.

Above Black Jack's Point the southern training-bank should sweep gradually around, so that it would be generally parallel to the south-eastern or harbour frontage of the new docks, and about 1,000 feet distant therefrom. It would be well that, in the first instance, this bank should not be carried further towards the south-west than the point where it would be intersected by an imaginary line drawn in prolongation of the jetty at the end of Stuart Street; it could be continued at any time if circumstances should require. The width of 1,000 feet or thereabouts will be quite sufficient to admit of vessels of the largest class entering and leaving the basins without any difficulty. If a greater width were adopted, there would be reason to apprehend that an undue amount of dredging would be found necessary to preserve the requisite depth.

*Reclamation of Ravensbourne, Shag, and Burke's Bays.*

With regard to the question (No. 1), whether the taking of the Dunedin and Port Chalmers Railway straight from point to point of the three bays—Ravensbourne, Shag, and Burke's—would prejudicially affect the interests of the harbour: I consider that if the railway embankments be so formed as to present fair and even lines for the easy flow of the tidal waters along their river faces, their effect in preserving the momentum of the tidal currents will be such as will practically give an equivalent for the tidal water abstracted. I am of opinion, therefore, that the reclamation of the three bays will not be prejudicial to the interests of the harbour, provided the river faces of the embankments be formed in the manner above described.

*Landing of Dredged Materials for Reclamations, as proposed by the Board's Engineer.*

As to the third question—namely, my opinion of the method of reclaiming with the dredged materials, as proposed by the Board's Engineer: I have carefully considered this matter, and, in view of the large expenditure upon the special appliances required to carry the proposal into effect, estimated at about £24,000 for the barges, trucks, and incline, I am of opinion that it would be inexpedient to incur so large an outlay upon the preliminaries for what must necessarily be regarded as an experiment, and as to the satisfactory result of which, in point of economy, I entertain considerable doubt.

*Mr. Duckham's Pneumatic Process for Landing Dredgings.*

Question No. 4 has reference to the employment of Duckham's pneumatic process for reclaiming with the dredged materials. Looking at the fact that no inconsiderable portion of the borings are described as in "clay and sand," or in "compound sand and clay," this system is not, in my opinion, suitable for this case except, it might be, to a limited extent. There can be no doubt that Mr. Duckham's process is admirably adapted for dealing with materials in a semi-fluid condition, such as found at the Millwall Docks, where it is used for landing only soft silt and mud which have accumulated from time to time, and where there cannot be any admixture of clay or other solid matter.

*As to other Methods of Landing Dredgings.*

As to the question (No. 5), whether I could recommend a more expeditious and economical mode of reclaiming with the dredged materials than by the proposal of the Board's Engineer, or the pneumatic process of Mr. Duckham: I can only suggest either the adoption of mechanical "diggers," in connection with ordinary steam cranes, or the employment of a system of "skips" or "tubs" placed in barges in the manner described below.

If the former be resorted to, I would suggest the employment of self-filling and discharging diggers of the class introduced within the last few years; more especially of the hemispherical type, worked in connection with steam-cranes, by means of which the materials may be lifted from the barges and deposited in railway trucks on the land with a minimum amount of manual labour.

If the "skip" system be employed, I would suggest the use of the same method as was adopted by a contractor, Mr. Mitchell, under a patent of his own (now, I believe, expired) in part execution of a design of mine for the improvement of a river in Ireland some years since. In this case iron "skips" or "tubs" were placed side by side in chambers or cells in flat-bottomed barges, the skips fitting closely together in the barges, so that the materials delivered from the shoot of the dredger fell