

440. Had you any experience in harbour works prior to doing this work at Oamaru?—Yes; I was engineer to the Harbour Board at Port Chalmers, and previously I was employed on the Liverpool Dock works at Home.

441. How long have the works in Oamaru been in progress?—I think it is nearly ten years since they were started.

442. How much of the breakwater has been constructed?—I think about 1,450 feet, and there is about 300 feet to do yet. On the 31st December last there were 1,350 feet done.

443. Does that represent an average progress of 100 feet in six months?—No; the progress now, if a steady supply of cement could be kept up, would be about 30 feet per month.

444. What depth have you reached at low water?—At present about 19 feet 6 inches.

445. What has been the total expenditure to date?—The total cost of the breakwater up to the 31st December was £111,800; but since then we have put on another hundred feet, the cost of which was about £68 per foot. In round figures the breakwater is now costing £68 per foot, which includes supervision, cement, and everything else.

446. Can you state what has been the cost per lineal foot for the whole of the work, including all the charges up to the 31st December last? The money expended on the breakwater up to date amounts to £111,800. The average cost from the starting point, including supervision, has been £122 per lineal foot.

447. What has been the expenditure upon plant?—About £9,000, excluding cement and stores. The principal items are the travelling-crane, which cost about £2,000. It was built in Dunedin, and I think it is worth £2,500. I think the contractor who built it lost money by it.

448. What are the other items?—There is another steam locomotive for hauling blocks from the stacking-ground down to the breakwater. All the rails on the breakwater are included in the plant. The locomotive cost £700. There are also a great many trucks, which cost in the aggregate about £500. Then there are the concrete-mixers and the engine and machinery connected therewith, which would cost about £1,000.

449. I am asking you for these particulars for the purpose of comparing them with the New Plymouth Harbour Board's works: you understand that?—Yes. The heavy rails on the breakwater and the cement-sheds should also be counted. We have also a lot of ballast-wagons. The balance of the £9,000 is represented by plant, such as moulds in which the concrete blocks are made, and other things of that kind. There are also two small cranes. The whole plant belonging to the Board is valued at £5,662, and there is £3,442 worth of plant belonging to the present contractor, making altogether about £9,000 worth.

450. What has been the total amount expended for engineering charges and supervision?—About £10,500, extending over a period of nearly ten years.

451. The other expenses appear to amount to £2,580?—Yes; that amount will be covered by incidental expenses.

452. Will you explain the item of expenditure on wharfage, £40,103?—The wharfage reclamation cost £34,655, and the railway £4,316, making a total of about £40,000 altogether. We had first of all to make a railway from the shingly beach down to the breakwater, which is an extensive work—we had to do this in order to get the shingle, and we built three concrete walls near the breakwater.

453. What portion of that charge is fairly due to the construction of the railway?—None whatever. The breakwater could not be made without this expenditure on the railway. I may state also that this railway serves the purpose of working the ordinary traffic in connection with the railway system.

454. Will you state the cost of the cement used?—We are paying the present contractor £4 5s. 3d. per ton for cement, delivered in Oamaru.

455. And what is the cost of the other materials used in making the concrete?—About 14s. 6d. per foot, including the labour and shingle and sand; the cost of shingle and sand would be about 2s. 6d. a yard, and the broken stone from the quarry would cost about 4s. 6d. The balance is for labour. I am speaking of the cost per cubic yard of gravel and stone, and not of a cubic yard of concrete. In the blocks which are moulded on shore we use very little stone, but in the concrete that is deposited as a monolith we use very small stone.

456. Would not the cost of sand and gravel per yard of concrete be something between 3s. 6d. and 4s.?—Including the stone and the gravel, it would be about 4s. I do not think we put more than one-third of the stone in the cases.

457. Then the difference between 4s. and 14s. 6d. represents the labour?—Yes; and that labour includes the placing of the blocks in position.

458. A large proportion of your concrete is put into monoliths *in situ*?—Yes.

459. Would the cost be greater or less if you had to make it all in blocks?—There is only a difference of 6d. per yard as far as the labour is concerned; but by using large stone the Board save the cost of cement.

460. Then the monoliths are cheaper?—Yes, because you save a portion of the cement.

461. How many yards of concrete do you make with 1 ton of cement?—We use  $7\frac{1}{2}$  tons of cement to every lineal foot of breakwater.

462. How many cubic yards are included in a lineal foot of the breakwater?—One ton of cement will make from  $5\frac{1}{2}$  to 6 cubic yards of concrete.

463. Would you consider it safe to make the proportion 1 in 9 or 1 in 10?—No. I have tried that, and failed.

464. In what proportion did you try it?—Our present proportion is 1 in 6. I made experiments, and the result was that it would not be safe to make them poorer than 1 in 8.

465. Do you mean 1 in 8 of the loose materials, or 1 in 8 of the finished block?—I refer to the finished block.

466. But from your experience of this work you think the proportion of 1 in 6 is a fair and proper proportion to insure the durability of the work?—Yes.