

concrete ; sand, 3s. ; cement, £1 2s. 2d. ; mixing and placing in moulds, 4s. ; erection of moulds, 2s. 6d. ; cost of plant, 4s. ; overhead, 5s. : total, £2 4s. 11d.

I would point out that under the Harbour Board's specification (page 33) the sand and gravel required would be supplied by the Board at the cost to the contractor of 3s. per cubic yard. To comply with the specification for a 1-2½-5 mix the materials required would be—Cement, 1·22 barrels ; sand, 0·40 cubic yards ; shingle, 0·90 cubic yards. The sand and gravel would therefore cost the contractor 1·3 × 3s. = 3·9s., or say 4s. per cubic yard of concrete, as against the 7s. 3d. included in the price of £2 4s. 11d. Taking the cement at £5 14s. per ton, and assuming that six casks go to 1 ton, the cost per cask equals 19s. and the cement required £1 3s. 2d.

In Exhibit 173 Mr. Kenny shows that two drivers and about ten labourers are required to operate the Board's mixing plant, fill the moulds, and place the spalls. Allowing £1 per day for driver and 16s. for labourer, and that the output is 83 yards per day, as shown in Exhibit 173, the cost of labour per yard is 2s. 4·9d., and not 4s. as included in the price of £2 4s. 11d. It should be noted that the price of 2s. 4·9d. includes fixing moulds and placing spalls. This eliminates a further item of 2s. 6d. per yard included by the contractor. In reference to the 4s. included in the £2 4s. 11d. for cost of plant, I would point out that the Board specify in their printed conditions that the plant required for the completion of the breakwater will be hired to the contractor at the following rates : Browning crane—4 hours or less £1 5s. ; eight hours or less, £2 10s. ; sixteen hours or less, £3 15s. : concrete-mixer, 10s. per day : steam winch and boiler, 15s. per day : dredge " J.O.D.," £2 per hour. The total quantity of concrete required is—concrete in cap, 20,000 cubic yards ; concrete in blocks, 42,000 cubic yards ; concrete in wave-breaker, 18,000 cubic yards : Total, 80,000 cubic yards. An output of 83 yards per day, $\frac{80000}{83} = 964$.

The only items which can be properly charged to concrete mixing and placing are the concrete-mixer, and possibly the steam winch and boiler. Presuming that these would be required for the whole of the 964 days, the cost to the contractors would be £1,205 ÷ 80,000 = 3·61d. However, to cover the cost of repairs to moulds, &c., we include 1s., as against the 4s. included in the cost of £2 4s. 11d. It is interesting to note that the estimate of 4s. for plant in 80,000 cubic yards would give the contractors a gross return of £16,000. Including overhead, my estimate of the cost of a cubic yard of concrete in the moulds, is—

	£	s.	d.
Shingle and sand	0	4	0
Cement	1	3	2
Mixing, erecting moulds, cleaning moulds, placing concrete and spalls	0	2	5
Hire of plant	0	1	0
	1	10	7
Overhead and insurance, 10 per cent.	0	1	5
	1	12	0
Less 20 per cent. for spalls	0	6	4·8
	1	5	7·2
Spalls at 5s. 6d. per yard at 20 per cent.	0	1	1·2
	1	6	8·4
Contingencies allowance	0	2	3·6
Per cubic yard	£1	9	0

Allowing 2s. 6d. per cubic yard for placing, Mr. J. D. Holmes's price, in moulds, would be £2 12s. 6d. per cubic yard ; contractor's price, £2 4s. 11d. ; Mr. Furkert's price, £1 10s. ; Mr. Kenny's price, £1 8s. 6½d. ; A. C. Mackenzie, £1 9s.

Adopting my own quantities and a rate of, say, £1 10s., I estimate the cost of extending the breakwater at

	£
Concrete in cap : 20,000 cubic yards at £1 10s.	30,000
Concrete in blocks in position : 42,000 cubic yards at £1 12s. 6d.	68,250
Concrete blocks in wave-breaker : 18,000 cubic yards at £1 12s. 6d.	29,250
Rubble foundation : 45,000 cubic yards at 12s.	27,000
	£154,500

As against Mr. J. D. Holmes's £386,800.

WHARF CONSTRUCTION AND IMPROVEMENTS.

MESSRS. Cullen and Keele's recommendation is for one wharf 600 ft. by 187 ft., with two cargo-sheds 350 ft. by 35 ft. Messrs. Cullen and Keele estimate the cost of wharf and cargo-sheds at about £97 per 100 square feet of wharf area, and Mr. Furkert at £100 per 100 square feet of wharf area ; Mr. J. D. Holmes at about £162 per 100 square feet of wharf area. In my estimate I have adopted £120 per 100 square feet of wharf area, which also covers the cost of two sheds as recommended by Messrs. Cullen and Keele. The high price included by Mr. Holmes is probably due to his having adhered to the contract price for concrete already quoted.

Wharf and cargo-sheds, 600 × 187 = 1,122 squares at £120 = £134,640.