

IMPROVEMENT
OF THE
Port and Harbour of Drogheda.

REPORTS OF
CAPTAIN HOSKYN, R.N.,
AND
MR. URE, C.E.

DROGHEDA:
PRINTED AT THE "REPORTER" OFFICE,
15, LAURENCE-STREET.

1863.

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REPORT OF CAPTAIN HOSKYN, R.N.

SIR—Your letter of the 22nd instant to the Admiralty, on the subject of Mr. Hoskyn's report on Drogheda, having been referred to this Department, in consequence of the Provisions of the Harbours Transfer Act, 1862, which transfers the jurisdiction over tidal waters, hitherto vested in the Admiralty, to the Board of Trade, I am directed by the Lords of the Committee of Privy Council for Trade, to forward you herewith a copy of the report, and have to request that payment of Mr. Hoskyn's account may be made to him, you having undertaken to discharge such account in your letter of the 7th May, 1862.—I am, Sir,

Your obedient servant,

JAMES BOOTH.

To the Secretary to the Harbour Trustees,
Drogheda.

[COPY.]

“DROGHEDA—LIMITS OF PORT.

“Admiralty Survey, Holywood, Belfast,
“22nd October, 1862.

“SIR—I have the honour to report, for the information of the Lord Commissioners of the Admiralty, that in pursuance of their orders, contained in your letter of the 20th May last, I have recently visited Drogheda, for the purpose of making out the boundaries of the Port, and determining the points in dispute between the Harbour Commissioners and neighbouring proprie-

tors, and that I was unable to attend to this subject earlier, being absent from this part of Ireland on other duty.

"My first inquiry at Drogheda was for the plans and books of reference mentioned in the 149th section of the Act for the improvement of the port of Drogheda, which I found duly lodged with the Clerk of the Peace, as directed by the 156th section. With this explicit and authoritative guide to the limits of the port, I had no difficulty in defining their extent, as laid down in the 148th section, and in ascertaining the encroachments, which I find as follows:—

"Referring to the plan of Drogheda Harbour (a tracing of which I have the honour to enclose):—

"First—On the South shore, at the bottom of Graves' lane, a new quay (A) has been erected by the Harbour Commissioners, without, as far as I can learn, complying with the 152nd section of their Act, which directs that no work of the kind shall be constructed below high water mark, without the previous consent of the Lords Commissioners of the Admiralty.

"Secondly—The proprietors of the neighbouring foundry, Messrs. Grendon, took advantage of this illegal encroachment of the Harbour Commissioners to extend their river front in a line with the Commissioners' quay, from B to C on the plan, where it is left for the present in an unfinished state. In so far as this gives a continuous line of quays it is an improvement on the former irregular river frontage; but their construction, without the consent of their lordships, is decidedly opposed to the 152nd section of the Act, which explicitly declare "it shall be unlawful for the Commissioners, or any other persons" to construct such works without their previous consent.

"Thirdly—In the vicinity of the Gas Works, at (D), the Harbour Commissioners have, without complying with the 152nd section, reclaimed a piece of mud-land, by depositing the stuff from the dredger thereon. The former high-water line is thereby obliterated, and a part of the new building at the Gas Works is projected beyond it. The neighbouring owners lay claim to this new-made land, and their tenants are cultivating it. The

251st section of the Act provides that the right or title of other persons to the mud-lands is to be respected. This point should have been determined, and the consent of the Admiralty obtained, before any reclamation was made by the Harbour Commissioners.

"Fourthly—Continuing along the South shore of the river to the Eastward, and referring to the tracing from the Ordnance survey at (E), in the townland of Staggreenan, the proprietor of Balmarino, Mr. M'Evoe, has gone to considerable expense in making an embankment and roadway, which, I have no doubt, when completed, will be a public convenience. He asserts that his lease or tenure gives him this power; but such encroachments on the mud-lands, without their lordship's previous consent, are plainly opposed to the provisions of the 152nd section of the Act.

"Fifthly—On the North shore of the river at Queensborough, on the property of Mr. Smyth, an encroachment has been many years completed. The county road at this point has been turned out on the mud-lands, with an inconvenient bend; yet, I understand this has been accepted by the County Surveyor, and was never objected to by any one until now.

"These are the only encroachments that were complained of to me, but I observed that works were in progress by the Harbour Commissioners at the Custom-house Quay, for which their lordships' consent is necessary.

"It is much to be regretted that the Harbour Commissioners for the Port and River Boyne did not report these encroachments to their lordships at their commencement, a plain duty on their part in the exercise of their powers of conservancy, that would prevent a good deal of the irritation now existing on the subject, and also that they should so mistake their powers under the Act, as to themselves erect and construct works below high-water mark, without, in the first place, complying with the provisions of their Act for that purpose.

"I am of opinion that the works enumerated are not so injurious to navigation as to call for their removal, particularly as some of them are of long standing;

but as they give a claim to the enclosed property, and as any further extension of such works, without their lordship's sanction, would inflict a very serious injury on the Harbour, by excluding the tidal water, I beg to submit that the promoters of these encroachments should be called upon to make out their titles to the land enclosed, as provided by the 251st section, failing which they should pay such rent to the Crown for them as may be determined on.—I have, &c.,

“(Signed)

“R. HOSKYN,

“Master H.M.S. Fisguard,

“Admiralty Surveyor.

“To the Secretary of the Admiralty,
“London.”

REPORT OF MR. URE, C.E.

NEWCASTLE-ON-TYNE,

9th Feb., 1863.

TO THE COMMISSIONERS OF THE PORT AND HARBOUR OF
DROGHEDA.

GENTLEMEN,—Agreeably to your request communicated by Mr. McNamara, that Mr. Barry Gibbons and myself would inspect the River Boyne and harbour of Drogheda with the view of advising you as to the measures we would recommend you to adopt for the further improvement of the port, we visited Drogheda and examined the river, when, after meeting with the Commission, our attention was called to the following matters as being those upon which you more especially wished an expression of our opinion.

First—The improvement of the River and Harbour.

Second—The renewal of the Town Bridge of Drogheda.

Third—The best position to open a new Quarry; and

Fourth—Any improvement that suggested, in regard to your existing dredging machinery and its working.

Shortly after our visit Mr. Gibbons unfortunately became so unwell as to be unable to attend to business, and in consequence of his illness terminating fatally, the preparation of

the plans and report has devolved upon me. I should mention, however, that in consultation Mr. Gibbons fully approved of the general principles upon which this report is based, and of the manner in which the design of the accompanying plan of improvement is laid out. His illness, however, following so shortly on our visit to Drogheda prevented me from having the benefit of considering and advising with him as to any of the details.

First—As to the improvement of the River and Harbour.

The examination of the River when at Drogheda, and a comparison of its present with its former condition, as given in old reports, particularly Mr. Golborne's of 1783, shows that considerable improvement has been made in the navigable channel by deepening the Bar and straightening and deepening the River course to the Harbour of Drogheda, that the Harbour had been considerably extended and deepened; and that the facilities so afforded have attracted to the port vessels of large size, and so established a different class of trade, was to be expected as the natural result, as elsewhere, of the improvement of the navigation.

The observations on the tides and the soundings taken last Summer by Mr. Donor, from instructions then given, show that an ordinary average Spring tide rises 13 feet 7 inches at the Bar, and 10 feet 7 inches in the Harbour; that at low water of such a tide there is about 4 feet 9 inches of water on the Bar, and a general depth of 5 feet to 6 feet up to Drogheda, except at Banktown and Beaulieu shoals, where it is sometimes less, but which vary in depth between the periods of being dredged, and except immediately above the Maiden Tower for a short distance (about 300 lineal yards) where it is 6 feet to 6 feet 6 inches; about a similar length below New Deep Point, where it is 6 feet to 10 feet 6 inches; about a similar length opposite Branagan's Point, where it is 6 feet to 7 feet 6 inches; and about 800 yards above the New Quarry Quay, where it is 6 feet to 7 feet deep. And in the Harbour of Drogheda, between the Town Bridge and Railway Viaduct, the depth at low water, except in the deep water berths, is about 7 feet to 8 feet. Above the Town Bridge, for a length of about 300 yards, the depth is 12 feet to 15 feet, and 8 feet to 9 feet for about half to three-quarters of a mile further up, after which the river becomes shoal at low water, and without manufactories or dense population on its banks.

The main obstacles to be encountered in using the present river by the existing trading vessels and steamers, are difficulty of entry and departure in stormy weather, caused by

the limited depth of water on the bar; the abrupt bends, especially those at Musselbed Point and New Deep Point, making the navigation difficult, and the general want of depth of water in the river, especially at Banktown and Beaulieu Shoals.

These difficulties are proposed to be removed and a free and safe use of the River and Port obtained by the plan of works now recommended; which consist of two sea breakwaters, one on the South, and the other on the North of the entrance, and of straightening, deepening, and widening the channel from the Bar upwards.

The breakwaters, which are about 3,000 feet long, are designed of the diverging form shown on the plan as being best adapted for stilling the waves, so that when a vessel has passed their heads, which are proposed to be placed in about 12 to 13 feet at low water of Spring tides, it may be safe in a small outer Harbour; and also to give the requisite shelter to enable a Dredging Machine to be applied effectively to deepen the bar and the space inside the breakwater.

Were the present river walls prolonged into the depth of water just indicated, the expense would not be materially lessened; and I would be apprehensive that vessels in stormy weather would be liable to loose their steerageway, in which event they would in all probability be driven on the walls under the influence of a heavy sea.

It is here proper to remark that though designed exclusively for the benefit of an entrance to the River, the expense inside the breakwaters would be available as a refuge for a large proportion of the vessels engaged in the coasting trade, a great advantage to them, and their use of which would be a source of revenue to the Commission; and although this space is small, many vessels may find shelter at a time by a steam tug taking them to moorings to be provided a short distance inwards. This consideration is not unimportant when it is remembered that there is but little shelter for such vessels during bad weather along that part of the Irish coast, except at Kingstown, which is but indifferently adapted to their use either in regard of the necessary shelter or the requisite extent of refuge.

The straightening of the River, more particularly at the abrupt bends as shown on the plan, I know from experience of other rivers will give an easy navigation; these abrupt bends are the Musselbed, where it is proposed to remove from off the projecting point about 400 feet; the New Deep Point also about 400 feet; the Beaulieu Point about 150 feet; and Stagreenan Point, which is proposed to be removed to the line of the River walls.

A good navigable channel for the River from the Bar to the Harbour would be about 10 feet deep at low water of average Spring tides having a bottom width, which would be liberal, of about 300 feet at the entrance, gradually diminishing to about 150 feet at the upper part near the Harbour. The Harbour (between the Railway Viaduct and Town Bridge) is proposed to be made about 12 to 14 feet deep at low water, excepting where the Quay walls or other work would be rendered unsafe by making that depth; and it would be desirable to make a part of it about 18 feet to 20 feet deep at low water, to enable the Harbour to fulfil the condition very frequently required in the charters for ships engaged in the foreign trade, that they always lay afloat. A timber jetty would probably be required for berthing in this part.

The only power on which I would recommend you to rely for this amount of River and Harbour Improvement is a constant application of efficient dredging machinery until the required capacity of channel is obtained; after which the expenditure for maintenance would be moderate.

The quantity of dredging required to be performed to effect the above objects may be stated in round figures at about 2,750,000 tons; and to accomplish this work in a reasonable time, I would recommend a dredging machine to be obtained of such power as would perform the work in, say, about 6 or 7 years from the time of its commencing work; after which it would be available for any further improvements in the lower or upper river that may be then deemed most useful.

And with the view to economy in your dredging operations, I would advise that all dredgings be deposited at sea, in deep water, except where land be desired to be made from the River for some defined purpose, when the present system of deposit from punts could be continued.

The estimate for these works will be approximately as follows:—

North Pier, 3,000 feet in length,	
South Do., do. do.	£55,000
One dredging machine, complete,	£12,000
Six hopper barges for conveying dredgings to sea,	5,400
One steam tug for towing ditto,	1,600
Excavating to low water level at Musselbed Point, New Deep Point, and Beaulieu Point, 183,000 cubic yards, at 6d.,	£19,000
Dredging channel of River and Harbour from and inclusive of	4,575

Bar to the Town Bridge, and also inclusive of the Musselbed, New Deep, Beaulieu and Stagreenan Points, &c., 2,750,000 tons, at 3½d.,	40,104
Constructing river walls at the above Points, say	2,000

Timber jetty in Harbour,	65,679
	600
Add contingencies 10 per cent.,	£176,279
	17,621
Total,	£193,900

My recommendation is limited to the prosecution of the preceding works as being the most important I can devise, on the above scale of estimate for the improvement of the River and Harbour; but should the Commissioners be of opinion that their means will enable them to carry out a plan of improvement for the Upper River, as for instance to Old-bridge, where it communicates with the Locks of the Inland Canal Navigation, or a larger plan of improvement below Bridge, I will be happy to devise such a plan upon being informed approximately of the amount that can be expended upon it.

But in the event of the expenditure of the preceding estimate being greater than the resources of the Commission will bear, I would advise that the entire plan be kept in view, and that all work undertaken be towards its construction, as I am of opinion that it would be better to perform portions of it effectively at a time, leaving the others to be done in a similar way afterwards, rather than limit the entire plan and construct an incomplete work as a whole in order to perform it at once.

In this view I would recommend that the removal of the points and the dredging operations in the River and Harbour be undertaken in the first instance, as being most in the way of the large steamers, such as the Colleen Bawn, that now trade on the River. I would, however, be doubtful, without the shelter afforded by a partial construction of the Breakwater Works, of being able to deepen the Bar by dredging; but the increased capacity of the River Channel, made by dredging, would bring up to Drogheda a column of tide nearly equal to that at the Bar, proportionately increasing the quantity of tidal water; and as the enlarged Channel would also give a freer passage to the tidal and flood waters, I anticipate from their joint action an additional

scouring power and consequent beneficial action in the Bar, which would add somewhat to its depth.

I would at the same time impress on the Commissioners the importance of proceeding with the Breakwater works with the least possible delay after the construction of the River works has been provided for.

On a further consideration of the means at your disposal, it may be found desirable to limit somewhat the new River Channel, in order to proceed simultaneously with it and the Breakwater works. Should this be so, or should it be desirable for other reasons, a good navigable channel could be made of the depth of 10 feet at low water average Spring tides, having 200 feet bottom width near the sea, gradually diminishing to 100 feet near the Harbour, including deepening the Harbour in about 10 years, at an estimated cost of about £45,000, in place of £65,679, as stated in the general estimate for the larger channel, to be constructed in the shorter time previously stated; and in regard to the Breakwater works, I would anticipate considerable improvement would be derived from them after about half the estimated expenditure had been made.

When considering the plan of improvement to be recommended, the straight channel proposed by Mr. Donor between Branagan's Point and the Maiden Tower, as described in his report of January, 1861, has not been overlooked; nor a straight channel from the North Crook to sea; and, while I am satisfied that either plan would be very advantageous, being so straight, yet, having regard to the large expenditure already incurred on the present channel between these places, which would be sacrificed by the execution of either of these plans; to the great cost attending carrying them out, in all probability very greatly larger than that estimated, and much in excess of the cost of the plan now recommended between the same points; and, being of opinion that even if completed a deep and uniform channel would not be obtained by either of their means, throughout the River, and that extensive dredging operations would be required to give the enlargement of channel before recommended, which would involve the estimated expenditure on the dredging machinery, and a large proportion of the estimate for dredging, I prefer to advise you to add to the existing River works, rather than form a new channel of such an expensive character; and this the more especially, as any economy that can be effected otherwise will be well expended on the Breakwater works and other River and Harbour improvements.

But at the same time, I would wish to guard against its

being supposed that I would have recommended the existing River lines had the work to be commenced of new.

The retaining walls above Bridge are going out of repair; the earth behind them is exposed, and large quantities of rubbish so placed as to be within reach of freshes, which remove and deposit it in the River, from which it afterwards requires to be removed by dredging.

I would recommend that the walls be placed in a proper state of repair, and that all rubbish be prevented from being placed so that it can be washed into the River.

Second—The renewal of the Town Bridge at Drogheda.

This Bridge is old and has been reported as out of repair for a considerable period.

While I do not consider it to be in a satisfactory condition, I am nevertheless of opinion that it may be safe for several years if attention be paid to keep it in repair.

In order to be able to form an opinion as to the influence of its piers on the scouring power of the tides and land floods, I asked Mr. Donor to take certain observations; his report of the result of these, which coincide with my own when in Drogheda, is to the effect that the tide is retarded to the extent of 2 inches by the Bridge Piers on both flood and ebb of both Spring and Neap tides; that is, on the flood tide, the water is 2 inches higher on the East side of the bridge and on the ebb tide 2 inches higher on the West side of the bridge; and that during time of heavy rains the water is 4 to 5 inches higher during the ebb tide on the West than it is on the East side of the Bridge.

While I consider that the enlargement of the waterway, which would be due to the removal of the Bridge Piers, would effect an improvement in the tidal flow and ebb, and likewise pass off the land freshes more rapidly, I do not consider the additional scouring power so obtained would in amount form a material element in improving the navigation.

In the event of the River improvements being carried out to the extent before recommended, it is doubtful if the present bridge foundations would be sufficient, and, in order to support them, a portion of the harbour near the bridge would require to be left undeeptened, or, if deepened, a stone weir would require to be placed along the bridge foundations to sustain them, a course I would not recommend.

The portion of the Boyne extending about a mile above Bridge may be easily made available for purposes of Harbour traffic, and up to Oldbridge, to communicate with the Canal Navigation; and I would recommend, as a question of trade and navigation, that when the Town Bridge is rebuilt, it be

as an opening bridge with a sufficient area of water-way; but it is for the consideration of the inhabitants of Drogheda how far the working of such a bridge on their only line of communication across the River and with the Railway Station, would not be too serious an inconvenience to compensate for the advantages that would be derived from its being used in a manner to open the navigation of the Upper River unless its working for the passage of vessels were limited to the tide that had high water in the morning or the evening, which would produce the minimum of inconvenience to the inhabitants, but would cause some detention to the shipping.

This detention would not be of much consequence, except to steam-vessels, which would in all probability have their berths below bridge.

Were a new opening bridge constructed a short distance above the existing Bridge, as is contemplated, no objection could be taken to renewing the existing Town Bridge as an opening Bridge, for, in that case, the two Bridges could be worked in such a manner that a free and uninterrupted communication would be always maintained both along the River and across it between the highways on either side; and be an arrangement that would remove entirely any objection on the part of any class of vessels to use the Upper River so far as depended on the Bridges.

It would be desirable that a Bridge built on either site be laid out on a proper plan for the navigation before receiving the sanction of the Commissioners.

Third—The best position to open a New Quarry.

My attention was drawn to two sites belonging to the Commissioners available for a quarry from which to obtain stone for the River Works.

One of the proposed sites is the quarry now in course of being opened out; the other is situated on the South side of the River immediately to the East of the Railway Viaduct.

For the general works of the Commissioners it was stated that one situation would be about as convenient as the other; but it was thought if the Quarry near the Viaduct were worked, a site would be made for a Graving Dock free of cost, as the result of the quarrying operations.

The stone near the Viaduct lays at such a level that a small quantity only would be quarried before the depth proper for a Graving Dock would be gained—and as all the preliminary expenses for quarrying a considerable depth would require to be incurred, such as the removal of the surface soil, the erection of engines and cranes, and the for-

mation of the coffer-dams, the small amount quarried would be done at a very costly rate.

On the other hand, were the quarrying made to such a depth as would be economical for quarry purposes, the space below the bottom of the Graving Dock would require to be filled and the Dock foundations made upon it, by piling and other work of such kind as would cause the cost of the Dock to be greater than if formed from the virgin ground.

At the level at which Mr. Donor stated the rock to exist, it appeared to me that there would be about sufficient rock excavation to build the Graving Dock walls and entrance, being the most economical condition under which a Dock can be constructed.

I am, therefore, of opinion that of the two sites indicated, the one at present being opened out is preferable; but that this quarry should be considerably enlarged, by extending the embankment toward the River so that its width from the highway be about 250 feet to 300 feet, and lengthwise to the extent that may be required. The highway ought not to be allowed to be diverted nearer the River until after the Commissioners' purposes with the quarry are satisfied.

If the proposed Graving Dock be for the large steamers that frequent Drogheda, its construction will necessarily be expensive—i.e., about £10,000 to £12,000; but if for sailing vessels, say up to about 300 to 400 tons, which will cover the large proportion of the sailing trade of Drogheda, a floating Graving Dock and a gridiron convenient to it could be advantageously established, the cost of which would be about £2,000.

Fourth—Any Improvement that suggested in regard to your existing Dredging Machinery and its working.

Assuming that the working of the present Dredger and its punts is to be continued for a time, I consider the following suggestions may be acted on.

It would be a considerable advantage to your machine were it capable of dredging in 3 to 4 feet greater depth, which would enable it to work during the greater portion of every tide, except high Spring tides, in any part of the River.

This advantage may be obtained at small expense by raising the upper tumbler about 15 to 18 inches, and receding it toward the engine as far as may be found practicable—I think about 6 to 9 inches.

The tonnage of the dredged material as now taken is very inaccurate, being much overstated, probably to the extent of fully 50 per cent. I would recommend that a scale be at-

tached to each end of each punt; that each punt be loaded with iron or other material of known weight, and the displacement of each ton recorded for after use.

I also think that the whole work should be performed by the workmen at a rate per ton, such rate to vary for different kinds of ground, the tonnage to be ascertained from the scale just referred to, and each man paid in proportion to his rate of wages.

I would recommend the dredging machinery to be kept in the best possible state of repair, which is far from being the case at present; and, with this view, would advise it to be placed under the charge of a competent mechanical engineer accustomed to such machinery, whose duty would be to work the engine, and have the control, and be responsible for keeping it and the other parts of the machinery, including the buckets, &c., in proper repair.

It would be an improvement were the punts surrounded by cribbing boards about twelve inches deep, in order that they may be able to hold without falling overboard larger quantities of dredged material for a load than is the case at present.

Appended is a statement of the cost of dredging, prepared and furnished me by Mr. Donor, but for the reasons before given, in respect of the quantities of work being overstated, I do not consider that the dredging and depositing, as performed during recent years, costs on the average less than 7d. to 8d. per ton.

There is also added a statement of the expense of quarrying the stone used on the River works, which appears to be more accurate.

In preparing this report and the accompanying plan, I have laboured under the difficulty of a want of knowledge of the money I might calculate to expend upon the works. I have, therefore, placed the whole subject in regard to the works and estimates from such points of view as suggested themselves to me, and will be happy to supply any further information in my power upon being informed of your wishes.

In concluding, I have to express my regret that this report should have been so long delayed; and to add that I do not entertain any doubt, if the works contemplated in it be carried out on the scale projected, but that the existing trade of Drogheda will be amply accommodated, and a further large trade drawn to your port, by reason of the increased facilities afforded.—I am, Gentlemen, your obedient servant,

JOHN F. URE.

RETURN OF THE EXPENSES INCURRED BY DREDGING IN THE RIVER BOYNE FOR THE YEARS

1858, 1859, 1860, AND 1861.

Date labour of dredging, & year punting, & discharging	Do. for Coals.			Do. for Oil.			Do. for Ta-Chains, low and Candles.			Do. for repairs of Ropes, &c.			Do. for Match-Dredger and Repairs of Dredge Punks			Total amount of each year's expenses.			Total num-ber of tons lifted each year.			Total cost of lifting and discharging each ton of the dredged material.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	Tons.	D.	per ton.	£	s.	d.
1858 104	1	11	11	1	7	1	0	7	1	8	5	34	4	5	0	0	0	24	1	3	175	18	23	8,087
1859 383	0	3	41	18	7	3	1	8	3	9	6	47	16	2	71	18	6	45	5	9	606	10	7	30,743
1860 460	14	10	45	11	0	3	7	5	3	11	9	21	7	3	55	10	9	18	4	10	611	7	10	36,175
1861 494	14	11	53	4	7	3	16	3	3	18	3	27	3	10	135	11	11	38	5	7	736	15	4	41,755

This calculation is made, allowing 14 tons for dry sand or gravel, and 10 tons for mud or soft sand in each punt load.

P. DONOR.

Return of the cost of quarrying and conveying stones to the Bar of Drogheda for the years 1857, 1858, 1859, and 1860.

Years.	Cost of quarrying and conveying stone to the water side.	Cost of conveying stone to the Bar, with the load and unloading of them	Total cost per ton.
1857	12d.	4d.	16d. per ton
1858	13 ³ / ₄ d.	4d.	17 ³ / ₄ d. per ton
1859	11 ¹ / ₄ d.	4d.	15 ¹ / ₄ d. per ton
1860	11 ³ / ₄ d.	4d.	15 ³ / ₄ d. per ton

In consequence of the stone quarried in 1858 being required for the quay wall, their having to be dressed, the stone had to be quarried more carefully than if intended for rubble; consequently the cost of quarrying has been increased.

P. DONOR.