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REPORT

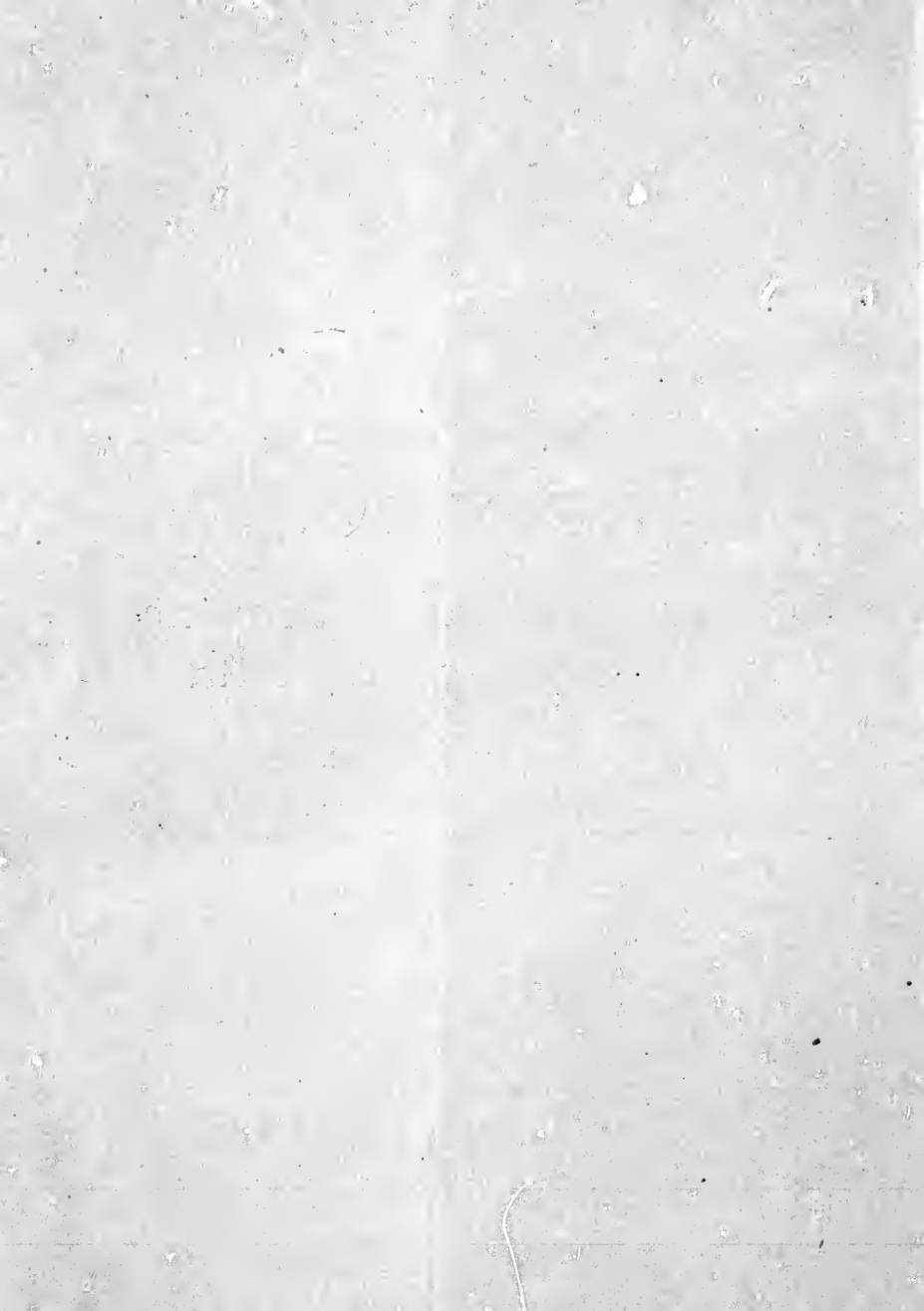
On the Wooden Graving
Dock, at St. John's, Nfld.

*Edward
Keating*
By E. H. KEATING, C. E.



ERRATUM.

Page 167, on the 12th line from the top, for "shortened," read "hastened."



CITY ENGINEER'S OFFICE,
Halifax, N. S., 26th Dec., 1884.

To His Worship the Mayor, Chairman Dry Dock Committee

SIR,—Having been requested to proceed to St. John's, Newfoundland, to be present at the opening of the new wooden graving dock just completed at that port, I beg to submit the following report:—

Friday, the 5th of December, was the day appointed for the formal opening of the dock, but owing to delay in removing the temporary coffer-dam at the entrance, the ceremony did not take place until the afternoon of Wednesday, the 10th inst., at which time H. M. S. Tenedos was hauled into the dock and the water was pumped out during the night. There was no demonstration of any kind on the occasion.

The harbor of St. John's is limited in extent, being about a mile and a half in length by not over half a mile in breadth in the widest place.

The dock is admirably situated for the purpose for which it is intended, at the head of the harbor on a site which could scarcely have been more favorable for construction purposes. A large part of the area was formerly bare at low tide while the remaining portion was in shallow water. The whole of the material requiring excavation was of the easiest possible description to be removed, being deposits of river mud, sand and gravel brought down by a rivulet which discharges its waters at the upper end of the harbor locally called "River-head."

An agreement between the Government of the Colony and Messrs. J. E. Simpson & Co., of New York, was entered into on the 17th March, 1883, for the construction of the works, and was ratified by an Act of Parliament passed on the 21st of April of the same year.

Under the agreement the Government provided the site free of cost to the contractors, admitted all materials and machinery

required exempt from customs' dues, and stipulated to pay the sum of \$550,000 in monthly instalments, at the rate of 85 per cent. on the value, according to a certain schedule of prices, the balance of 15 per cent. being payable on completion.

The contractors on their part agreed to furnish all the materials, plant, machinery and labor required under the terms of the specifications, and to complete the whole of the works within a period of twenty-four months.

The agreement also contains a stipulation that the contractors shall, on the completion of the works, lease them from the Government and keep them in repair for a term of ten years at a rental of \$15,000 per annum.

The contract price for the dock alone without the gate, engine-house, pumping machinery or other necessary appurtenances was \$216,602.

The following is a synopsis of the various items included in the contract with the price set opposite to each :

Plans, Specifications and Engineering.....	\$ 25,470 00
Coffer-dam	28,810 00
Bulkheads	25,160 00
Engine-house and Culverts.....	12,560 00
Pumping during construction.....	18,000 00
Pumps, Boilers and Connections.....	36,600 00
Caisson, fitted complete	35,408 00
Removing temporary Coffer-dam	9,223 60
Capstans, Gipsies, &c	5,100 00
Freight-house and Work-shops.....	28,000 00
Piers.....	28,200 60
Excavation alongside Piers and Freight-house..	25,856 40
Filling, Grading and Excavation in Slips.....	26,010 00
Engine, Boiler and Tools in Work-shop.....	10,000 00
The Dock proper.....	216,602 00
Dredging Channel from piers to deep water.....	25,000 00
Total.....	\$556,000 00

It will be seen that the above contract amounts when summed together exceed by \$6,000 the bulk sum, previously alluded to as the total contract price of the works. I am

unable to point out where the error is, as the discrepancy exists in the printed official papers to which I was referred for information.

The dock is the largest structure of its kind in America, being of the same length and draught of water as No. 2 dock at Erie Basin, New York, while its width across the body is 17 feet greater on top and 3 feet 10 inches greater on the bottom.

Its principal dimensions are :

Extreme length inside at coping level from head to caisson when at outer grove or sill . .	600 ft.
Extreme length at bottom on centre line of keel blocks	558 ft.
Extreme width of body at coping level	132½ ft.
“ “ “ on floor	49 ft. 10 ins.
Depth of water over gate sill at high water, Spring tide	25 ft.

The dock is practically of the same shape and appearance as all the other large wooden docks along the Atlantic coast of America, with its sides flaring upwards from the bottom at an angle of about 45 degrees. Every portion of the structure exposed to view is composed of wood work. The short altars which form the sides and head of the dock and nearly all of the principal framing timbers are of pitch pine imported from the Southern States. The gate sills, abutments and the gate sill braces are American white oak. The foundation piles and other piles required are specified to be of spruce not less than 12 inches in diameter at the butt and 6 inches at the smaller end. The floor planks are 3 inch spruce.

The structure differs in one essential part from all other wooden docks previously built by the same firm of contractors; its peculiar feature being that solid rock underlies the bottom at a few feet below the flooring plank, thus rendering piling in the usual way—over that portion of the dock which is the deepest—an impossibility.

A hard conglomerate overlies the rock, and upon this is said to have been placed from 2 to 4 feet of concrete, into which were bedded iron ties secured by bolts to the floor timbers.

Around the sides and head of the dock, piles are driven and the braces secured thereto in the customary manner. The

braces are spaced about four feet apart longitudinally, or at right angles to the axis of the dock, and the piles about 7 feet apart transversely, those near the bottom altars naturally being short on account of the close proximity of the rock.

Behind the wooden face of the sides and head of the dock a material resembling clay was deposited and rammed in for a thickness of about two or two and half feet. The woodwork immediately adjoining the entrance and gate sills is said to be backed liberally with cement concrete instead of the clay puddle, used so extensively behind the greater portion of the remaining woodwork.

There are a few leaks visible around the sides and head of the dock, but not of sufficient extent to cause uneasiness, as far as can be seen by a casual observer. The bottom, however, is so constructed—the floor planks having open joints and hidden ditches below—that a large amount of leakage might occur without the possibility of detection, except by closely watching the discharge into the pump-well. By measurements taken at this point on the 8th instant, when the dock was empty, dry and to all appearances practically tight, the leakage was ascertained to be at the rate of 965 imperial gallons per minute, or 1,389,600 gallons per day. The contractors claim to have stopped some of this leakage since the measurements were taken, but, however this may be, future periodical observations and gaugings taken and recorded by some competent, reliable and disinterested person, would be instructive and of very considerable interest.

The works were commenced by the contractors in May, 1883, and they hope to complete the whole of their contract early next spring, the principal things requiring attention, now, being the engine, boiler, tools and shafting for the workshop and some 60,000 cubic yards of dredging.

The opinion is freely advanced by some of the leading people in St. John's that in view of the completion of the graving dock at that port a structure intended for similar purposes at Halifax is not now needed. A St. John's paper of the 5th instant, however, makes the following remark which, in this connection, is worthy of notice :

“The great difficulty that we see about making the dock a remunerative investment relates to the fact that for six months

of the maritime year this port is practically closed to ocean-traversing steamers, and that at the very time of the year when the latter are most exposed to the dangers for which docks are remedies!"

This statement on the other hand is flatly contradicted by persons who ought to be able to form a correct judgment in such matters; but, however, this may be, it is a well known fact that the entrance into the port of St. John's, if not actually unapproachable during certain seasons, is at least regarded with no small degree of fear by nautical men, throughout the early months of the year, by reason of dense fogs and the risk of encountering large masses of drift ice with which few steamers could safely cope unless built specially for such service.

It can scarcely be contended that the approaches to this port are open to the same objections, and taking this into consideration, and the many other manifest advantages which we possess, besides the fact that the net tonnage of large ocean steamships entering the harbor of Halifax is over 20 times greater than *St. John's, there can be little room for diversity of opinion as to the advisability of yet constructing a graving dock at this port.

Regarding wooden docks of the same type as that just completed at St. John's, it must be admitted that so long as they are maintained in a good state of repair they answer all the purposes for which they are intended as well as any other contrivance of a similar nature which could be devised; ships of any size or class can be deposited in them as readily, safely and cheaply as in docks built of less perishable materials, while the short and narrow altars—which constitute the sides and form a continuous stairway from top to bottom around nearly the whole structure—present the undoubted advantage in winter weather which wood is known to possess over stone or iron in exposed positions.

To claim more than this for the wooden dock it is necessary to assume conditions which cannot be supported by facts, while as a counterbalance there are the grave objections that the structure cannot be regarded as a permanent one, and

* The net tonnage of foreign trading ocean steamships which entered the port St. John's in 1882 was 19,504 tons, while at the port of Halifax it was 432,054 tons.

after the lapse of a few years the repairs account must necessarily be heavy if the dock is much used and is kept in perfect order.

If the undertaking should be one which owes its existence to large public grants, I venture to think that to most persons who will give the matter fair consideration, these objections must appear fatal to the adoption of wood and clay as the chief materials of construction, unless the circumstances attending the case are such as to assure the subsidizers against the risk of the ultimate loss of their money.

As regards time required for construction the wooden dock undoubtedly has the advantage. On a favorable site and under ordinary management there is no reason why it could not easily be built within a period of two years, while with every exertion it would not be safe to assume that a stone structure could be completed in less than two years and a half.

It is claimed for wooden docks that their comparative cheapness should outweigh all other considerations. The American patentee claims that "the original cost is less than one tenth that required for a permanent stone dock," and if this, or even a much higher value had been fixed as their true worth, there would be no need for further argument in their favor. An examination into the facts, however, shows that in some cases at least their actual cost has not fallen short of a fair price for a similar stone structure in a favorable locality. The two wooden docks at Brooklyn are reported as having cost as they stand to-day \$1,283,356 (exclusive of interest) or say \$640,000 each—although they are both operated by the same set of pumps—and in the case of St. John's, if the value of the lands and the remitted duties be added it will be found that the actual cost of the dock at that port has been about the same sum. A carefully designed permanent stone dock with all its appendages, under similar favorable circumstances and with suitable building materials within a reasonable distance, would not in my judgment prove any more expensive.

It should also be borne in mind that at this port good building stone for rubble backing and the best of granite for facing purposes are abundant, and by using these materials

our own mechanics and laborers would be employed and benefitted, while by the adoption of wood the bulk of the material needed would of necessity have to be imported.

If a wooden dock is not often required for use and is kept filled with water when not needed, it is clear that the durability of those portions of the woodwork below tide level will be almost indefinite so long as they are not subject to attack from "Limnoriæ" or the "Teredo;" while on the other hand if the dock is constantly frequented by shipping its length of life must necessarily be greatly shortened, as there is no condition under which the decay of wood is more speedily ~~shortened~~ than when alternately wet and dry for a few days at a time. *shortened*

For the above reasons I can see no cause for altering or modifying the opinions expressed in my report dated 22nd January, 1883.

Taking a practical view of the case as it now stands with regard to the proposed dry dock for this port—if it cannot be secured without pecuniary aid from the city—it appears to me that while the corporation might reasonably consider their contemplated grant of \$10,000 per annum as the utmost which they should contribute towards an undoubtedly permanent structure, it would not seem judicious to subsidize a wooden dock to anything like the same extent, unless the conditions should appear extremely favorable, and satisfactory security is given that the money advanced will be refunded whenever the works fall into decay or cease to be serviceable.

Respectfully submitted,

E. H. KEATING, M. INST. C. E.,

City Engineer.