ANNUAL REPORTS

OF THE

HARBOUR COMMISSIONERS

OF MONTREAL

FOR THE YEAR 1887.

Montreal:

PUBLISHED BY ORDER OF THE HARBOUR COMMISSIONERS OF MONTREAL

1888.

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FOR THE YEAR 1887.

Commissioners:

ANDREW ROBERTSON, Esq., Chairman.

Hon. J. B. ROLLAND, Senator,
EDWARD MURPHY, Esq.,
HENRY BULMER, Esq.,
VICTOR HUDON, Esq.,
HUGH McLENNAN, Esq.,
CHARLES H. GOULD, Esq.,
Hon. J. J. C. ABBOTT, Q.C., Mayor.
ANDREW ALLAN, Esq.,

ALEXANDER ROBERTSON, Secretary.

Montreal:

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STATEMENT

MADE BY

MR. ANDREW ROBERTSON, CHAIRMAN,

HARBOUR COMMISSIONERS OF MONTREAL,

ON THE

Business of the Port for the year 1887, *and other matters connected with the Trust.*

AT THE MEETING OF THE BOARD, HELD ON 20TH APRIL 1888.

GENTLEMEN,—

I regret that in consequence of my absence through illness I have not been able to lay before you sooner the usual Annual Reports of the various Departments of the Trust. I have now the pleasure of doing so, and am pleased to state that there is a general increase, as the following figures will show.

In 1886, the Ocean Vessels were 703 in number and the Tonnage 809,699 tons; while in 1887, they were 767 vessels and 870,773 tons in Tonnage, an increase of 61,074 tons.

This Tonnage includes the Coal Ships which pass into the Canal Basin and the Tonnage of which was 86,154 tons; and as the Dues there go into the Canal Revenues, there was a loss to the Harbour of about $17,000, as compared with 1880, when it amounted to about $1,000.

The Tonnage of Vessels was in

	Ocean.		Inland,		Total.
1886.....	809,699	tons.	809,819		1,619,518
1887.....	870,773	"	791,452		1,662,225
An increase of.....	61,074	A decr. of	18,367	Incr. of	42,707

Showing a falling off in Inland Tonnage of 18,367 tons or 2.27 p.c.

The Revenue which was in 1886.....	$273,674
was in 1887.....	289,885
an increase of.....	$ 16,211

or 5.93 p.c.

Bonds.

During the last Session of Parliament, the Commissioners obtained an Act (50-51 Vic. chap. 42) to enable them to issue Bonds at less than par rates; the Acts hitherto giving power to borrow only at, or above, par. We were thus handicapped with the disadvantage that we had to issue at such a price as they could assuredly be sold at or over par. Let me state last year's operations: we sold $172,000 of par value four per cent. for an average of 96, the loss for the year being $6,807.50. The interest on $172,000 at 4 p.c. equals $6,880. We thus pay less than 8 p.c. for the first year, including the loss by price, and the 4 p.c. interest they bear, and for 29 years afterwards only 4 p.c. We redeemed with these Bonds and money previously obtained $200,000 of the 6½ p.c. Bonds. The Annual Interest being $13,000; this at 30 years is $390,000. Our Interest Account under the new issue will cost only $248,000 or $142,000 less, and the saving of interest on interest will come to quite as much more.

This year there matures Series L $90,000 which has to be provided for, but after this no Bonds mature till 1894 when $331,000 fall due, and in 1896 $440,000 fall due. Might I suggest now to the then Board if some scheme could not be taken up that would be even cheaper to the Board, in the shape of a Registered Stock which seems to be much preferred by Investors to Bonds which are not registered, the same as our Montreal City Stock.

An Act was obtained last session of Parliament (50-51 Vic., cap. 43) granting a further sum of $325,000 for the purpose of deepening Cap-à-la-Roche to 27½ feet at low tide.

We have also applied to the Government for an additional sum of $200,000 to widen and straighten certain portions of the channel which have been found to be somewhat difficult, and the exact sum has been estimated, as will be seen by the Engineer's Report, at $195,294.

Mr. Charles H. Gould's term of office having expired on the 1st August last, he was again elected by the Corn Exchange Association to act as their representative on this board for another term of four years.

During the year we were visited by several war ships. The first was in August, when the United States corvette "Galena," commander Chester, arrived. In August we had the French flag-ship "La Minerve," Rear Admiral Vigne, commander-in-chief of the naval division of the North Atlantic French Squadron, Captain Menard commander. In September we had a visit from H. M. S. "Tourmaline," commander Mather Byles. This ship was here several years ago, and to the whole of them we extended all the facilities of the harbour in our power.

During my absence I noticed in the papers from time to time considerable discussion as to the assumption of the lake St. Peter debt by the Government, and the strong efforts made by deputations and otherwise in Ottawa with that object in view.

I notice in some of the remarks and letters written, there seemed to be an impression that the Harbor Board were not acting up to their duties. I wish to take this opportunity of saying that such has not been the case, as the records from 1879 to the present time will show.

In May last a memorandum was addressed to the Hon. Sir Hector L. Langevin, and this was repeated again in

November, copies of which are hereto annexed. No action up to this time has resulted by the Government, but it is sincerely hoped that they will accede to what is a just and reasonable demand in the interest of the St. Lawrence route and the Dominion.

Harbor Improvement.

In consequence of the increased shipping last year and the difficulty of finding suitable accommodation, instructions were given by the Board to Mr. Kennedy, the Harbor Engineer, to prepare plans showing how greater accommodation could be obtained as near the centre of the harbor as possible. His Report is herewith appended. From this report it will be seen the plan is a progressive one, and can be utilized as the increase of trade may require. No final action has yet been taken on it pending the report of the Flood Committee on the effect the work contemplated might have on inundation, which the Board has asked the Hon. Minister of Public Works to obtain.

In the Ship Channel, last year, the dredges were kept working night and day and it was hoped that it would be finished in the Fall, but from stress of weather, fogs and other delays, it was found impossible to complete it. As will be seen by the memorandum submitted to the Government, it is hoped it will be completed early in the coming season, so that when the low water in the Fall comes, it will be usable to the full depth of 27½ feet by that time.

Two important notices were given to Mariners during the year, that of the 14th July and also that of the 7th October, which are also hereto appended.

HARBOUR COMMISSIONERS OF MONTREAL.

NOTICE TO MARINERS.

Notice is hereby given that a new Ship Channel, 300 feet wide, has been dredged through Pouillier Rayer, from the head of the Cap Charles Channel, to the lower end of the new, or south Cap à la Roche Channel.

The new Pouillier Rayer Channel is a straight continuation of the Cap Charles Channel and the centre line of both is the line of the Ste. Emelie lighthouses brought in one.

The actual depth of water in the new channel, from time to time, will be the same as that in the Cap à la Roche south channel.

The new channel is marked with black buoys on its south bank, and by red buoys on its north bank, in the usual way.

The above described new Pouillier Rayer Channel is hereby declared open for navigation for vessels drawing over eight feet and less than the depth of water in the Cap à la Roche new Channel.

Vessels of eight feet draft and under are to pass clear of the new channel.

By order,

ALEXANDER ROBERTSON,
Secretary.

HARBOUR COMMISSIONERS OFFICE,
MONTREAL, 14th July, 1887.

HARBOUR COMMISSIONERS OF MONTREAL.

NOTICE TO MARINERS.

Notice is hereby given that the depth of water in the New Ship Channel, through the Cap à la Roche, Pouillier Rayer and Cap Charles Shoals, will hereafter be from twenty-one and a half feet at low water of neap tides to about thirty feet at spring tides, which is one and a half feet greater depth than formerly.

This increased depth will hereafter be shown by the semaphore.

The depth of water in the ship channel at Dos de Cheval will be equal to that in the Cap à la Roche new channel.

The depth in the old or north channel at Cap à la Roche, keeping close on the marks, may be taken at five and a half feet less than the depth in the new Cap à la Roche Channel.

It is to be understood that the Commissioners will, as heretofore, take every means to secure correctness in the signals given by the semaphore, but they will not be responsible for the consequences of any error that may happen in such signals.

By order,

ALEXANDER ROBERTSON,
Secretary.

HARBOUR COMMISSIONERS OFFICE,
MONTREAL, October 7th, 1887.

MEMORANDUM of the Harbour Commissioners of Montreal, prepared for submission to the Honorable Sir Hector L. Langevin, K.C.M.G., C.B., Minister of Public Works.

The Harbour Commissioners have been engaged in further improving and deepening the ship channel of the River St. Lawrence between Montreal and Quebec since 1873, when there was only 20 feet of water in the channel. In 1883 a minimum depth of 25 feet was obtained, and by the end of the present season of navigation it is confidently expected that the channel will be completed to 27½ feet at low water, except at Cap-a-la-Roche, where vessels loaded to the full capacity of the channel have to take advantage of half tide to pass.

To enable the Harbour Commissioners to carry on this great undertaking, certain sums of money have from time to time been loaned them under the authority of various Acts of the Dominion Parliament, amounting in all to $2,680,000, of which has been received $2,530,504.10.

On this amount as advanced, the Commissioners have regularly paid interest amounting to $694,840.73 at the end of the last fiscal year.

When it is taken into consideration that the dredging plant employed cost $575,000, it will be seen that the cost for deepening has only been $1,955,504.10.

The yearly charge for interest has been a hard and continually increasing burden on the revenues of the Harbour, and has prevented the Commissioners for years past from making any substantial improvements or extensions in the harbour.

Additional wharf accommodation is now urgently needed to meet the requirements of the trade of the port, and if the Commissioners were relieved of this payment of interest to the Government, they would be in a position to borrow the necessary money to make such improvements, and eventually to somewhat reduce the tariff of rates and dues now in force.

It must, however, be borne in mind that for the improvement of the harbour of Montreal, liabilities to th public in the form of bonds to the extent of $2,060,000 have been issued, and on these, interest must be provided for out of the revenues of the harbour; and besides, repairs, &c., require a considerable expenditure, so that it is absolutely necessary that a revenue should be raised for these purposes.

It has always been contended by the Commissioners, and is now generally conceded, that the deepening of the ship channel is not a local work, but one of great benefit to the Dominion at large, and the cost of same should therefore be assumed by the Federal Government.

In this connection, copies of three documents prepared by the Commissioners, under date of 31st March, 1879, 1st December, 1880, and 15th November, 1882, and submitted to the Department of Public Works, are herewith forwarded. These set forth at length the views and position of the Commissioners, and time and events have even more fully confirmed them.

For these and other reasons, the Commissioners hope that the Honorable the Minister will be pleased to take such steps as may be necessary during the present session.

of Parliament, for the entire assumption by the Government of what is known as "the Lake St. Peter debt," and the relief of the harbour of Montreal from all payments in relation thereto.

On behalf of the Harbour Commissioners of Montreal,

(Signed,) ANDREW ROBERTSON,
Chairman.

HARBOUR COMMISSIONERS' OFFICES,
Montreal, May 10th, 1887.

MEMORANDUM by the Harbour Commissioners of Montreal to the Honourable Sir Hector L. Langevin, K.C.M.G., C.B., Minister of Public Works.

The Board of Harbour Commissioners being anxious as to the future prospects of the Channel and Harbour, in view of the evidently near prospect of a large increase in business, instructed their engineer to report upon the present position of the Channel, as to its completion to 27½ feet at low tide, including Cap-a-la-Roche, as provided for in the last session of Parliament, and the probable cost of the same.

From this they find that the deepening above Cap-a-la-Roche to 27½ feet is not entirely completed, as was expected, owing, it is explained, to the bad weather which prevailed at the end of summer and this autumn. A detailed statement of the work remaining to be done after the 31st October is appended hereto. The dredges have all been at work since that date, and a considerable proportion of the work included in that statement will have been done before winter sets in.

The Engineer estimates that the sum of $383,680 will be required to carry out the deepening to 27½ feet at low water, after 31st October.

Probably the odd amount, $33,680, is about what will be spent to the close of the year, leaving us to begin the season with $350,000 required to carry on the work. Against this sum we have yet to receive of the amount passed by Act of Parliament, $330,000, showing a deficiency of $20,000, which exceeds the estimates by less than two per cent.

The work remaining to be done above Cap-a-la-Roche can be completed before low water next year.

As in former years, it will be necessary to make repairs to the dredging plant; this and the outfit for the spring will require an outlay of probably $50,000. This amount the Board requests the Honourable the Minister of Public Works to cause to be advanced, when required, out of the last grant of $325,000, so as to enable the work to be prosecuted at the opening of navigation.

After considerable experience in navigating the channel, it has been found that at a number of places it is hard to steer the ships in safety, in consequence of sharp turns and cross currents. The Commissioners, therefore, also instructed their engineer to prepare an estimate of what would be required at the dangerous places, and he estimates that to straighten, widen and make the necessary improvements would cost $195,294; say $200,000. The Harbour Commissioners would be glad if the Honourable the Minister could see his way to recommend this to his colleagues as being essential for the safe navigation of the St. Lawrence River, and which, the Commissioners believe, would tend to the general good of the Dominion.

The Commissioners would also beg to call his attention to the state of their finances, and to ask him to consider, as early as possible, the policy of assuming the interest on the channel debt.

The deepening of the channel is now nearly completed,

and as the trade of the country is continually increasing, it is incumbent on the Commissioners to provide more wharf accommodation in the harbour of Montreal. The energies of the Board have been mainly directed for some years to the prosecution of the channel operations to the suspension of the harbour enlargement. Immediate action in the direction of harbour improvement is now imperative, if the advantages of the expenditure on the channel are to be retained.

As the Harbour Revenue is burdened with the interest on the advances made by the Government for the channel, it is impossible for the Commissioners to make the expenditure necessary to meet the requirements of the increased and prospective trade of the country without relief from the Government.

The Revenue and Expenditure will show this clearly as per statement appended:—

The revenue of the coming year (1888) from all sources, based on that of 1886, will probably be about		$284,000
The probable expenditure will be as follows:—		
Interest to Government for advances	$112,000	
Interest for Harbour debt	120,000	
Ordinary charges for management, repairs, lighting, etc	108,000	$340,000
Showing an anticipated deficiency for 1888 of		$56,000

If relieved from the interest on the advances from the Government, the Board will be enabled to make the immediate necessary enlargements in the Harbour without unduly burdening the trade. If, however, these enlargements be made, and the Government still insists on receiving the interest of the channel debt, it will be necessary to increase wharfage dues, placing Montreal and Canada at a disadvantage in the competition with American Atlantic ports, and possibly proving disastrous to the trade of the St. Lawrence.

Appended hereto is a statement showing the number and tonnage of sea-going vessels for ten years back, as also the income derived from the same, the interest paid to the Government for the channel, and that paid to the public for the Harbour. The statement exhibits a very satisfactory increase in the trade and tonnage of the port, which, owing to the reductions that it was found necessary to make in the Tariff of Dues, does not yield a corresponding increase in the Revenues of the Trust, the latter being now insufficient for the payment of present interest and the efficient carrying forward of Harbour extension essential for the trade of the port.

The Board, therefore, requests the Honorable the Minister of Public Works to consider the position in which the Board is now placed, and trusts that he will be able to devise such measure of relief by the Government again assuming the channel expenditure as a public work, as originally undertaken, or such other mode of relief as may, in the wisdom of the Government, be considered expedient, and which would enable the Harbour Commissioners, with the revenues then available, to enter upon a scheme of Harbour improvement commensurate with the growing trade of the port.

(Signed), ANDREW ROBERTSON,
Chairman.

HARBOUR COMMISSIONERS' OFFICES,
Montreal, 30th November, 1887.

YEAR.	No. of Vessels.	Tonnage.	Total Income.	Government Interest.	Harbour Interest.	Total Govt and Harbour Interest.	Balance of Income to pay charges and repairs to Harbour.
1878.....	516	397,266	$222,610	$46,945	$111,779	$158,724	$ 63,866
1879.....	612	506,969	269,596	54,532	108,875	163,407	106,180
1880.....	710	628,271	326,424	58,902	112,721	169,623	156,821
1881.....	569	531,929	238,140	52,240	114,468	167,708	70,432
1882.....	648	554,692	249,130	70,721	110,207	180,928	68,202
1883.....	660	664,263	247,813	68,407	114,342	182,749	65,064
1884.....	626	649,374	230,633	74,575	114,842	189,417	51,216
1885.....	629	683,854	224,897	81,704	115,975	196,679	28,218
1886.....	703	809,699	278,590	91,384	118,477	209,861	68,729
1887.....	767	870,773	*284,000	99,187	115,813	215,000	69,000

* Estimated.

HARBOUR COMMISSIONERS OF MONTREAL.

ESTIMATE of cost of completing Ship Channel to 27½ feet at low water, Longueuil to head of Cap-à-la-Roche Channel (water taken at 11 feet on Lake St. Peter Flats). NOVEMBER 15th, 1887.

LOCALITY.	MATERIAL.	Quantity scow measurement. Cubic Yards.	Price per Yard.	Amount.
Batiscan Traverse.	Clay and boulders.	35,000	25c	$ 8,750
Batiscan Village...	" " .	16,000	25	4,000
Do ...	Stone-lifting, lin. ft.	2,200	..	5,000
Becancour	H'd pan and b'ders.	17,000	45	7,650
Cap Madeleine and Three Rivers....	Clay and boulders.	35,000	36	12,600
Nicolet Bank.....	H'd pan and b'ders.	7,000	45	3,150
Lake St. Petcr.....	Soft clay.....	450,000	3	13,500
Ile de Grace.....	Scraping, lin. ft....	400,300	$1.00	400
Contrecœur	Stiff clay and b'der	43,000	12c	5,160
Vercheres & vici'ty	Clay and boulders.	18,000	12	2,160
Pointe Marie.....	" " .	11,000	11	1,210
Cap St. Michel.....	Clay and gravel...	195,000	8	15,600
Varennes	Clay and boulders.	135,000	10	13,500
P'te-aux-Trembles.	" " .	125,000	15	18,750
Longueuil.	H'd pan and b'ders.	45,000	25	11,250
				$122,680

HARBOUR COMMISSIONERS OF MONTREAL.

ESTIMATE of cost of completing Ship Channel to 27½ feet at low water, Cap-a-la-Roche to Cap Charles, inclusive, (water taken at 11 feet on Lake St. Peter Flats). NOVEMBER 15th, 1887.

LOCALITY.	MATERIAL.	Quantity scow measurement Cubic Yards.	Price per Yard.	Amount.
Cap Charles.....	Shale rock.....	140,000	40c	$56,000
Pouillier Rayer....	H'd pan and b'ders.	80,000	$1.00	80,000
" "	Stone-lifting.....	1,700	..	5,000
Cap-à-la-Roche, including curve...	Shale rock.....	300,000	40c	120,000
				$261,000

HARBOUR COMMISSIONERS OF MONTREAL.

ESTIMATE of cost of widening, straightening and improving the Ship Channel from Longueuil to Grondines Village, inclusive, in addition to deepening to 27½ feet, at low water of 11 feet on Lake St. Peter Flats as now in progress. NOVEMBER 15th, 1887.

Locality and Work.	Nature of Material.	Quantity Cubic Yards.	Price per Yard.	Amount.
Grondines Vil'ge, straightening..	Shale rock, bo'ders.	45,000	50c	$22,500
	Boulders.			7,500
Batiscan Village, straightening..	"	47,000	25	5,000
	Clay and boulders.			11,750
Nicolet, widening..	H'd pan and b'ders	38,000	45	17,100
Ile de Grace, straightening....	Clay and gravel...	50,000	25	12,500
Cap St. Michel, widening	" " ...	130,000	15	19,500
Varennes, wide'ng.	Clay and boulders.	140,000	15	21,000
Longueuil, wide'ng.	H'd pan and b'ders	30,000	40	12,000
Total cost of widening and straightening.....				$128,850
Add for deepening certain unfinished places to make 27½ feet depth with 10' 6" on flats instead of 11.....				39,690
Add for cleaning over places already dredged to give 27½ feet with 10' 6" on flats.....				9,000
				$177,540
Add for minor places and contingencies, 10 p. c.....				17,754
				$195,294

HARBOUR COMMISSIONERS OF MONTREAL.

Chief Engineer's Office,

MONTREAL, January 19, 1888.

ALEXANDER ROBERTSON, ESQ.

Secretary, &c.

DEAR SIR,

In obedience to recent instructions from the Board, requiring me to submit a project for harbour enlargement, I herewith transmit a plan showing in outline a general scheme of enlargement embodying such features as appear to me best suited to the circumstances and requirements of the port.

It will be seen that the proposed enlargements are naturally separated into three main divisions:—

1st. The Central Division, extending from the entrance of the Lachine canal to Victoria pier, Section 20.

2nd. The Hochelaga Division, commencing at the lower end of the existing wharves at the Hudon Cotton Mill, Section 40, and extending three-fourths of a mile down stream.

3rd. The Point St. Charles Division, embracing the reclamation of the rocky flats between the Victoria Bridge abutment and the entrance to the Lachine canal.

In the first or Central Division, it is proposed to enclose an area of about 101 acres by an embankment placed at the outer side of the Island Shoal, and carried up to a level sufficient to prevent the ice of the main river channel from being shoved over it into the enclosed basin. The embankment will also exclude the strong current of the main channel and the enclosed area will therefore be converted into a slack-water basin, in which vessels can be conveniently and safely moved about in summer or laid up in winter, and which will also allow of the erection on the wharves of warehouses and other

structures of such character as cannot be affected by the mere rising and falling of the smooth sheet of ice.

Within this basin it is proposed to build a series of large pier wharves, connected with the main shore and placed at such an angle as to afford easy access by ships as well as by railway cars and ordinary vehicles.

It is proposed to widen out Commissioners street to 100 feet by moving out the revetment wall and with it the line of the shore wharves. In order to protect the City from spring floods, the revetment wall is intended to be surmounted by a water-tight parapet wall of suitable design and height, and having ample openings for the access of vehicles to the wharves. Ramps similar to those now in use, but fewer in number and of much greater width and of easier grade, will lead from these openings to the wharves below. Over the ramps is a suitable site for double lines of elevated railway tracks, supported at proper height by rows of columns standing on the parapet wall and outside walls of the ramps, so that the railways, if desired, may have connection with each other along the city front without interfering with vehicle traffic to the wharves.

Should the city prefer to widen Commissioners street by setting back the line of the buildings on the north-west side rather than by moving out the line of the shore wharves, it can, of course, be done, the same general arrangement being applicable in either case.

Besides the elevated tracks, the wharves will, of course, have tracks laid at the surface level for allowing cars to approach the ships at all parts.

It is proposed to build the wharves to a level well above the highest May or "north water" freshets, say two or three feet higher than the existing wharves, but not to carry them above the level of winter floods.

The berths for vessels would in the first instance be

made with 27½ ft. depth at low water, the same depth as being made in the ship channel, but the wharves would be founded at such depth as to allow of subsequent dredging to 30 feet.

The location of the wharves, and in fact the arrangement of the whole scheme, is such as to allow of the construction of the works in sections, without materially interfering with the business of this most important part of the harbour.

The whole water discharge of the Canal locks and milling powers will be through the basin, and it will therefore be kept in wholesome condition.

The deep water wharf frontage afforded by this central division will be about 21,000 lineal feet. This will supersede 5,200 feet of deep water front and 2,100 feet of shallow water front, or in all—7,300 feet of existing wharfage, thus giving in the most valuable part of the harbour a fourfold increase of space for ocean vessels of the largest class.

The second, or Hochelaga Division, in a part of the project which has been before the Board for some time, and consists of a proposed new shore wharf with a series of piers extending out to the natural deep water, and at such an angle as to afford as easy access as possible to vessels from the rather strong current outside.

The locality, from its being at the Current St. Mary, is much exposed to heavy ice shoves, and the wharves would therefore require to be very strongly built and at no greater height than necessary to prevent their being overflowed by the May freshets.

It is proposed to make them all deep water wharves, and the total increase of frontage for sea-going vessels which they will afford will be about 10,200 lineal feet.

The third, or Point St. Charles Division, consists of the extension of the outer embankment of the first division

up to the abutment of the Victoria Bridge, thus enclosing a great part of the rocky flats between the proposed outer embankment and that to be built on the outer side of the Windmill Point Basin now under construction. The basin thus formed would be raised above the general level of the harbour, and would thus become a high-level dock. Ocean vessels will have access to it at the lower end by means of large locks, and inland craft will have additional access by a channel connecting the head of the dock with Canal Basin No. 2.

The embankment of this dock from being at high level and above winter floods, would afford excellent sites for permanent warehouses, dry-docks, workshops, etc. The area of the dock will be 72 acres and the wharf frontage in it will be 10,800 lineal feet.

With the several divisions of the proposed enlargement all carried out, the future capacity of the harbour, as compared with the present, would be as follows :—

PRESENT CAPACITY.

Deep water wharfage made or capable of being made 27½ feet deep at low water	16,300	lin. ft.
Deep water wharfage made or capable of being made 20 to 25 feet at low water	2,100	"
Shallow water wharfage made or capable of being made 10 to 20 feet at low water	6,050	"
Total	24,450	"

FUTURE CAPACITY.

Deep water wharfage—27½ feet at low water	43,130	lin. ft.
Do. do. 20 to 25 feet at low water	1,460	"
Shallow do. 10 to 20 do. do.	4,360	"
Total	50,950	"

Yours respectfully,

(Signed,) JOHN KENNEDY,
Chief Engineer.

HARBOUR COMMISSIONERS OF MONTREAL.

Chief Engineer's Office,

MONTREAL, February 25th, 1888.

ALEXANDER ROBERTSON, ESQ.

Secretary, &c.

DEAR SIR,

I am requested by the Board to supplement the description of proposed harbour enlargements, addressed to you on the 19th ult., by a somewhat fuller explanation of the character of the proposed works, and by giving the reasons which have lead to the adoption of the main features of the project, and this I now beg to give :—

First, as to the site, I look upon it as almost self-evident that any considerable addition to our harbor accommodation must be made by utilizing more of the river and not by extending inland. In Griffintown, which is the only direction in which inland extension of the central part of the harbour would be feasible, the average assessed value of land and buildings is about $20,000 per acre, and the expropriation cost would, of course, be about double as much.

No scheme of harbour enlargement, adding less than 100 acres to the space required for the class of shipping now frequenting the central part of the harbour, could be considered as upon a scale adequate to the wants of the port. The land alone would cost something like $4,000,000.

The works specially pertaining to such inland docks would also be very costly. The entrance locks alone, of the size requisite to admit the largest modern steamers would be very formidable structures, and these, together with bridges, water supply, new railway approaches and other special works could hardly be estimated at less than $500,000. The two items of site and special works would, therefore, make inland docks cost some $4,500,000

in excess of river docks, provided the general works and wharves were about of the same extent and character in each.

This sum at 4½% would represent an annual charge of $202,500, equal to 5 cents per ton on 4,000,000tons, or over twice the whole present shipping of the port.

As regards the relative advantage of inland and river docks for conducting the business of the port, opinions, no doubt, differ, but to me they appear to be about equal in value, though different in kind. With inland docks, the inconvenience and delays of locking would be transferred from the canal craft to the ocean and lower port vessels, and the risk of disaster from damage to locks would, in a measure, be taken from the smaller canal locks and put upon the great ones belonging to the dock. These items must be considered to the disadvantage of inland docks, but against them are the advantages of non-flooding in winter of the stores and mechanical appliances for handling cargoes.

Practically the same general considerations would apply to inland docks if placed at Hochelaga, except that the purchase of the site would be less costly. Hochelaga would, however, have the serious commercial disadvantage of being some three miles distant from the present business centre of the city.

A consideration of some importance as between river and inlands docks is that any area reclaimed from the river is so much added to the business dimensions and possibilities of the city, while the taking of occupied or available land and turning it into docks, is so much reduced, or at least a mere exchange of one kind of usefulness for another.

With these views as to site, I have endeavored to utilize as much of the river as can be done without cramping it either in winter or summer, and in doing this

I have followed almost all the large projects for harbour enlargement in taking advantage of the bay between the Victoria pier and the west abutment of the Victoria bridge. Only the inshore margin and part of the length of this great bay is yet turned to service. It is full of shoals and useless for navigation ; it is not only too shallow to be of service in carrying off any great quantity of ice or water in spring, but its shape is such that it helps to form the shoulders of the bottle neck which catches and holds the inshore ice opposite the centre of the city, and leaves it piled in large masses on the wharves and revetment wall. I have, therefore, followed several important previous plans, and particularly that of the Board of Engineers of 1876, in recommending the enclosure of this bay by an embankment running in a line from the outer end of the bridge abutment towards the Victoria pier, thus acting both as a glance-pier to guide the ice and water into St. Mary's current, and to enclose a harbour alike free from ice-shoves in winter and currents troublesome to shipping in summer.

In the first instance this pier might be a simple embankment made of dredgings from the space within and of width and height enough to act as an effective barrier to the passage of ice over it into the enclosed basin. Later on, as trade requires, the inner side could be faced with crib-work or masonry and formed into so much additional wharfage.

In utilizing the basin thus enclosed I have been mainly guided by the fact that all connected with shipping and shipping-charges are united in the opinion that for ships with general cargoes, the part of the harbour from the entrance to the canal to the Canadian Pacific elevators is by far the most valuable part.

Both those interested in the ship and the cargo feel at a decided disadvantage, as to cargo and general expenses,

if berthed outside these limits. To lessen the expenses on such cargoes, which form so large and important part of the trade of the port, it is obviously essential that the central part of the harbour be arranged to accommodate the largest possible number of ships, and that access should be had to them both by cart and car in the most direct practicable way.

With this in view, it is proposed to fill up the basin inside the embankment from the entrance of the canal to Victoria pier, with five piers running out from shore to as great a length as possible, still leaving a roomy passage for vessels entering or leaving the canal and upper part of the harbor, as well as the basins between the proposed piers themselves.

The present foreshore wharves, which, as a rule, are quite too narrow, would be widened out to 200 feet, so as to afford room for the main lines of railway tracks traversing the whole length of the harbour, and having branches out to the several piers, and also room for roadway, freight sheds, &c.

The piers, because of their being in a basin protected from the ice shoves, which so seriously damage the present wharves, may either be of moderate breath and cheaply built pile-work or may be of more liberal dimensions and permanent construction, as the means of the Board may permit.

As regards the height of the new piers and shore-wharves, it is proposed to make them only safely above the highest May or "north-water" freshets. At this level they will of course be submerged in winter, but as the ice can only rise and fall, and not shove, there will be no difficulty in erecting sheds and other structures of a character which may remain permanently. To raise the wharves so as to secure any real advantage from being dry all the year round would require that they be high

enough to be safely clear of maximum floods, or in other words some six feet higher than the revetment wall and Commissioners street.

This, of course, is not to be thought of, but anything short of it seems to me to offer no benefits worth anything like the great cost of raising the wharves up to some intermediate level, as that of Commissioners street, for instance.

The protection of the city from winter floods and the widening of Commissioners street, are matters not within the province of the Harbour Commissioners, but as they can best be carried out in conjunction with harbor enlargement, provision has been made for them. The Government Flood Commission has, in substance, recommended for the protection of this part of the City, either a bank, or dyke, or parapet, as future plans of harbour enlargement may best permit. In any case the present revetment wall must be rebuilt (unless it were merged in the quay wall, by raising the wharves to high level), and it is therefore proposed, as best suited to all the conditions, to widen the street and rebuild the wall on the new line, with a parapet wall, of suitable height and character to exclude the floods, having suitable gate openings for summer access to the wharves. But the City can, of course, exercise its pleasure as to this without affecting the material features of the plan of harbour enlargement.

The central part of the harbour, though best adopted for the accommodation of general cargo vessels, does not meet the need of room for the rapidly increasing number of vessels exchanging whole cargoes with railways and inland boats bringing coal and raw material to the manufactories at the outskirts of the city, and taking away lumber, grain, etc. Such trades can be best accommodated at other and less crowded parts of the harbour, and for these it is proposed to proceed with the construction of

shore wharves and piers at Hochelaga, at such rate as may be found requisite. Much has already been done towards this in recent years by filling alongshore with dredgings, and it now only needs that the general plan be systematically carried out.

The construction of the central and Hochelaga divisions of the general scheme will, doubtless, furnish all the increased wharfage required for many years to come, but in order to make the project complete, the plan shows how the flats at Point St. Charles may be utilized by the construction of a high level dock, having connection both with the main harbour and with the canal. In this division are shown sites for dry and slip docks, but as these could not well be built alone and the construction of the high level basin will doubtless be delayed beyond the time when a graving dock may be found necessary, I am asked to point out a site where one could be built independently of other works.

I am unable to do this definitely without special surveys, borings and estimates, but may say that existing information leads me to propose Hochelaga or Maisonneuve as appearing to offer altogether the greatest advantages.

Yours respectfully,

(Signed,) JOHN KENNEDY,
Chief Engineer.

STATEMENT

OF

GENERAL RECEIPTS AND DISBURSEMENTS

OF THE

HARBOUR COMMISSIONERS OF MONTREAL,

FOR THE YEAR 1887.

HARBOUR COMMISSIONERS OF MONTREAL,
Secretary's Office,
MONTREAL, February 13th, 1888.

WILLIAM SMITH, ESQ.,
Deputy Minister of Marine,
OTTAWA.

SIR,

I have the honour, by direction of the Harbour Commissioners of Montreal, to forward herewith, for the information of the Honourable the Minister of Marine, statement of the General Receipts and Disbursements of the Trust for the year ended December 31st, 1887.

The Receipts from all sources were as follows, viz :—

From Dominion Government :

Received on account of New Channel Works.	$145,000 00	
Buoys and Beacons, allowance 1886.....	7,000 00	
		$152,000 00

Brought forward		$152,000 00
Real Estate :		
Final payment on old Building	3,600 00	
One year's interest on above	216 00	
		3,816 00
Harbour Plant :		
Canadian Pacific R'y, for dredge No. 5 lost	18,000 00	
J. Reynar, for old sheaves sold	36 90	
		18,036 90
Harbour Railway :		
Steel Rails sold		56 25
Buoys and Beacons :		
Refund of Custom's Duty		1 99
Harbour Dredging :		
Sundry amounts received for credit		6,454 18
New Channel Operations :		
Sundry amounts received for credit		2,957 46
Lighting Wharves :		
Electric Light'g, for use lamp, 22 nights @ 75c.	16 50	
Coal oil. Sundry amounts received	23 50	
		40 00
Harbour Expenses :		
Sundry amounts received		22 20
Harbour Repairs :		
Sundry amounts received		742 42
From Collector of Customs, Montreal :		
Wharfage on Goods, Inwards	128,733 89	
" " Outwards	72,907 45	
Tonnage Dues on Steamers	48,147 51	
" " Sailing Vessels	4,718 20	
		254,507 05
Interest :		
From Canadian Pac. R'y on value of Dredge over due	432 00	
Accrued on Debentures sold	514 66	
Received on Bank Deposits, less paid on over drafts	456 08	
		1,402 74
Carried forward		$440,037 19

Brought forward		$440,037 19
Harbour Debentures :		
Series F sold (par value)		172,000 00
From Local Traffic :		
Wharfage on Goods, Inwards	8,317 56	
" " Outwards	894 45	
Harbour Dues on Barges	9,134 21	
" " Steamers	2,056 96	
Commutation on Steamers	13,115 00	
Lumber piled	2,224 00	
Phosphate "	98 88	
Coal "	1,550 00	
Firewood "	491 75	
Rent of Railway Tracks	2,950 00	
Scales on the wharves	1,100 00	
Small Offices	847 90	
Penalties	69 50	
		42,850 21
Rent of Offices in Building		1,250 00
Rent of Yard, corner of Barclay & Water Sts.		437 55
TOTAL RECEIPTS		$656,574 95

The Disbursements were as follows :—

New Dredging Plant		$ 5,926 98
New Channel Operations		192,214 69
Buoys and Beacons		14,332 61
Dominion Government Interest		99,187 22
Debentures paid :		
Series H	7,000 00	
" J	100,000 00	
" K	100,000 00	
		207,000 00
Real Estate :		
Paid for Yard, corner Barclay & Water Sts..		12,650 00
Construction Account :		
Sections 16 and 41-44	6,149 27	
Wind Mill Point Wharf	5,228 74	
Electric Lighting	2,013 93	
Harbour Dredging (new work)	23,220 74	
		36,612 68
Carried forward		$567,924 18

Brought forward		$567,924 18
Interest on Debentures	115,730 00	
Discount on 4 per cent Debentures sold	6,807 50	
		122,537 50
Harbour Repairs		70,634 00
Harbour Expenses and Management		26,598 52
Harbour Dredging, Allans Basin and Canal Entrance		1,148 64
Harbour Survey		78 93
Lighting Wharves, Electric Light	2,978 79	
" " Coal Oil	491 96	
		3,470 75
Travelling and Incidental Expenses		237 00
Printing, Advertising and Stationery		2,624 56
Legal and Notarial Expenses		173 63
Refund and Rebate of Wharfages		2,469 25
Mrs. John Young, Annuity		600 00
Suspense Account		33,292 97
TOTAL EXPENDITURE		$831,789 93

In comparison with last year, the Ordinary Revenue shows an increase of $16,210.74, or about 6 %.

The loss to Harbour Revenue from the Coal Vessels which discharged in the Deep-water Basin of the Lachine Canal was about $17,000.

The following Departmental Reports have already been forwarded you, viz : the Chief Engineer's on the Harbour Works ; the Harbour Master's, with comparative statements of the Trade of the Port ; the Chief Engineer's on the maintenance of the Buoys and Beacons on the River, and the Report on matters relating to the Pilotage District under the jurisdiction of the Commissioners.

From the Harbour Master's Report, it will be seen that there has been an increase in the business of the Harbour for the past year, the increase in Sea-going Vessels being 64 vessels and 61,074 tons, while the Inland Vessels show a decrease of 154 vessels and of 18,367 tons.

The usual report on the deepening of the Ship Channel

between Montreal and Quebec to 27½ feet at low water, for the last fiscal year, has been furnished the Department of Public Works.

At the last Session of Parliament, a further grant of $325,000 was made to enable the Commissioners to deepen the Channel at Cap-à-la-Roche to 27½ feet at low water, which work will be entered upon at the opening of the coming season of Navigation.

I have the honour to be,

Sir,

Your obedient servant,

ALEXANDER ROBERTSON,
Secretary.

REPORT

OF THE

HARBOUR MASTER OF THE PORT OF MONTREAL

FOR THE YEAR 1887.

CAPTAIN THOMAS HOWARD, *Harbour Master.*

HARBOUR COMMISSIONERS OF MONTREAL,

HARBOUR MASTER'S OFFICE,

MONTREAL, January 3rd, 1888.

ALEXANDER ROBERTSON, ESQ.,

Secretary,

Harbour Commissioners of Montreal.

SIR,—

For the information of the Board of Harbour Commissioners, I beg to submit the following as my Annual Report for the year 1887, with comparative statements showing the number, tonnage, classification, nationality, greatest number of vessels in port at one time, number and tonnage of sea-going vessels consigned to the different agents, with statements showing the number and tonnage of inland vessels, and the greatest number in port at one time, during the past ten (10) years.

Seven hundred and sixty-seven (767) sea-going vessels arrived in port during the past season, of the aggregate tonnage of 870,773 tons; of this tonnage, 86,154 passed into the canal, showing an increase of sixty-four (64) vessels and 61,074 tons in tonnage, as compared with the year 1886. Of these vessels, 585 were built of iron, of an aggregate tonnage of 798,435 tons, and 182 built of wood, of an aggregate tonnage of 72,338 tons.

Of inland vessels there arrived in port 5,480, of an aggregate tonnage of 791,452 tons, showing a decrease of 154 vessels, and in tonnage of 18,367 tons, and a total of 6,134 vessels of all classes, and 1,662,225 tons in tonnage, showing an increase of vessels of all classes of 44,707 tons.

Lumber.—There were shipped during the season to the United Kingdom, 89,765,368 feet; to South America, 26,084,322 feet. Total shipments, 115,848,690 feet, showing a decrease of 11,042,850 feet from the previous year.

The Coal Trade.—During the season we had from Great Britain 42,347 tons, showing an increase of 11,736 tons and 1,978 tons of coke, showing an increase of 803 tons; and from the United States, 196,055 tons, showing a decrease of 26,383 tons, and 349 tons of coke, showing a decrease of 508 tons of coke, making a total of 240,729 tons. We had from the Maritime Provinces 368,067 tons, showing an increase of 55,266 tons over the previous year; 97,515 tons of the coal from the Maritime Provinces were discharged in the canal.

The Shipment of Phosphate during the season shows a slight decrease. The following are the figures for the past seven seasons:—In 1880, 7,500 tons were shipped; in 1881, 10,307 tons; in 1882, 15,556 tons; in 1883, 17,160 tons; in 1884, 20,461 tons; in 1885, 24,290 tons; in 1886, 21,048 tons; and in 1887, 20,597 tons.

The Grain Trade.—There were shipped from this port during the season, 7,732,848 bushels of wheat, 1,181,483 of corn, 1,932,304 of peas, 407,383 of oats, 9,648 of barley, and 109,123 of rye, making a grand total of 11,372,789, showing a decrease over the previous year of 2,772,529 bushels.

The Cattle Trade.—There were exported to Europe during the season, 64,907 head, and 35,172 sheep, showing a a decrease of 917 head of cattle, and 61,476 sheep. It is expected there will be a great increase in the quantity of cattle exported next season, as the prairie cattle will be shipped from here.

Wharf Accommodation.—In my last Annual Report I referred to the great want of wharf accommodation, and I regret nothing has been done to increase it. It now becomes absolutely necessary to extend our wharves ; that is, if we are to have the great increase in the shipment of grain from this port, as contemplated by the opening up of the new short line by the Sault Ste. Marie. The Canadian Pacific will require increased accommodation at Hochelaga to erect elevators, and meet the demands of increasing business. The Grand Trunk will also require facilities at Wind-Mill Point for storing and shipping grain, and receiving inward cargoes. Independent of these railways, we have the increase in the general business to accommodate. If wharves are not built immediately, we must expect the grain business to go past us to some port where greater facilities are afforded for exportation to Europe.

I would, therefore, respectfully recommend the Board of Harbour Commissioners to extend the wharf at Hochelaga three thousand feet, so as to connect with the new St. Lawrence Sugar Refinery. This immense establishment will require berths for three or four ships at a

time, to discharge raw sugar, and coal-laden ships with despatch.

I would also recommend extending the Commissioners' railway tracks to the Sugar Refinery.

Weather Report.

January.—1st, snow storm, east wind, crossing on the ice at Longueuil and St. Lambert's, tem. 14 above zero; 2nd, 5 below, west wind; 3rd, at 9 a.m., 20 below, teams crossing at St. Lambert's; 4th, fine morning, east wind, tem. 8 below; 5th, misty day, tem. 5 above; 6th, fine morning, north wind, tem. 15 above; 7th, delightful day, north wind, tem. 10 above; 8th, very cold, tem. 18 below zero, north-east wind; 9th, fine, tem. 20 below at 7 p.m., snowing; 10th, tem. zero, quantity of snow fell last night; 11th, fine morning, tem. zero; 12th, snowing, tem. 15 above, west wind; 13th, fine morning, five below zero; 14th, great snow storm, east wind, tem. zero, storm continued all day, trains delayed; 15th, snow storm continues, very severe weather; 17th, tem. 20 above zero; 18th, blowing a gale, tem. 10 below, railroads all blocked; 19th, west wind, tem. 10 below zero; 20th, 8 a.m., 10 below, north wind, 9 p.m., very mild during the night, rain, and blowing a gale; 21st, fine morning, 20 above zero; 22nd, snowing, turned to rain, tem. 30, rain all day; 23rd, rain continued, tem. 30 above zero, streets all glare ice; 24th, tem. 29, raining; 25th, fine clear morning, west wind, tem. 8 above zero; 26th, west wind, tem. 5 above zero at 7 a.m., at 9 a.m. zero; 27th, cold morning, tem. 10 below zero; 28th, tem. zero; 29th, rain this morning, 8 a.m. 40 above zero, west wind; 30th, 30 above zero; 31st, great change, 10 below zero, west wind. The month throughout was very changeable.

February.—1st, cold east wind, tem. 8 below zero; 2nd, 18 below; 3rd, milder, snowing, 10 above; 4th, fine, west

wind, tem. 10 above zero; 5th, cold west wind, at 7 a. m., tem. 10 below zero; 6th, tem. zero; 7th, fine weather, tem. 4 above; 8th, tem. 16, blowing a gale, with sleet and rain; 9th, fine, west wind, tem. 28 above; 10th, tem. 18 above, south wind; 11th, east wind, blowing a gale, with snow storm, tem. 14 above, in the afternoon a regular blizzard; 12th, fine, clear morning, tem. zero; 13th, tem. 2 above zero, west wind; 14th, fine weather, south wind, tem. 3 above; 15th, much milder, south-east wind, tem. at 8 a m. 28 above zero; 16th, west wind, tem. 30 above zero; 17th, north-west wind, tem. 25 above zero; 18th, east wind, tem. 10 above, snow storm all day; 19th, west wind, tem. 34 above, blowing a gale; 20th, tem. 25 above, west wind; 21st, east wind, tem. 14 above; 22nd, east wind, tem. 10 above; 23rd, tem. 20 above, west wind; 24th, south-west wind, tem. 30 above zero; 25th, fine morning, west wind, tem. 2 above; 26th, cold, east wind, tem. 8 below zero; 27th, snowing all day and blowing a gale, all the trains detained, tem. 30 above; 28th, west wind, tem. 4 below zero last night.

March.—1st, fine morning, 8 a.m. tem. 1 above zero; 2nd, much milder, south wind, tem. 30 above, sleighing good; 3rd, 20 above; 4th, north-east wind, tem. 10 above zero; 5th, cold morning, tem. 12 below zero; 6th, great snow storm, trains all delayed; 7th, 27 above, east wind, thick mist, trains still delayed; 8th, 20 above, west wind; 9th, tem. 16 above; 10th, 34 above zero, fine; 11th, tem. 12 above zero; 12th, tem. 20 above zero; 13th, mild, tem. 30 above; 14th, tem. 32 above, north wind, snowing; 15th, 8 above zero, north-west wind; 16th, 14 above; 17th, tem. 22 above; 18th, north-west wind, tem. 38 above, snowing; 19th, tem. 42 above; 20th, tem. 44 above; 21st, tem. 30 above, north-west wind; 22nd, snowing, tem. 32 above zero; 23rd, snowing all night, tem. 22 above zero; 24th, tem. 16 above, sleighing good; 25th,

snowing all last night, blowing a gale, tem. 24 above; 26th, tem. 9 above; 27th, fine, tem. 16 above; 28th, snowing, tem. 20 above; 29th, cold, tem. zero; 30th, blowing a gale, blowing a gale north-west, tem. zero; 31st, fine morning, sleighing good, tem. 12 above.

April.—1st, fine, west wind, tem. 8 above; 2nd, cold, east wind, tem. 10 above zero; 3rd, west wind, tem. 40 above; 4th, rain all last night, tem. 34 above; 5th, tem. 30 above, west wind, blowing a gale; 6th, tem. 18 above; 7th, tem. 20 above; 8th, fine, tem. 30 above; 9th, tem. 35 above; 10th, fine and mild, tem. 50 above; 11th, cloudy, tem. 48 above, east wind; 12th, tem. 30 above; 13th, tem. 29 above, east wind, water rising; 14th, fine morning, tem. 32 above; 15th, dark morning, afternoon rain, tem. 22; 16th, disagreeable day; 17th, fine, tem. 34; 18th, tem. 38; 19th, fine day, tem. 35; 20th, tem. 45, water still rising; 21st, tem. 50, great ice shove in the afternoon; 22nd, tem. 58, water over the streets, Griffintown and all the lower districts flooded; 23rd, rain, temp. 45, water 42 feet 2 inches on the lock sill; 24th, water falling slowly; 25th, fine morning, tem. 50; 26th, fine, tem. 52; 27th, tem. 47, west wind, water gone down below revetment wall; 28th, fine, clear day, tem. 45; 29th, rain all last night and this morning, tem. 41; 30th, tem 44, east wind, water clear of the wharves.

May.—1st, fine day, tem. 45, tug "St. Francis," from Sorel, first arrival, navigation open; 2nd, steamer "Quebec" arrived this morning and left for Quebec same evening; 3rd, fine and warm, tem. 65, 2.45 p.m. steamship "Oregon" arrived, first arrival from sea; 4th, tem. 65, G.T.R. and C.P.R. cars came on the wharves; 5th, north-east wind, tem. 65; 6th, cold, tem. 50; 7th, west wind, tem. 65; 8th, very warm, tem. 75; 9th, tem. 70; 10th, tem. 70 in the morning, and at 2 p.m. 78; 11th, tem. 65; 12th, tem. 55, north-east wind; 13th, tem. 53; 14th, fine

morning, tem. 68 ; 15th, fine and warm, tem. 70 ; 16th, tem. 65, water going down, Island wharf dry ; 17th, tem. 65 ; 18th, east wind, tem. 55, 7 p.m. rain ; 19th, fine, tem. 60 ; 20th, cold, east wind, tem. 30 ; 21st, fine, tem. 60 ; 22nd, west wind, 4.30 p.m. tem. 82 ; 23rd, tem. 70 ; 24th, tem. 75 to 80, rain all night ; 25th, north-east wind, rain, tem. 60 ; 26th, fine morning, tem. 65 ; 27th, dark morning, tem. 60, east wind ; 28th, tem. 55 ; 29th, tem. 65 ; 30th, south wind, tem. 65 ; 31st, fine day, tem. 70.

June.—1st, dark morning, tem. 65, rain ; 2nd, fine, tem. 66 ; 3rd, tem. 65 ; 4th, east wind, tem. 59 ; 5th, west wind, showers during the day ; 6th, tem. 68, dark weather ; 7th, tem. 68, east wind ; 8th, fine west wind, tem. 75, 9 pm. rain; 9th, fine, tem. 68 ; 10th, tem. 70, east wind ; 11th, tem. 68 ; 12th, tem. 74 ; 13th, tem. 70 ; 14th, tem. 65, easterly wind ; 15th, fine, tem. 70 ; 16th, rain, tem. 69 ; 17th, tem. 65 ; 18th, tem. 60 ; 19th, tem. 60 ; 20th, fine, tem. 65, west wind ; 21st, tem. 70, rain ; 22nd, tem. 70 ; 23rd, tem. 75 ; 24th, tem. 68 ; 25th, tem. 60 ; 26th, tem. 65 ; 27th, tem. 70 ; 28th, tem. 70 ; 29th, tem. 75 ; 30th, tem. 80, south-west winds.

July.—1st, very warm, tem. 91, west winds ; 2nd, tem. 84 ; 3rd, rain this morning, tem. 80 ; 4th, tem. 84, at 4 p.m. 95 ; 5th, tem. 85 ; 6th, tem. 80, at 3 p.m. rain storm ; 7th, tem. 75 , 8th, west wind, tem. 80 ; 9th, tem. 85 ; 10th, tem. 80 ; 11th, tem. 74 ; 12th, tem. 75, 9 p.m. rain storm ; 13th, tem. 80 ; 14th, tem. 70 ; 15th, tem. 95 ; 16th, tem. 70 ; 17th, tem. 75 ; 18th, tem. 70 ; 19th, tem. 75 ; 20th, tem. 80 ; 21st, tem. 80, 2 p.m. rain storm ; 22nd, tem. 80 ; 23rd, tem. 80 ; 24th, tem. 75 ; 25th, tem. 75 ; 26th, tem. 75 ; 27th, tem. 78 to 84 ; 28th, tem. 86 ; 29th, tem. 80 ; 30th, tem. 80 ; 31st, tem. 85. West winds prevailed during the month, which was unusually warm.

August.—1st, tem. 80 ; 2nd, tem. 76 ; 3rd, tem. 75 in the

morning, in the afternoon 85 ; 4th, tem. 80 ; 5th, tem. 82, rain at midnight ; 6th, tem. 75, at 8 p.m. great change in temperature to 60, and during the night to 45 ; 7th, cold morning, north wind, tem. 55 ; 8th, at 7 a.m. tem. 60 ; 9th, west wind, tem. 65 ; 10th, tem. 74 ; 11th, tem. 74, raining ; 12th, tem. 75 ; 13th. tem. at 8 a.m. 57 ; 14th, tem. 75 ; 15th, tem. 70 ; 16th, tem. 75 ; 17th, at 7 a.m. tem. 60 ; 18th, 9 a.m. rain, tem. 67 ; 19th, tem. 65 ; 20th, tem. 70 ; 21st, tem. 70 ; 22nd, tem. 70 ; 23rd, tem. 63 ; 24th, tem. 60 ; 25th, tem. 51 ; 26th, tem. 50 ; 27th, tem. 52 ; 28th, tem. 65 ; 29th, tem. 58 ; 30th, 60, east wind ; 31st, east wind, tem. 60, foggy morning. It will be seen that on Saturday, the 6th, we had a great change in temperature ; after that date, the continuous hot weather was over.

September.—1st, fine morning, tem. 65, west wind ; 2nd, tem. 64, rain ; 3rd, tem. 63 ; 4th, delightful day, tem. 65 ; 5th, tem. 65 ; 6th, tem. 65 ; 7th, rain all last night and this morning, tem. 70 ; 8th, cold, tem. 58 ; 9th, rain, tem. 55 ; 10th, tem. 50 ; 11th, fine, tem. 60 ; 12th, cold, frost last night, at 7 a.m. tem. 50 ; 13th, tem. 65 ; 14th, tem. 68, rain this morning ; 15th, tem. 60 ; 16th, tem. 52 ; 17th, tem. 48 ; 18th, tem. 70 ; 19th, tem. 58 ; 20th, tem. 50 ; 21st, fine morning, but smoky, tem. 55 ; 22nd, clear morning, tem. 60 ; 23rd, tem. 50 ; 24th, tem. 48 ; 25th, tem. 55 ; 26th, very smoky weather, tem. 50 ; 27th, tem. 53, west wind, dense smoke ; 28th, west wind, tem. 55, smoke so dense that vessels of all classes are detained ; 29th, west wind, smoke and fog, nothing moving in or out of the harbour, tem. 50 ; 30th, east wind, weather clear, tem. 52. The month was fine, but navigation very much interrupted by smoke, caused by bush fires.

October.—1st, 7 a.m. tem 60, rain this morning ; 2nd, tem. 55 ; 3rd, tem. 58 ; 4th, tem. 60 ; 5th, tem. 55 ; 6th, tem. 55 ; 7th tem. 56 ; 8th, tem. 50 ; 9th, rain this morning, tem. 55, east wind ; 10th, tem. 55, foggy morning ; 11th, clear

morning, tem. 55 ; 12th, fine and clear, tem. 45 ; 13th, wet day, tem. 45 ; 14th, fine and clear, tem. 45 ; 15th, frost last night, tem. to-day 50 ; 16th, tem. 60 ; 17th, tem. 50, fine weather ; 18th, tem. 55 ; 19th, tem. 45 ; 20th, tem. 45 ; 21st, south wind, rain, tem. 48 ; 22nd, tem. 45 ; 23rd, tem. 50, at 7 p.m. snow and rain, blowing a gale ; 24th, 8 a.m. tem. 58 ; 25th, frost last night, at 9 a.m. tem. 39 ; 26th, cold morning, tem. 30 ; 27th, tem. 30 ; 28th, tem. 32 ; 29th, fine morning, tem. 45, 2 p.m. snow storm, continuing till midnight ; 30th, fine and cold, tem. 30 ; 31st, tem. 34, south-west wind.

November.—1st, cold morning, tem. 30 ; 2nd, tem. 35 ; 3rd, tem. 36 ; 4th, tem. 44, dark day, with rain ; 5th, tem. 36 ; 6th, tem. 35 ; 7th, tem. 40 ; 8th, tem. 43 ; 9th, tem. 28 ; 10th, tem. 30, snowing ; 11th, tem. 54, snowing, east wind ; 12th, tem. 34 ; 13th, tem. 36 ; 14th, tem. 36 ; 15th, tem. 32 ; 16th, tem. 37 ; 17th, tem. 33 ; 18th, tem. 34 ; 19th, tem. 35 ; 20th, tem. 45, snowing ; 21st, tem. 35 ; 22nd, tem. 35 ; 23rd, tem. 36, dark morning ; 24th, at 9 a.m. tem. 18 ; 25th, dark day and rain, tem. 40 ; 26th, tem. 33 ; 27th, tem. 55 ; 28th, snow storm, tem. 33, south-east wind, barque "De Mari Marcello" left port for sea, being the last sea-going vessel of the season, but had to winter in Quebec ; 29th, at 8 a.m. tem. 12 ; 30th, clear and cold, north-east wind, tem. 9 above zero.

December.—1st, 7 a.m. tem. zero ; 2nd, 7 a.m. 3 above zero ; 3rd, snow last night, south wind, tem. 33 above zero ; 4th, tem. 35 above, rain all day and all night ; 5th, clear weather, tem. 42, snow all gone ; 6th, tem. 28 ; 7th, tem. 21 ; 8th, tem. 23 ; 9th, tem. 18 ; 10th, tem. 25 ; 11th, rain all last night and all day, tem. 35 ; 12th, tem. 33, raining ; 13th, fine west wind, tem. 26 ; 14th, tem. 32 ; 15th, tem. 32 ; 16th, tem. 20 ; 17th, tem. 27th ; 18th, snow last night, sleighing to-day, tem. 28 ; 19th, tem. 3 sleighing good ; 20th, tem. 16 ; 21st, tem. 13 ; 22nd, tem.

13 ; 23rd, tem. 5, west wind, navigation closed, Longueuil ferry steamer went into winter quarters this morning ; 24th, tem. 3 above zero ; 25th, tem. 5 above zero ; 26th, at 8 a.m., 1 below zero, water rising ; 27th, 7 above zero ; 28th, 24 above, south wind, snowing all day ; 29th, tem. 10 above, great snow storm last night, water has risen over the wharves ; 30th, tem. last night 15 below zero, at 7 a.m. 10 below, sleighing good ; 31st, 7 a.m. tem. 8 below zero, snow last night, water two feet over the wharves, men crossed the ice on foot this morning from Longueuil to Hochelaga.

Yours respectfully,

THOMAS HOWARD,
Harbour Master.

PORT OF MONTREAL.

Statement showing the Nationality and Tonnage of Sea-going Vessels that arrived in Port during the Season of 1887, *that were navigated by* 23,425 *Seamen.*

Nationality.	Number of Vessels.	Tonnage.
British	660	774,139
Norwegian	66	51,789
German.....	17	22,985
French	10	11,409
Spanish.	3	5,426
American	9	3,815
Italian	1	892
Dutch	1	318
Total.....	767	870,773

PORT OF MONTREAL.

Comparative Statement, showing the dates of the Opening and Closing of Navigation, first arrival from Sea, and the last Departure for Sea, the past ten years.

Years.	Opening of Navigation.	Closing of Navigation.	First Arrival from Sea.	Last Departure for Sea.
1878.....	March 30	Dec. 23.	April 20.	Nov. 24.
1879.....	April 24.	" 19.	May 1.	" 24.
1880.....	" 17.	" 3.	" 2.	" 22.
1881.....	" 21.	Jan. 2, '82.	April 29.	" 23.
1882.....	" 11.	Dec. 9	May 6.	" 21.
1883.....	" 27.	" 16.	" 5.	" 20.
1884.....	" 22.	" 18.	" 2.	" 20.
1885.....	May 5.	" 7.	" 8.	" 20.
1886.....	April 24.	Dec. 4.	April 30.	" 25.
1887.....	May 1.	" 23.	May 3,	" 28.

PORT OF MONTREAL.

Comparative Statement showing the Number and Tonnage of Inland Vessels that arrived in Port the past ten years, with the greatest number in Port at one time.

Years.	Number of Vessels.	Tonnage.	Greatest Number in Port At one time.
1878.....	5,502	764,243	261.....Oct. 15.
1879.....	5,698	817,243	227.....Nov. 6
1880.....	6,489	1,044,380	253.....July 7.
1881.....	6,030	949,380	191.....Nov. 4.
1882.....	5,947	848,780	190.....Sept. 29.
1883.....	5,477	764,721	174..... " 5.
1884.....	4,808	726,015	161.....July 9.
1885.....	5,003	724,975	142.....Oct. 1.
1886.....	5,521	809,819	178.....Aug. 25.
1887.....	5,367	791,452	189.....May 31.

PORT OF MONTREAL.

COMPARATIVE STATEMENT, *showing the Number, Tonnage, and Classification of Sea-going Vessels that arrived in Port from the Maritime Provinces the Past Ten Years.*

YEARS.	Steamships.	Tonnage	Ships.	Tonnage.	Barques.	Tonnage.	Brigs.	Tonnage.	Brigantines.	Tonnage.	Schooners.	Tonnage.	Total No. of Vessels.	Total Tonnage.
1878.....	42	21,812	2	1,132	32	15,749	3	954	21	4,196	65	6,683	165	50,526
1879.....	62	40,686	2	1,733	59	32,271	1	457	16	3,660	80	8,573	220	88,380
1880.....	88	62,688	3	2,492	59	36,294	1	413	17	5,001	68	6,562	236	113,450
1881.....	104	80,040	1	734	44	10,666	2	553	13	2,502	48	4,883	212	99,378
1882.....	168	136,036	....	.....	25	15,574	....	.....	13	2,364	54	5,993	260	159,967
1883.....	191	164,982	....	.....	11	8,066	1	307	6	1,015	54	5,620	263	179,990
1884.....	161	124,377	....	.....	8	5,031	....	.....	1	456	40	3,825	210	133,689
1885.....	142	117,436	....	.....	18	11,997	....	.....	10	2,307	47	4,814	217	136,554
1886.....	175	150,784	....	.....	4	2,535	3	794	2	466	41	2,902	225	157,481
1887.....	224	194,023	2	2,389	11	8,676	1	313	2	342	36	3,139	276	208,882

PORT OF MONTREAL.

PORT OF MONTREAL.

COMPARATIVE STATEMENT, *showing the Number, Tonnage and Classification of Sea-going Vessels that arrived in Port the past ten years, with the dates of the greatest number in Port at one time, each year.*

Years.	Steamships.	Tonnage.	Ships.	Tonnage.	Barques.	Tonnage.	Brigs.	Tonnage.	Brigantines.	Tonnage.	Schooners.	Tonnage.	Tot'l number of vessels.	Tot'l tonnage	Greatest Number in Port at one time.
1878..	207	269,878	44	47,577	113	58,711	9	2,610	34	6,537	109	11,953	516	397,266	45....June 3
1879..	289	378,353	33	38,412	121	65,223	5	1,404	37	8,560	127	15,017	612	506,969	49....Aug. 13
1880..	354	475,741	42	50,141	143	76,816	11	3,252	41	9,715	119	12,606	710	628,271	67.... " 4
1881..	321	446,457	5	4,640	104	60,617	9	2,377	30	6,152	100	11,686	569	531,929	59.... " 18
1882..	379	475,679	4	4,330	93	51,195	10	2,702	37	7,182	125	13,604	648	554,692	53.... " 21
1883..	464	605,805	3	3,356	70	38,547	7	2,417	15	3,012	101	11,126	660	664,263	38....June 27
1884..	444	585,397	2	2,218	83	49,048	3	1,036	13	2,996	81	8,679	626	649,374	44....Aug. 13
1885..	441	619,647	2	2,792	76	45,560	1	338	23	6,141	86	9,376	629	683,854	43....July 15
1886 .	532	736,648	11	13,475	68	47,233	10	3,061	7	1,850	75	7,432	703	809,699	44....Aug. 18
1887..	600	807,471	7	8,684	68	43,275	2	1,118	7	2,031	82	8,194	767	870,773	37....July 21

PORT OF MONTREAL.

Number and Tonnage of Sea-going Vessels consigned to the following Merchants, 1887 :—

No.	Name of Firm.	Steam.	Tonnage.	Sail.	Tonnage.	Total. No. of Vessels	Total Tonnage.
1.	H. & A. Allan	73	173,233	.....	.....	73	173,233
2.	D. Torrance & Co	51	111,386	.....	.....	51	111,386
3.	R. Reford & Co	62	94,949	.....	.....	62	94,949
4.	Canada Shipping Co.	28	66,017	.....	.....	28	66,017
5.	Kingman Brown	61	54,711	2	2,264	63	56,975
6.	Anderson McKenzie	17	26,966	26	19,753	43	46,719
7.	Charles McLean	33	39,404	3	1,617	36	41,021
8.	Henry Dobell & Co	42	27,769	.....	.....	42	27,769
9.	J. & R. McLea	28	23,982	4	768	32	24,750
10.	Munderloh & Co.	18	21,080	.....	.....	18	21,080
11.	Carbray Routh	18	18,975	2	1,656	20	20,631
12.	Kingman Brown (canal)	23	19,552	.....	.....	23	19,552
13.	J. G. Sidey	13	18,225	.....	.....	13	18,225
14.	Brock & Co	24	15,508	16	1,120	40	16,628
15.	Intercolonial Coal Co.	15	14,230	1	77	16	14,307
16.	H. Dobell & Co (Canal)	20	13,127	.....	.....	20	13,127
17.	A. McKenzie, (canal)	3	3,828	14	8,440	17	12,268
18.	Canada Sugar Ref. Co.	5	9,200	1	422	6	9,622
19.	F. C. Henshaw	6	6,338	2	1,841	8	8,179
20.	Charles McLean (canal)	6	5,560	7	2,286	13	7,846
21.	Bossière Frères	7	7,611	.....	.....	7	7,611
22.	Men of War	3	5,330	.....	.....	3	5,330
23.	Wulff & Co.	.....	.....	9	5,251	9	5,251
24.	Muir & Son	9	4,894	.....	.....	9	4,894
25.	J. Burstall & Co	3	3,222	1	666	4	3,888
	Sixteen others	32	22,374	79	17,141	111	39,515
		600	807,471	167	63,302	767	870,773

REPORT

UPON THE MAINTENANCE OF THE

BUOYS AND BEACONS

ON THE

SHIP CHANNEL BETWEEN MONTREAL AND QUEBEC

FOR THE YEAR 1887.

JOHN KENNEDY, M. INST., C.E., *Chief Engineer.*

HARBOUR COMMISSIONERS OF MONTREAL,
Chief Engineer's Office,
MONTREAL, January 31st, 1888.

ALEXANDER ROBERTSON, ESQ.,
Secretary,
Harbour Commissioners of Montreal

DEAR SIR,

I beg to report as follows upon the maintenance of the Buoys and Beacons of the Ship Channel between Montreal and Quebec during the navigation season of 1887.

The buoys and beacons were, as usual, maintained by the Commissioners' Officers and steamers, but with some little change in the arrangement of the service.

In maintaining the buoys in recent years it has been customary to take a steamer of the Commissioners' dredging fleet at intervals throughout the summer, and make a tour of all the buoys, taking several days to the trip, and repairing or changing any buoys that required it, and

then to allow them to stand with as little work as possible till the next general tour. In consequence of the dredges of the Ship Channel being now worked night and day, instead of only by day as before, this could not be continued without seriously delaying the dredges. To avoid such delay as well as to render the buoy maintenance more efficient by making the repairing more nearly continuous, the system has been somewhat changed. The buoy service has been more completely combined with the surveying and testing of the Channel by arranging that the Engineers in charge of the latter should also maintain the buoys, and that in their running up and down the Channel for any purpose, the condition of the buoys should always be carefully watched and any needed repairs or adjustments promptly made. Any of the Commissioners' tugs have also been called upon for extra services as needed, the maintenance of the buoys always having precedence of other work.

The arrangements as regards boats, though not all that could be desired, is the best which circumstances would allow, and it has resulted in the buoys being put in very good order, early in summer, and their being maintained in excellent condition till the close of navigation.

Derangements and damages were very frequent, but repairs were as a rule, promptly made; two or even three steamers having been called to work simultaneously at different parts of the River when needed.

Besides the continual inspection of buoys by the surveying steamers in passing up and down the river, an aggregate of over a thousand stops were made for adjustment, repairs, replacing, etc., making an average of nearly four workings to every buoy throughout the summer.

On the 3rd of May, or as soon as the floating ice permitted, two steamers were sent out to commence setting the buoys, one taking the part of the river above Sorel,

and the other the part below. By the 4th of May, such buoys were set as are necessary to enable the first ships to reach Montreal safely in the high water of spring, and in a few days later, all the usual buoying of the Channel was completed.

The next heavy part of the work occurred in June and July, when over half of all the wooden buoys in the river were taken up in turn and replaced by larger ones, floating higher and showing better.

Others at the more important places, such as at the ends of curves, were replaced by large iron buoys.

At Pouillier Rayer, a newly dredged channel, running straight through the shoal from Cap a la Roche to Cap Charles, was buoyed out and opened to Navigation on July 13th.

At the head of Lake St. Peter a change in the line of Channel, giving better water, was made on October 14th and new buoys were placed to mark it out. Several new buoys have also been set in other places, to mark out shoals found in surveying, or in accordance with suggestions from experienced pilots.

In all fourteen buoys have been added to those of former years. Twelve screw anchors, with buoys attached, were carefully put down in Lake St. Peter last winter in order to secure accuracy of alignment in the Channel and to facilitate the placing of the other buoys in the summer.

The "balizing" of the spar buoys (or putting of bushes on them), to make them more conspicuous in the autumn smoke and fog, was commenced on August 8th, and the balizes were maintained during the remainder of the season.

The large shore beacons on Grondines Point, Upper Grondines line and Sainte Anne de Sorel were renewed, and several others were repaired and painted.

The taking up of such buoys as could be spared before the close of Navigation was commenced on November 20th. The general taking up of the buoys was commenced on the 28th November, on which day the last vessel passed down, and was finished on the 30th, three steamers being employed in the work.

The number of buoys in use in the Channel near the close of Navigation was :—

Spar buoys (wooden)	177
Cone and cylinder buoys (steel and iron)	35
Total	212

The stock of wooden buoys ashore in reserve has been largely increased, so that there may be always on hand a sufficient number of large buoys being dried out to replace those becoming waterlogged by use.

The spare buoys now on hand are :—

Spar buoys (cedar)	266
Cone and cylinder buoys (steel and iron)	4
Total	270

The cost of the service for 1887 was $13,723.84, which is much higher than that of other recent years by reason of the changes and improvements made and the increased number of buoys in use and in reserve.

The comparison is as follows :—

1884	$ 7,595.84
1885	9,732.46
1886	7,018.42
1887	13,723.84

Appended are abstract tables of details connected with the service.

Yours respectfully,

JOHN KENNEDY,
Chief Engineer.

ABSTRACT of Steamers time employed in the maintenance of Buoys and Beacons during season of 1887.

MONTHS.	TIME OF SERVICE.			REMARKS.
	Buoys. Days.	Beacons. Days.	Total Days.	
May.....	25¼	3¼	28½	Commenced placing buoys on May 3rd.
June.....	12¼	.....	12¼	
July	16½	¾	17¼	
August	16¾	1¾	18½	
September	12½	.....	12½	
October	9½	.....	9½	
November.....	17¾	¼	18	Finished taking up buoys Nov. 30th.
Totals	110½	6	116½	

STEAMERS employed in the maintenance of Buoys and Beacons, and service of each.

NAME OF STEAMER.	TIME OF SERVICE.			REMARKS.
	Buoys Days.	Beacons Days.	Total Days.	
St. James.....	72¾	2½	75¼	Working season, from May 2nd to Nov. 30th, 184 days, not including Sundays.
McNaughton.....	3	.....	3	
John Pratt.....	26¼	3½	29¾	
St. Francis.....	5½	.....	5½	
St. Peter.....	1¼	.....	1¼	
St. Louis.....	1¾	.....	1¾	
Totals	110½	6	116½	

TABLE showing number of buoys on Ship Channnel near the close of Navigation and details of work of maintenance for season of 1887 :—

LOCALITY.	No. of buoys.		NUMBER OF TIMES WORKED AT.						
	Wood.	Iron.	Entirely lost and replaced by another buoy.	Found lying flat and replaced by another buoy.	Found too low and replaced by another buoy	Ballast adjusted.	Found dragged out of position and corrected	Balized.	Totals.
Pointe aux Trembles (En Bas) to Three Rivers	38	18	10	6	19	15	9	71	251
Three Rivers to Sorel	65	6	11	15	63	26	11	124	392
Sorel to Montreal	74	11	7	5	57	15	11	141	423
Totals	177	35	28	26	139	56	31	336	1066
	212								

TABLE showing new Buoys placed in entirely new positions during season of 1887.

ate.	LOCALITY.	No. of buoys.	Color.	Description.	REMARKS.
May 21.	Head of Richelieu Rapids	1	Red	Iron	Temporary buoy in place of balize.
July 13.	Pouillier Rayer	3	Black	Iron	New Channel.
" "	" "	1	Red	Iron	do.
July 18.	Becancour	1	Black	Wood	Lower end of Channel.
July 21.	Pouillier Rayer	1	Red	Wood	New Channel.
July 29.	Becancour	1	Black	Wood	Upper end of Channel.
Sept. 8.	Pouillier Rayer	1	Red	Wood	New Channel.
Sept. 19.	Nicolet Traverse	1	Red	Wood	Opposite English Bank.
Oct. 4...	Lake St. Peter	2	Black	Wood	Between Stone Island and head of Ile aux Raisin Traverse.
Oct. 10.	Nicolet Traverse	1	Black	Wood	Between English Bank and No. 3 Light-ship.
Oct. 26.	Nicolet	1	Black	Wood	Between Iron Shoal and Force Shoal.

REPORT

OF THE

PILOTAGE DISTRICT OF MONTREAL

FOR THE YEAR 1887.

HARBOR COMMISSIONERS OF MONTREAL,
Secretary's Office,
MONTREAL, January 23, 1888.

WM. SMITH, ESQ.,
Deputy Minister of Marine,
OTTAWA,

SIR,—

I have the honor by direction of the Harbour Commissioners of Montreal, as the Pilotage Authority, to transmit, for the information of the Honorable the Minister of Marine, the Annual Report of the Pilotage District of Montreal for the year ended the 31st December, 1887.

By By-law the number of active licensed Pilots is at present forty-five.

On 20th May, Messrs. Gédeon Groleau, of Grondines, and Néré Belisle, of Deschambault, were licensed as pilots to fill vacancies on the list, caused by the superannuation of Pilot Adolphe Lisé at end of 1886, and the continued absence of Pilot Damase Caien, whose whereabouts were unknown. The latter on 31st August was again allowed to resume piloting, which accounts for the list showing forty-six names, besides that of the Superintendent.

There were no deaths or superannuations of pilots during the year, and there was no increase in the number of Apprentice Pilots.

Messrs. Liboire Perrault and Wilfred Raymond passed their examinations in May, 1884, and will be licensed when vacancies occur.

The following is a list giving the name and age of each Branch Pilot for and above the Harbour of Quebec, acting under the authority of the Harbour Commissioners of

Montreal, with the earnings of each for the season of 1887:—

No.	Name.	Age.	Earnings.	Remarks.
1	Léveillé, Joseph	70	.....	Supt. of Pilots.
2	Bouillé, Zepherin	59	$1,432.50	
3	Bélisle, Cyrille	60	692.77	
4	Raymond, George	58	892.57	
5	Naud, Augustin	61	856.25	
6	Bélisle, Hubert A	57	534.81	
7	Dufresne, Athanase	54	1,336.37	
8	Gagnon, Pierre	60	1,203.11	
9	Bélisle, George	48	505.85	
10	Naud, Onésime	47	1,558.63	
11	Hamelin, J. Octave	54	1,513.75	
12	Chandonnet, Jos	47	1,716.46	
13	Bouillé, Louis A	48	1,128.65	
14	Boudet, Prudent	46	1,629.02	
15	Bélisle, Elzéar	53	561.80	
16	Pleau, Joseph	50	860.56	
17	Brunet, Célestin	45	1,702.72	
18	Bélisle, Louis	42	1,685.60	Sus. May 20th.
19	Caien, Damase	47	268.75	Pend'g enquiry,
20	Groleau, Ulric	40	702.58	reinst'd Aug. 31
21	Frenette, Alfred	48	1,091.55	
22	St. Armand, Alfred	44	555.40	
23	Bélanger, Phillipe	49	1,058.12	
24	Gagnon, Victor	49	672.09	
25	Perrault, Narcisse	50	1,680.18	
26	Toupin, Treflé	40	629.74	
27	Auger, Cléophas	41	1,614.80	
28	Desjordy, François	43	573.79	
29	Labranche, Ferdinand	42	1,181.73	
30	Perrault, David	46	1,298.12	
31	Gauthier, Alexis	41	1,215.56	
32	Bouillé, Louis Z	39	1,383.29	
33	Toupin, Joseph	38	1,666.36	
34	Gauthier, Laurent	38	1,567.64	
35	Arcand, Jean	35	975.50	
36	Nault, Delovoie	36	1,858.11	
37	Gauthier, Wilbrod	36	1,3[illegible]2.44	
38	Mayrand, Louis	40	707.56	
39	Dufresne, George	39	776.19	
40	Arcand, Norbert	35	1,020.77	
41	Toupin, Uldoric	33	774.54	Susp. 15 Nov.
42	Bouillé, Tancrede	34	923.87	till 30 Nov. '88.
43	Arcand, Nestor	32	1,181.50	
44	Nault, John	31	1,433.10	
45	Dusseault, Joseph	32	1,465.82	
46	Groleau, Gedeon	33	610.82	Br'chd 20th May.
47	Belisle, Néré	34	487.68	" "
	Total		$50569.02	

The foregoing amount was received from the following services, viz :—

BRITISH:		
Steamers	$37,951.54	
Sailing Vessels	6,104.29	
		$44,055.83
FOREIGN:		
Steamers	$2,916.69	
Steamers in Coal Trade	2,862.57	
Sailing Vessels	733.93	
		$6,513.19
Total		$50,569.02

The following list shows the name, age and residence of each Apprentice Pilot serving his time under the authority of this Trust :—

No.	NAME.	AGE.	RESIDENCE.
1	Liboire Perrault	38	Deschambault.
2	Wilfred Raymond	33	do
3	Alphonse Cossette	39	Champlain,
4	Hubert Perrault	38	Montreal.
5	Audilon Portelance	34	Grondine.
6	Joseph Hurteau	27	Contrecœur.
7	Adolphe Richard	39	do
8	Joseph Langlois	32	Pointe-aux-Trembles (en bas)
9	Edouard Perrault	37	Deschambault.
10	Lydoric Bouillé	30	do
11	Elié Bouillé	28	do
12	N. Edson Angers	37	Ste. Anne de la Perade.
13	Honore Dusseau	34	Deschambault.
14	Narcise Paquet	33	do
15	Jean Baptiste Nadeau	29	Levis.
16	Arthur Brière	30	Portneuf.
17	Aubert Naud	33	Deschambault.
18	J. Sifroy Labranche	31	Portneuf.
19	Alexis Perrault	25	Deschambault.

Of the above several are believed to have left the country and several to have given up serving their apprenticeship.

The list will probably be revised and new names added during 1888.

There will also likely be an examination for appren-

tices who have fulfilled all the requirements of the By-laws.

There were during the season several casualties to vessels, and the Commissioners were called together to investigate the following ones, complaints having been made against the several pilots in charge by the masters of the different vessels. The particulars of these are as follows :—

On 27th July Pilot Hubert Belisle was summoned to answer to a charge by Capt. G. W. Hunter, of the SS. "Cotherstone," that he had caused this vessel to strike at Cap Charles on the 17th June, and to ground below Longue Pointe on the 18th June, on her passage from Quebec.

Having heard the evidence and considered the same, the Board agreed to dismiss the complaint, there being no evidence to establish any neglect of duty on the part of the Pilot.

On 1st August, on the complaint of Captain Lindall, an investigation was held into an accident to the SS. "Vancouver," on 26th June, in the vicinity of Cap Charles Pilot Ferdinand Labranche was charged with having caused her to touch the ground heavily, from which she had received serious damage.

In this case also the Board adjudged that the charge against the Pilot Respondent, made by the Complainant, was not sustained by the evidence and that the complaint be dismissed.

On the 12th August the Board again met to consider the grounding of the SS. "Bonnington," opposite Varennes, on August 4th, while in charge of Pilot Gédeon Groleau.

Having heard Capt. Burkill's statement and the evidence of others, the decision was that the Pilot was blameable; but there being no sworn complaint against him, the Commissioners could not proceed further.

On the 15th November an investigation was held into the grounding of the SS. "West Cumberland," on the 9th instant, nearly opposite St. Croix, and then at Grondines.

The complaint against Pilot Ulderic Toupin, who was in charge, was that he had been guilty of a breach and dereliction of his duty, and had caused the said vessel serious damage.

The evidence was taken under oath and the Respondent was represented by counsel.

The case having been deliberated upon, it was decided that the Pilot was guilty and should be suspended until the 30th November, 1888.

The following is the Tariff of Pilotage now in force in the Pilotage District of Montreal, viz :—

QUEBEC TO MONTREAL & VICE VERSA.	DOWNWARDS.	UPWARDS.
Pilotage of Vessels in tow of Steamers, for each foot of draft of water.....	$2.00	$2.00
Pilotage of Vessels propelled by Steam, for each foot of draft of water.....	2.50	2.50
Pilotage of Vessels under Sail, for each foot of draft of water.....	2.80	4.20
Moving a Vessel from one wharf to another in the Harbour of Montreal, or from foot of St. Mary's Current into the Harbour.	5.00	5.00

The amount received by the Harbour Commissioners as the Pilotage Authorities of the District, was as follows :—

For poundage, 5 per cent. on the earnings of Pilots.....	$2,507.24
" " " Three Rivers in 1887.....	74.83
" " " Sorel in 1886 and 1887.....	46.20
" Sundry poundage.....	17.92
Interest on investments.....	2,399.32
	$5,045.51
The disbursements for Pensions to old and infirm Pilots and widows of Pilots, were.....	$3,070.53

I have the honour to be, Sir,

Your obedient servant,

ALEXANDER ROBERTSON, *Secretary.*

REPORT

ON THE

WORKS FOR THE IMPROVEMENT AND MAINTENANCE

OF THE

HARBOUR OF MONTREAL,

FOR THE YEAR 1887.

JOHN KENNEDY, M. Inst., C. E., *Chief Engineer.*

HARBOUR COMMISSIONERS OF MONTREAL,
Chief Engineer's Office,
MONTREAL, January 30th, 1888.

ALEXANDER ROBERTSON, ESQ..
Secretary.
Harbour Commissioners of Montreal.

DEAR SIR,

I beg to submit for the information of the Board of Harbour Commissioners, the following report upon the works in the Harbour of Montreal, for the year ended 31st December 1887.

The principal works of the year are dredging the basins in sections 5 to 11, 20 to 23 : deepening the Ship Channel through the Harbour ; rebuilding and widening the wharf in Section 10 ; widening and raising the wharf in Section 16 ; repairing and raising the piers in Sections 14, 17 and 18, and raising and repairing the wharves in Sections 25 and 26.

The following are the chief details of the work done :

New Works.

Sections 5 *to* 10 (*Windmill Point*).—The enlarging and deepening of the Basin has been continued in different parts and at different times as dredging plant could be spared for the purpose. Boulders and loose rock were cleared off parts of the bottom with two of the stone-lifters from the Ship Channel dredging fleet

Quantity dredging during the past year 15,164 cubic yards. Expenditure, $11,218.

Section 10 (*Windmill Point*).—A length of 400 feet of crib-work wharf was built in front of the old wharf and founded at greater depth, thus continuing the new wharf from where it was left in 1886 down to the lower end of the basin. The additional breadth given by the new wharf averages 30 feet, and its depth is sufficient to allow of the basin being made 27½ feet deep at low water.

The expenditure for the work of the past year, exclusive of dredging is $13,508, and as the new wharf in a measure takes the place of the old one, three fourths, or $10,131 may be properly charged to account of new works, and the remaining fourth, or $3,377, to repairs.

Section 14.—The upstream side of the basin was deepened to 27½ feet at low water. Expenditure $1,307.08.

Section 16,—An offset in the wharf at the lower end of the basin was filled in with pile work and the wharf widened out so as to give an additional ship's berth. Expenditure, $4,312.27.

Section 18 (*Market Basin*). — Part of the basin was dredged out to 27½ feet deep at low water. Expenditure, $1,742.77.

Section 19 (*Bonsecours Basin*).—Part of this basin was deepened to 25 feet at low water. Expenditure, $396.08.

Sections 20, 21 *and* 23. — Several shoal places were deepened to 27½ feet at low water. Expenditure, $5,703.63.

Sections 41 *to* 44 (*Hochelaga*).—The dredgings deposited alongshore in former years, were in the past year partly levelled down, so as to prevent the accumulation of stagnant water. Expenditure, $1,837.

Section 45 *and below.*—The depositing of spare dredgings from the Harbour has been continued alongshore in such positions as to form backfilling for future extensions of the wharves below the Hudon Cotton Mill. Quantity deposited, 2,362 cubic yards.

Ship Channel through the Harbour.—A little dredging was done in removing boulders and small shoal places opposite Victoria Pier. Expenditure, $2,614.18.

Electric Lighting.—The lighting circuit was extended to Section 36 from its former termination at Section 23, and 20 new lamps were added in this and other parts of the Harbour. Expenditure, $2,013.93.

Harbour Repairs.

The breaking up of the ice last spring brought another very high flood, greater indeed than recorded in any previous spring, except in that of 1886. A great quantity of ice was shoved upon the wharves and left lodged there on the lowering of the river, involving considerable cost in clearing it off. Much damage was again done to the wharves; the timber work of the pier in section 14 was completely carried away down to the water line; the outer ends of the two piers, Sections 17 and 18 were wrecked so that they had to be taken down and rebuilt. Costly repairs, partly arising out of damages by ice, and partly from ordinary wear and tear have also been needed and done at Sections 14, 17, 18, 20, 25, 26, 31 to 33 and 40, as hereafter detailed. The general repairing has also been well kept up and the condition of the timber work of the wharves as a whole has been improved.

The total cost of repairs for the year is $64,984, which compares as follows with that of previous years:—

1875	$16,499
1876	35,711
1877	26,077
1878	18,974
1879	18,819
1880	17,330
1881	16,159
1882	27,962
1883	35,768
1884	44,869
1885	42,158
1886	64,989
1887	64,984

The following are the chief repairs made during the year:—

Removing ice.—The ice left deposited on the wharves in spring, principally on sections 20 to 24, 25, 27, 29, 33 and 35 to 39 was cleared off as quickly as possible after the subsidence of the water. Cost $4,289.80.

Section 10 (*Windmill Point*).—As already mentioned under the head of "New Works," a new line of crib-work was built outside the old one and the wharf widened. Proportion of cost charged to repairs $3,377.

Sections 12 *and* 13.—The narrow piece of wharf between the old entrance of the Lachine canal and the little basin was renewed on top and had new face planking. About 150 feet of the mainshore wharf had the top renewed. Cost $304.09.

Section 14.—The timber work of the pier carried away by the ice down to low water line was rebuilt and the top of the pier refilled, raised and macadamized. Cost $3,165.36.

Section 16.—In connection with the widening of the wharf, the existing adjoining parts were raised about a foot and the timber top was renewed. Cost $701.21.

Section 17 (*Richelieu Pier*).—The timber work of the outer end of the pier, which was badly wrecked by the winter ice, was rebuilt from low water line up. The timber work of the down stream side was also all rebuilt above ordinary water line. Cost $3,139.

Section 18 (*St. Helen's Island Ferry Berth*).—The timber work of the outer end of this pier was also much damaged by ice, and in the latter part of the summer it was rebuilt. Cost $1,518.

About 200 lineal feet of the timber work of the inshore wharf at the lower end of the section was also rebuilt above water line. Cost $735.82.

Section 20.—The crib-work which forms the recess in the upstream side of the pier, where the pier joins the shore wharf, has been undermined for some years past and has involved considerable annual cost for making good the sinkage and loss of filling. Last summer a row of timber sheet piling was driven along the defective part and it was otherwise thoroughly repaired. Expenditure, $1,116.88.

Sections 25 *and* 26.—The timber work of both basin and pier, 650 lineal feet in all, was renewed from ordinary water level up, and the whole wharf raised about two feet. Cost $2,795.17.

Sections 31 *to* 33.—The top of the timber work and planking of the wharf were renewed throughout sections 31 and 32 and the upper part of 33, a distance of 1,600 lineal feet in all. The slip in sec. 31, built in 1881 for the railway ferry boat (now rendered useless by the opening of the Lachine bridge) was taken up and the wharf restored to its original straight line. Total cost $5,069.67.

Section 40 (*Hudon Wharf*).—The lower end of the wharf, which, from its exposed position, frequently suffers damage from ice, was somewhat damaged again last winter.

This and the need of raising its level and otherwise making it more suitable for its new use as a ferry wharf, led to rebuilding and strenghtening the upper courses of the timber and adding some two feet to the height of both timber work and backfilling. Cost $841.61.

Roadways.—The roadways of the wharves and ramps have been maintained with "banc rouge" macadamizing stone, as usual, 449 toises in all were spread upon them.

Electric lighting.—The lighting was in spring extended down to section 36, making a circuit of 6¼ miles of wire with 48 arc lamps upon it.

Much trouble and expense has been occasioned by the failure of the conducting cables under the two entrances of the Lachine canal. Early in the summer, the first two pairs, which had worked well in 1886, were found to have failed. These were replaced by wires covered with ordinary tape and black insulation, such as are used for land lines but made up to ⅝ inch diameter, and each encased in a strong one inch lead pipe filled with crude petroleum.

These worked very satisfactorily indeed until near the close of navigation, when one of the cables was torn out of its protecting groove in the masonry and then damaged by crushing, doubtless by a passing boat.

Harbour Dredges and Dredging.

The Harbour dredging plant has consisted of three spoon, or dipper dredges, two derricks and two screw tugs, with scows and a floating shop, as detailed in the appended table. Three of the dredges and one tug spent about half the summer in working upon the Ship Channel deepening opposite Longueuil, and two of the stonelifters belonging to the Ship Channel fleet were in turn employed during the fall in the Harbour work.

The Harbour dredging fleet was wintered, as usual, in the Richelieu River, at the Harbour Commissioners Ship Yard, Sorel, and the necessary repairs were made at the Commissioners Works.

The dredges were brought up from Sorel on May 4th, and got to work in the Montreal Harbour on May 9th. Three dredges were lent to the ship channel work during the latter part of the summer, but the remainder of their time was spent in the Harbour work, as elsewhere detailed. All the dredges were sent to winter quarters at Sorel, on the 28th November.

The number days during which the spoon dredges were on duty on the Commissioners' works, either in the Harbour or Ship Channel, and including all, except Sundays, from commencing in spring to leaving off in fall, was 175 days for No. 4, 173 days for No. 6, and 175 for No. 7, making an aggregate of 523 days for the season.

The nominal working time is ten hours per day, which gives a total of 5,230 hours service, but the actual dredging time, after deducting that lost for repairs, changing position, detention by vessels, short days in autumn, and all other causes, was reduced to 3,324 hours, or an average of 63.56 per cent of the gross time of service.

The total outlay for working the fleet, consisting of three spoon dredges, two unloading derricks, two screw tugs and the scows, was $41,430.58 and this, as usual, represents the entire cost of working the plant, machinery, repairs, outfit, fuel, wages, salaries, insurance and all other outlays, except interest on capital and depreciation of plant.

The following are the comparative costs and quantities of dredging for 1887 and for previous years :—

Years.	Cubic Yards Dredged.	Total Cost.	Cost per Cubic Yard, Cents.	Remarks.
1875...	151,719	$68,979	45	
1876...	156,082	55,462	$35\frac{50}{100}$	
1877...	173,449	45,103	26	
1878...	211,731	48,748	23	
1879...	189,609	41,006	$21\frac{63}{100}$	
1880...	186,430	46,914	$25\frac{16}{100}$	
1881...	170,764	54,128	$31\frac{69}{100}$	
1882.	187,339	53,598	$28\frac{60}{100}$	Spoon Dredges and Stone-lifters.
	9,429	13,254	$\$1.40\frac{60}{100}$	Elevator Dredges.
	196,768	66,852	$33\frac{96}{100}$	Average.
1883.	36,358	17,956	$49\frac{38}{100}$	Spoon Dredges and Stone-lifters.
	6,990	19,385	$\$2.77\frac{30}{100}$	Elevator Dredges—lifting rock and boulders and clearing up.
	43,348	37,341	$86\frac{14}{100}$	Average.
1884...	125,648	49,468	$39\frac{37}{100}$	Spoon Dredges and Stone-lifters.
1885...	69,494	28,563	$41\frac{10}{100}$	" " "
1886...	57,728	25,772	44	" " "
1887...	36,993	23,259	62	" " "

The cost and character of the dredging done in the different parts of the Harbour are as follows :—

Sections 5 to 10 (*Wind Mill Point Basin*).—Enlarging and deepening the basin, clearing up loose boulders and rock, and making foundation for crib-work, material chiefly shale, hard pan and gravel, dredged with spoon dredges, boulders grappled with stone-lifting barges, depth of water at time of dredging, 25 to 32 feet. Quantity dredged, 17,553 cubic yards, scow measurement, costing 73¼ cents per cubic yard.

Section 11.—Clearing obstructions to entrance of canal; hard clay, sand and stones; depth of water, 27 feet, 788 cubic yards, costing 45 cents per yard.

Section 12.—Clearing away small shoals and lumps, hard pan, boulders, and silt, 25 to 30 feet depth, 2,250 cubic yards, costing 35 cents per yard.

Section 14.—Dredging off a small ridge and cleaning up alongside wharf, hard pan, sand and sewage 22 to 28 feet depth, 2,655 cubic yards, costing 49 cents per yard.

Section 18 (*Market Basin*).—Deepening parts of basin,—sand and gravel, 28 to 33 feet depth, much delay from vessels, 4,050 cubic yards, costing 43 cents per yard.

Section 20 *to* 21 (*Military Basin*).—Clearing away small shoals, sand, gravel and stones, 25 to 28 feet depth, considerable delays from vessels, 5,940 cubic yards, costing 65½ cents per yard.

Section 23.—Dredging off small shoals; sand, gravel and boulders; 22 to 28 feet depth, very strong current and frequent stoppages for vessels; 2,565 cubic yards, costing 71 cents per yard.

Appended are tables giving further particulars as to the dredging plant and the work done.

Yours respectfully,

JOHN KENNEDY,
Chief Engineer.

HARBOUR DREDGING—ABSTRACT OF WORK DONE BY EACH DREDGE FOR THE HARBOUR OF MONTREAL IN 1887.

(Not including the dredging done in the Ship Channel by Harbour Dredges.)

VESSELS.	PLACES AT WHICH DREDGES WORKED.	Time of Service.		QUANTITIES DREDGED, CUBIC YARDS.			CHARACTER OF SOIL.
		Days.	Total Days.	Spoon Dredges.	Stone Lifters.	Totals. *Cubic Yds.*	
Spoon Dredge No. 4	Sections 5 to 10, Windmill Point	34		3,217			Shale rock, hard pan and gravel.
	" 11, Entrance to Canal	3		473			Hard clay, sand and stones.
	" 14, Elgin Basin	16½		2,655			Hard pan and sewage.
	" 21, Military Basin	29½		2,970			Sand, gravel and stones.
			83			9,315	
Do. do No. 6	" 5 to 10, Windmill Point	30		3,701			Shale rock, hard pan and gravel.
	" 12 Allan's Basin	10		2,250			Hard pan, boulders and silt.
	" 18, Market Basin	22		4,050			Sand and gravel.
	" 23, Commissioners' Wharf	23		2,565			Sand, gravel and boulders.
			85			12,566	
Do. do No. 7	" 5 to 10, Windmill Point	62		8,246			Shale rock, hard pan and gravel.
	" 10, Cribwork	22		1,613			Shale rock.
	" 11, Entrance to Canal	1½		315			Hard clay, sand and stones.
	" 19, Bonsecours' Basin	5		1,192			Sand and stones.
	" 20, Military Basin	19½		2,970			Sand, gravel and stones
			110			14,306	
Stone-Lifter, No. 2	" 5 to 10, Windmill Point	36½			435		Boulders,
			36½			435	
Do. No. 3	" 5 to 10, Windmill Point	37			311		Boulders.
			37			311	
Totals			351½	36,247	746	36,993	

HARBOUR DREDGING—*Statement Showing the number of days worked by each Dredge, and the quantity dredged at each place for the Harbour of Montreal in* 1887.

PLACES WHERE DREDGES WORKED.	VESSEL.	Time of Service DAYS.	TOTAL DAYS.	QUANTITIES DREDGED. Spoon Dredges.	Stone Lifters.	Totals. Cubic yds	CHARACTER OF SOIL.
Sections 5 to 10, Windmill Point.....	Spoon Dredge No. 4.	34	.....	3,217	.....	.....	
	" " No. 6.	30	.....	3,701	.....	.....	
	" " No. 7.	62	.....	8,246	.....	.....	Shale rock, hard pan and gravel.
	Stone Lifter No. 2.	36½	.....	.....	435	.....	
	" " No. 3.	37	.....	.....	311	.....	Boulders.
			199½			15,910	
" 9, Crib Work.....	Spoon Dredge No. 7.	22	.....	1,643	.....	.....	Shale rock.
			22			1,643	
" 11, Entrance to Canal.....	" " No. 4.	3	.....	473	.....	.....	
	" " No. 7.	1½	.....	315	.....	.....	Hard clay, sand and stones.
			4½			788	
" 12, Allan's Basin.....	" " No. 6.	10	.....	2,250	.....	.....	Hard pan, boulders and silt.
			10			2,250	
" 14, Elgin Basin.....	" " No. 4.	16½	.....	2,655	.....	.....	Hard pan and sewage.
			16½			2,655	
" 18, Market Basin.....	" " No. 6.	22	.....	4,050	.....	.....	Sand and gravel.
			22			4,050	
" 19, Bonsecours Basin.....	" " No. 7.	5	.....	1,192	.....	.....	Sand and stones.
			5			1,192	
" 20 and 21, Military Basin	" " No. 4.	29½	.....	2,970	.....	.....	
	" " No. 7.	19½	.....	2,970	.....	.....	Sand, gravel and stones.
			49			5,940	
" 23, Commissioners' Wharf....	" " No. 6.	23	.....	2,565	.....	.....	Sand, gravel and boulders.
			23			2,565	
Totals.....			351½	36,247	746	36,993	

HARBOUR COMMISSIONERS' DREDGING PLANT EMPLOYED IN THE HARBOUR OF MONTREAL IN 1887.

HARBOUR COMMISSIONERS' DREDGING PLANT EMPLOYED IN THE HARBOUR OF MONTREAL IN 1887.

DESCRIPTION OF VESSEL	HULL.				ENGINES.					Capacity of Bucket.	Depth to which Dredge can work.	REMARKS.
	Length over all.	Breath of Beam.	Depth of Hold.	When Built.	Kind of Engine.	No. of Cylinders.	Diameter of Cylinders.	Length of Stroke.	Pressure of Steam.			
DREDGES.	Ft. In.	Ft. in.	Ft. in.				Inches.	Inches.	Lbs.	C. ft.	Feet.	
Crane Spoon Dredge, No. 4	77.3	27.0	6.6	1872	Horizontal, non-condensing.	1	14	16	60	40	32	Wooden Hull.
Boom " " No. 6	77.0	27.0	7.6	1874		1	14	16	90	40	35	Altered in 1881.
Crane " " No. 7	77.3	27.0	7.0	1874		1	14	16	60	70	32	Wooden Hull.
DERRICKS.												
Clam Shell Derrick, No. 1	56.8	23.9	5.9	.....	Horizontal, non-condensing.	1	8	12	75	.....	.....	Used as pile-driver.
" " " No. 2	57.0	23.6	5.9	1872		2	7	12	75	.....	.....	Wooden hull.
" " " No. 3	61.9	24.0	5.9	1875		1	10	12	75	.....	.....	" "
TUG BOATS.												
Tug St. Louis.....	67.0	15.0	8.7	1875	Vertical, non-condensing.	1	16	20	90	.....	.....	Wooden hull.
" St. Peter.....	71.6	16.6	8.6	1875		1	29	22	93	.....	.....	" "
BARGE.												
Staghound, (floating shop)..	103.4	21.5	7.6	1869	.....	.....	.....	.....	.....	.....	.....	Wooden hull.
SCOWS.												
4 Dumping Scows.....	80.0	16.0	7.6	.....	.....	.....	.....	.....	.....	.....	.....	All wood.
2 Flat Scows.....	75.0	20.0	5.9	1876	.....	.....	.....	.....	.....	.....	.....	" "
2 " "	75.0	20.0	6.0	1878	.....	.....	.....	.....	.....	.....	.....	" "
6 " " various sizes and ages..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	" "

REPORT

UPON THE

DEEPENING OF THE SHIP CHANNEL

BETWEEN

MONTREAL AND QUEBEC,

FOR THE YEAR 1887.

JOHN KENNEDY, M. INST., C.E., *Chief Engineer.*

HARBOUR COMMISSIONERS OF MONTREAL,
Chief Engineer's Office,
MONTREAL, January 31st, 1888.

ALEXANDER ROBERTSON, ESQ.,
Secretary,
Harbour Commissioners of Montreal.

DEAR SIR,—

I beg to submit, for the information of the Harbour Commissioners, the following report upon the work accomplished during the year 1887, in deepening the Ship Channel between Montreal and Quebec.

The work in hand is, in general terms, the deepening of the channel from its present depth of 25 feet (except at Cap à la Roche) to a depth of 27½ feet at low water, with a minimum breadth of 300 feet, in accordance with the provisions of Act 46 Vic., cap. 36, and Act 50–51 Vic., cap. 43.

It was hoped that all, except at Cap Charles and Cap à la Roche, would have been practically finished by the close of navigation, and to accomplish it, the greater part of the dredging fleet was worked night and day. Its accomplishment was, however, found impossible, owing, mainly, to unusually great interruptions by storms and for repairs, and to the dredging in several places having proved harder than was anticipated. Above Cap à la Roche several small pieces of dredging yet remain to be done, but there are no considerable sections, except about 2⅞ miles of very soft clay in Lake St. Peter, and about three-fourths of a mile, mostly detached lumps, at Pointe-aux-Trembles, *en haut*, all of which can be finished by the time of low water next summer.

The following are the chief details of the work done during the year:—

Platon.—An old wreck and a small shoal, which had gathered about it at the approach to the Platon wharf, were dredged away. Quantity of earth dredging, 2,036 cubic yards, costing $1,030.

Cap Charles.—A short piece of rock, about 100 feet in length, and occupying half the breadth of the channel, and a piece of hard pan, 350 feet in length, and also half the breadth of the channel, were dredged through to 26 feet 3 inches deep at low water. The large loose boulders were cleared off an area of 550 feet in length by half the breadth of the channel.

The shale rock bar at Cap Charles is now all cut through to 26 feet 3 inches depth at low water; but it yet remains to be tested, and any loose rock or boulders cleared up.

Quantity dredged this year: 3,780 cubic yards of rock, scow measurement, costing $1,829, or 48⅓ cents per yard; and 3,840 cubic yards hard pan and large boulders, costing $2,598, or 67⅔ cents per yard. Boulders lifted by

stone-lifting barge, 897 cubic yards, costing $1,090, or $1,21½ per yard.

Pouillier Rayer.—Several detached lumps of hard pan and boulders were dredged off. Quantity dredged, 5,787 cubic yards, costing $4,047, or 70 cents per yard.

The dredging of the Pouillier Rayer channel, which is an entirely new channel connecting the Cap Charles and Cap à la Roche south channels, was so far completed as to allow of its being opened for navigation to 20 feet deep at low water on July 14th last, and was further deepened so as to make it available, on October 7th, to 21½ feet at low water, and about 30 feet at high water.

Cap à la Roche.—Two rock-working dredges were employed night and day the greater part of the summer in dredging shale rock, principally in the middle of the bar and at the junction of the lines of the Cap à la Roche and Pouillier Rayer channels. Three stone-lifters were also employed at intervals throughout the summer in lifting boulders.

The work done consists in dredging 2,100 feet in length of the straight part of the channel to 27 feet deep at low water, and also in dredging and stone-lifting over large areas of irregular shape and depth at the junction.

Quantities removed: shale rock dredged, 142,080 cubic yards, costing $43,599, or 30⅔ cents per yard; boulders lifted, 2,233 cubic yards, costing $3,232, or $1.44¾ per yard.

The deepening of the Cap à la Roche channel was sufficiently advanced to allow of its being used, in conjunction with the new Pouillier Rayer channel to 21½ feet at low water, or 1½ feet more than formerly, on and after October 7th last.

Cap Levrant.—Some small shoals and lumps, covering a considerable length of channel below Cap Levraut, were

dredged off in the latter part of the summer. Quantity lifted, 1,275 cubic yards, costing $1,636, or $1.28⅓ per yard.

Batiscan Traverse.—A length of 850 feet of the Traverse was dredged, and several detached pieces, amounting, in all, to about 1,600 feet, were cleared of boulders by stone-lifters. Quantity dredged, 50,580 cubic yards; clay and boulders, costing $8,277, or 16⅓ cents per yard; boulders lifted by stone-lifters, 1,554 cubic yards, costing $2,313, or $1.49 per yard.

Batiscan.—At Batture Perron, a shoal just above the Batiscan church, touched only by the 27½ channel, a stone-lifter was set to work in the latter part of the season to clear away overlying large boulders. Quantity lifted, 196 cubic yards, costing $572, or $2.92 per yard.

Champlain.—At and below the village, several detached shoals were cut through, and all the dredging of the locality finished, except what cleaning up may be found necessary on testing. Quantity dredged, 36,531 cubic yards, tough clay and boulders, costing $12,693, or 34¾ cents per yard,

Bécancour.—The dredging away of the shoal at the bend (near the mouth of the Becancour River) was completed, and a great part of the dredging on the upper traverse was also completed. Quantity dredged, 9,889 cubic yards very tough clay and boulders, costing $11,340, or $1.14⅔ per yard.

Port St. Francis.—The Force shoal was cut through to the full depth. Quantity dredged, 26,656 cubic yards hard pan and boulders, costing $5,810, or 21⅘ cents per yard.

Lake St. Peter.—On the Nicolet Traverse, a distance of 950 feet left over from last year, was dredged through, and the traverse finished. Quantity lifted, 51,090 cubic yards stiff clay, with some boulders, costing $6,238, or 12⅕ cents per yard.

On the line between No. 3 lightship and the white buoy, and at the bend at No. 1 lightship, two pieces, amounting to 1½ miles in length, were dredged. Quantity raised, 601,900 cubic yards soft clay, costing $20,500, or 3 4/10 cents per yard.

On the line of the Ile aux Raisin lights, a length of 1⅛ miles was dredged, thus continuing the dredging of last year through to the head of the lake. Quantity raised, 77.370 cubic yards stiff clay and boulders, costing $6,087, or 7⅞ cents per yard.

Ile de Grace.—One day's work of a dredge was done. Quantity lifted, 240 cubic yards; cost $96.

Contrecœur Channel,—At Ile St. Ours, a distance of 1,700 feet was dredged. Quantity raised, 26,370 cubic yards; stiff clay and stones; costing $1,820 or 6 9/10 cents per yard.

Cap St. Michel.—A length of 1,450 feet of the channel oppesite Ile Bellegarde, was dredged in the latter part of the summer. Quantity dredged, 32,280 cubic yards, clay with some boulders; costing $3,658 or 11⅓ cents per yard.

Varennes.—The dredging of last year, which terminated just below the curve, was continued a distance of 1,900 feet, and as this was at a place where vessels have found much difficulty in making the turn, opportunity was taken to widen the channel 150 feet, or to 450 feet total width, at the worst part. About 300 feet in length in the Pouillier Varennes, above the curve, was also dredged. Total quantity raised, 127,415 cubic yards, clay with some boulders; costing $8,612 or 6¾ cents per yard.

Pointe aux Trembles.—Very nearly a mile of the channel, in detached pieces, was dredged. Quantity raised, 83,670 cubic yards, mostly stiff clay with boulders; costing $17,324 or 20 7/10 cents per yard.

Longueuil.—Three spoon dredges from the Montreal Harbour fleet were employed a considerable part of the summer, and a rockworking dredge and stone-lifter from Cap à la Roche, were added in the fall, to cut through the

shoal opposite Longueuil. Quantity dredged, 30,754 cubic yards, very compact hard pan filled with boulders; costing $23,748 or 77$\frac{3}{10}$ cents per yard.

Montreal.—Some shallow places in the ship channel, chiefly near the lower end of Victoria Pier, were dredged off. Quantity raised, 6,255 cubic yards, gravel and stones; costing $2,614 or 41$\frac{8}{10}$ cents per yard.

Tabular extracts of the quantities dredged at the foregoing places, and by the diffrent dredges, together with other information as to the works, will be found on the annexed tables.

Dredging Plant and Working Expenses.

The year's outlay, including all repairs, outfit, fuel, wages, salaries, insurance, and every expense except interest and depreciation of plant, for the Ship Channel fleet proper, while employed in the channel work, was $171,-364.72; and for the Montreal Harbour fleet employed in the ship channel, $19,408.29, or in all, $190,773. The quantities dredged are, 1,173,415 cubic yards of earth, and 151,263 cubic yards of rocks and large boulders, making an aggregate of 1,324,678 cubic yards.

It will be observed, on comparing the results of last year's working with those of previous years, as shown in the following table, that the total cost of last year's work and the average cost per cubic yard dredged, are both high. This, in the case of last year's total cost, arises from five of the six elevator dredges, and two of the three stone-lifters in commission having been worked night and day, in order to hurry the completion of the 27$\frac{1}{2}$ foot channel. The increased average cost per cubic yard of dredging has, doubtless, in part, been caused by the disadvantages incident to night-work, but it is chiefly due to a much larger quantity of rock and hard pan than usual, in proportion to Lake St. Peter clay and other soft dredging, and also to unusual delays from stormy weather, and for docking and other heavy repairs to the dredges.

Years.	Cubic Yards. Dredged.	Total Cost.	Cost per Cubic Yard.	Number of Vessels Employed.
1875.....	820,773	$134,744	16 4/10 Cents.	7 to 8 Elevat'r Dredges
1876.....	922,808	130,744	14 1/10 "	8 " "
1877.....	1,262,308	137,830	10 8/10 "	7 to 8 " "
1878.....	966,973	$124,891	12 9/10 "	8 Elevat'r Dredges
	117,663	24,125	20 5/10 "	1 to 3 Spoon "
	1,084,636	$149,016	13 8/10 "	Totals and Average..
1879.....	813,391	$135,519	16 66/100 "	8 Elevat'r Dredges
	29,819	7,835	26 26/100 "	2 to 5 Spoon "
	843,210	$143,354	17 "	Totals and Average..
1880.....	1,171,757	$136,537	11 65/100 "	8 Elevat'r Dredges
	47,474	10,500	22 11/100 "	2 to 4 Spoon "
	1,219,231	$147,037	12 5/100 "	Totals and Average..
1881.....	1,375,251	$149,141	10 84/100 "	8 Elevat'r Dredges
	78,537	18,160	23 12/100 "	1 to 4 Spoon "
	1,453,788	$167,301	11 43/100 "	Totals and Average..
1882.....	824,932	$151,223	18 36/100 "	7 Elevat'r Dredges
	74,303	20,981	28 23/100 "	2 to 4 Spoon "
	899,235	$172,204	19 15/100 "	Totals and Average..
1883.....	360,344	$121,325	33 66/100 "	6 Elevat'r Dredges
	137,047	40,690	29 10/100 "	2 to 5 Spoon "
	497,391	$162,015	32 17/100 "	Totals and Average..
1884.....	816,392	$122,163	14 96/100 "	6 Elevat'r Dredges
	22,197	11,244	50 66/100 "	2 Spoon "
	838,589	$133,407	15 91/100 "	Totals and Average..
1885.....	1,372,349	$142,455	10 38/100 "	7 Elevat'r Dredges
	32,703	15,182	46 42/100 "	1 to 3 Spoon "
	1,405,052	$157,637	11 23/100 "	Totals and average...
1886.....	1,491,177	$154,640	10 37/100 "	7 Elevat'r Dredges
	32,411	13,930	42 98/100 "	1 to 4 Spoon "
	1,523,588	$168,570	11 6/100 "	Totals and avérage..
1887.....	1,293,550	$171,365	10 25/100 "	6 Elevat'r Dredges
	31,128	19,408	62 33/100 "	2 to 3 Spoon "
	1,324,678	$190,773	14 41/100 "	Totals and Average..

The measurement of the quantity dredged is by tally of the scows, which, when filled level, hold 80 and 150 cubic yards, but they are reckoned at 60 and 120 cubic yards each respectively, to allow for imperfect filling.

The working plant employed consisted of the following vessels:—

Two Elevator-Dredges, with cast-steel buckets, for rock, Nos. 11 and 13.
One Elevator-Dredge, " large built " " " No. 8.
One " " " small built " " " No. 10.
Two Elevator-Dredges, " large built " " clay, &c., Nos. 9 & 12.
Three Spoon Dredges, during part of the summer.
Eight to nine Screw Tugs.
Three Stone-lifting Barges Nos. 1, 2 and 3.
Five Barges, as coal-tenders and smiths' shops.
Eighteen Hopper-bottomed Scows.
Five Flat-deck Scows.

The old number three dredge, which appeared in former lists of plant, needed considerable repairs, and could only have worked in low water after midsummer, and it was, therefore, most advantageous not to work it last year, but to employ the equivalent outlay and the services of the tug and trained crew in working one of the more powerful dredges by night.

The lifting barge belonging to the Dominion Government, hitherto chiefly used at Quebec, was handed over to the Ship Channel work in spring and was fitted out for service as an additional stone-lifter.

The first dredge was sent out from winter quarters on May 6th, which was as soon as the floating ice permitted, and three others followed almost immediately. One was delayed till the 24th of May for the completion of repairs in Sorel, and another, making the sixth dredge, was sent to Quebec for repairs in dry dock.

Two of those first sent out were set to work at once, two were unable to work till the 21st May, in consequence of extreme high water in the river, and the two which were under repair were got to work on the 21st and 24th May.

All worked till the 28th November, when they were sent to winter quarters at Sorel.

The number of days during which the Elevator Dredges were on duty, reckoning every day except Sundays from the date of leaving winter quarters to that of returning, was 176 for the dredge which worked by day only, and 281 to 325 for those which worked day and night, reckoning a day and a night as two days. The aggregate for the six dredges during the season was 1,695 days, or an average of 283 days each. The time of the stone-lifters was 156 days for No. 1, which worked during day only; 322 days for No. 2, which worked night and day, and 163 days for No. 3, which commenced 15th August, and worked night and day afterwards, counting a night and day as two days.

The nominal working time for day work is 12 hours per day, and for night and day it is $10\frac{1}{2}$ hours to each watch. The actual dredging time is, however, reduced by short days in autumn, early stoppages on Saturdays, time lost in storms, changing positions, accidents, repairs and delays of all kinds, so that time during which the dredges were actually dredging was 10,332 hours, or an average of $6\frac{1}{10}$ hours per watch for the whole season.

In addition to the regular Ship Channel fleet, two to three of the spoon dredges of the Montreal Harbor fleet were also employed a considerable portion of the summer.

No accident worthy of note occurred to the plant during the season.

The dredges and tugs were laid up during the winter of 1886-7 in the Richelieu River, at the Harbour Commissioners' shipyard, Sorel, and the barges, scows and other vessels without machinery were wintered about a mile above in the same river.

The repairs were, as usual, done at the Harbour Commissioners' works.

Appended are tables giving further particulars as to the dredging plant and the work done.

Yours respectfully,

JOHN KENNEDY, *Chief Engineer.*

DREDGING PLANT *employed in Deepening the* SHIP CHANNEL *between* MONTREAL *and* QUEBEC *in* 1887.

DESCRIPTION OF VESSEL.	HULLS. Length over all.	Breadth of Beam.	Depth of Hold.	When built.	Tonnage Register.	ENGINES. Kind of Engine.	No. of Cylinders.	Diam. of Cylind.	Length of Stroke.	Pres're of Steam.	Capacity of bucket.	Depth to wh dredge can work.	REMARKS.
DREDGES.	ft. in.	ft. in.	ft. in.					inches.	inches	Lbs.	C. ft.	Feet.	
Elevator Dredge No. 8.	135 0	29 0	10 0	1874	.....	Two coupled vertical direct acting condensing engines to each dredge.	2	20	32	70	16	37	Wooden hull.
" " No. 9.	135 0	29 0	10 0	1874	.....		2	20	32	70	28	37	" "
" " No. 10.	135 0	29 0	10 0	1874	.....		2	20	32	70	4	35	" "
" " No. 11.	135 0	29 0	10 0	1874	.....		2	20	32	80	6½	38	" "
" " No. 12.	135 0	29 0	10 0	1874	.....		2	20	32	70	16	38	" "
" " No. 13.	135 0	29 0	10 0	1874	.....		2	20	32	80	6½	38	" "
TUG BOATS.													
Minnie F. Parsons.....	76 0	15 0	6 6	1864	22.42	Vertical Non-condensing.	1	18½	20	80	.....	.....	Wooden hull.
Delisle.....	62 5	14 9	7 5	1869	17.07		1	18	20	90	.....	.....	" "
John Pratt.....	96 0	19 2	7 3	1874	21.41		2	14	16	77	.....	.....	" "
C. J Brydges	62 2	16 0	8 0	1874	21.29		1	20	22	85	.....	.....	" "
St. Francis.....	80 0	17 0	7 9	1875	37.93		1	20	22	85	.....	.....	" "
St. James.....	76 0	17 0	8 2	1875	54.57	Vertical condensing.	1	21	20	85	.....	.....	" "
St. Paul.....	60 6	15 0	8 0	1875	27 00	Vert. non-condens'g.	1	16	18	100	.....	.....	" "
McNaughton.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
BARGES.													Chartered for summer's work.
Caroline.....	103 8	22 6	3 3	1864	132.95	.....	.....	.....	.....	.....	.....	.....	Wooden hull.
Dreadnaught	104 2	21 5	7 4	1869	136.42	.....	.....	.....	.....	.....	.....	.....	" "
Waverly.....	100 0	20 11	7 1	1870	176.00	.....	.....	.....	.....	.....	.....	.....	" "
Alfred Demers	105 0	22 5	7 6	1878	131.00	.....	.....	.....	.....	.....	.....	.....	" "
A. G. Nish, (float'g shop)	100 8	22 6	6 4	1873	.....	.....	.....	.....	.....	.....	.....	.....	" "
Stone lifter No. 1.....	65 0	22 0	6 0	1858	.....	Steam Winches.	.....	.....	.....	.....	.....	.....	" "
" " No. 2	75 0	24 0	9 9	1878	.....	" "	.....	.....	.....	.....	.....	.....	" "
" " No. 3 .... (Government Barge)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	" "
SCOWS.					Scow No.	Capacity of Scow, Cubic yards.							
10 Hopper bottomed...	80 0	16 0	6 9	1874	33 to 44	80	.....	.....	.....	.....	.....	.....	4 Hoppers.
2 " "	54 6	18 0	7 0	1875	47 and 48	80	.....	.....	.....	.....	.....	.....	2 "
1 " "	50 0	19 9	7 3	1876	50	89	.....	.....	.....	.....	.....	.....	1 "
2 " "	89 0	18 0	7 9	1879	51 " 52	140	.....	.....	.....	.....	.....	.....	2 "
2 " "	89 0	18 0	7 9	1880	53 " 54	150	.....	.....	.....	.....	.....	.....	3 "
1 " "	82 5	20 0	8 0	1886	55	150	.....	.....	.....	.....	.....	.....	3 "
4 Flat scows	.....	.....	.....	.....	10 to 17	.....	.....	.....	.....	.....	.....	.....	3 "

All wood.

NOTE.—Three Spoon Dredges belonging to the Montreal Harbour Fleet were, in addition to the above, temporarily employed upon the Ship Channel.

ABSTRACT OF WORK *done by each* DREDGE *in Deepening the* SHIP CHANNEL *between* MONTREAL *and* QUEBEC *in* 1887.

VESSEL.	Places at which Dredging was done.	Time of Service		QUANTITIES DREDGED.			Totals.	CHARACTER OF SOIL.
		Days.	Total Days.	Spoon Dredges	Elevators and Stone Lift's, Earth.	Elevators and Stone Lift's, Rock.	Cubic Yards.	
Elevator Dredge No. 8....	Champlain	116			34,260			Tough clay and boulders.
" " "	Becancour	24			3,705			Very tough clay and boulders.
" " "	Contrecœur (Ile St. Ours.)	19			26,370			Stiff clay and stones.
" " " ...	Pointe aux Trembles	122			63,255			Stiff clay with boulders.
" " No. 9....	Lake St. Peter	213	281		601,900		127,590	
" " "	" (Ile aux Raisin)	32			68,820			Soft clay.
" " "	Varennes	70			118,340			Stiff clay and boulders.
" " No. 10....	Cap Charles	27	315		3,840		789,060	Clay and some boulders.
" " "	Pouillier Rayer	42			5,782			Hard pan and boulders.
" " "	Cap Levraut	17			1,275			Hard pan and boulders.
" " "	Nicolet Traverse	32			19,110			Hard pan and stones.
" " "	Pointe aux Trembles	58			20,415			Stiff clay with some boulders.
" " No. 11....	Cap Charles	19	176			3,780	50,422	
" " "	Cap à la Roche	220				63,930		Shale rock.
" " "	Champlain	14			2,190			Shale rock.
" " "	Becancour	54			3,660			Tough clay and boulders.
" " "	Varennes	18			9,075			Very tough clay and boulders.
" " No. 12....	Batiscan Traverse	86	325		50,580		82,635	Clay with some boulders.
" " "	Becancour	38			2,520			Clay and boulders.
" " "	Port St. Francis, Force sh'l.	58¾			26,580			Very tough clay and boulders.
" " "	Nicolet Traverse	32			31,980			Hard pan and boulders.
" " "	L. St. Peter (Ile aux Raisin)	31¼			8,550			Stiff clay with some boulders.
" " "	Ile de Grace	1			240			Stiff clay and boulders.
" " "	Cap St. Michel	38			32,280			Clay.
" " No. 13....	Cap à la Roche	233	285			78,150	152,730	Clay with some boulders.
" " "	Longueuil	80			7,560			Shale rock.
			313				85,710	Hard pan and boulders.
Stone-lifter No. 1.....	Cap Charles	18						
" "	Cap à la Roche	46					133	Boulders.
	Champlain	25					200	"

Stone-lifter No. 1	Cap Charles	18				133		Boulders.
" "	Cap à la Roche	46				290		"
" "	Champlain	25				71		"
" "	Becancour	27				4		"
" "	Port St. Francis, Force sh'l.	24				76		"
" "	Nicolet Trav. (L. St. Peter)	12						Assisting Dredge.
	Varennes	4						" "
" No. 2		156					574	
" "	Cap Charles	52½				764		Boulders.
" "	Pouillier Rayer	¼				5		"
" "	Cap à la Roche	151				1,924		"
" "	Batiscan Traverse	59½				681		"
" "	Champlain	1				10		"
" "	Varennes	2						Raising Scow.
	Longueuil	19½				357		Boulders,
" No. 3		285½					3,741	
(Government Barge.)	Cap à la Roche	8				19		Boulders.
" "	Batiscan Traverse	80				873		"
	Batiscan	38				196		"
Spoon Dredge No. 7		126					1,088	
" "	Platon Wharf	13		2,036				Earth and Wreckage.
	Longueuil	52		6,502				Hard pan and boulders.
" No. 6		33		6,255				Gravel and stones.
" "	Ship Channel through Harb.	54		8,190				Hard pan and boulders.
" "	Longueuil	1						Raising Scow.
	Varennes	92		8,145				Hard pan and boulders.
" No. 4	Longueuil	245					31,128	
Totals			2,507½	31,128	1,142,287	151,263	1,324,678	

NOTE.—The work done by stone-lifters in the Montreal Harbour is not included in the above table.

STATEMENT *showing the number of days worked and the quantity* DREDGED *at each place in deepening the* SHIP CHANNEL *between* MONTREAL *and* QUEBEC *in* 1887.

PLACES WHERE DREDGES WORKED.	VESSEL.	Time of Service Days.	Total Days.	QUANTITIES DREDGED.			Totals.	CHARACTER OF SOIL.
				Spoon Dredges.	Elevators, Etc.			
					Earth.	Rock.	Cubic Yards.	
Platon Wharf	Spoon Dredge No. 7	13	13	2,036				Sand and wreckage.
Cap Charles	Elevator Dredge No. 10	27			3,840		2,036	Hard pan and boulders.
	" " 11	19				3,780		Shale rock.
	Stone-lifter No. 1	18				133		Boulders.
	" 2	52¼	116¼			764		Boulders.
Pouillier Rayer	Elevator Dredge No. 10	42			5,782		8,517	Hard pan and boulders.
	Stone-lifter No. 2	¼	42¼			5		Boulders.
Cap à la Roche	Elevator Dredge No. 11	220					5,787	
	" " 13	233				63,930		Shale rock.
	Stone-lifter No. 1	46				78,150		Shale rock.
	" 2	151				290		Boulders.
	" 3	8	658			1,924		Boulders.
						19		Boulders.
Cap Levraut	Elevator Dredge No. 10	17	17		1,275		144,313	Hard pan and stones.
Batiscan Traverse	" " 12	86			50,580		1,275	Tough clay and stones.
	Stone-lifter No. 2	59½				681		Boulders.
	" 3	80	225½			873		Boulders.
Batiscan	" 3	38	38				52,134	
						196		Boulders.
Champlain	Elevator Dredge No. 8	116			34,260		196	
	" 11	14			2,190			Tough clay, sand and boulders.
	Stone-lifter No. 1	25				71		Boulders.
	" 2	1	156			10		Boulders.
Becancour	Elevator Dredge No. 8	24			3,705		36,531	
	" " 11	54			3,660			Very tough clay and boulders.
	" " 12	38			2,520			Very tough clay and boulders.
	Stone-lifter No. 1	27	143			4		Boulders.
							9,889	

Port St. Francis, Force sh'l	Elevator Dredge No. 12	58¾			26,580			Hard pan and boulders.
	Stone-lifter No. 1	24				76		Boulders.

				143			9,889	Boulders.
Port St. Francis, Force sh'l.	Elevator Dredge No. 12	58¾			26,580			Hard pan and boulders.
	Stone-lifter No. 1	24				76		Boulders.
L. St. Peter (Nicolet Trav).	Elevator Dredge No. 10	32	82¾				26,656	
	" " 12	32			19,110			Stiff clay and some boulders.
	Stone-lifter No. 1	12			31,980			
Lake St. Peter	Elevator Dredge No. 9	213	76					Assisting Dredge.
" (Ile aux Raisin)	" " 9	32	213		601,900		51,090	
	" " 12	31¼			68,820		601,900	Soft clay.
Ile de Grace	" " 12	1	63¼		8,550			Stiff clay and boulders.
Contrecœur (Isle St. Ours)	" " 8	19	1		240		77,370	
Cap St. Michel	" " 12	38	19		26,370		240	Clay.
Varennes	" " 9	70	38		32,280		26,370	Hard clay and stones.
	" " 11	18			118,340		52,280	Clay with some boulders.
	Stone-lifter No. 1	4			9,075			Clay with some boulders.
	" 2	2						Assisting Dredge.
	Spoon Dredge No. 6	1	95					Raising sunken scow.
Pointe aux Trembles	Elevator Dredge No. 8	122			63,255		127,415	
	" 10	58	180		20,415			Stiff clay with boulders.
Longueuil	" " 13	80					83,670	
	Stone-lifter No. 1	19½			7.560			Hard pan and boulders.
	Spoon Dredge No. 4	92		8,145		357		Boulders.
	" " 6	54		8,190				Hard pan and boulders.
	" " 7	52	29½	6,502			30,754	
Ship Channel in Montreal Harbour	" " 6	33	33	6,255			6,255	Gravel and stones.
Totals			2,507½	31,128	1,142,287	151,263	1,324,678	

REPORT

ON

FLOODING OF THE ST. LAWRENCE

AT

MONTREAL AND VICINITY

DURING RECENT YEARS.

HARBOUR COMMISSIONERS OF MONTREAL.

Chief Engineer's Office.

MONTREAL, October 3rd, 1887.

ALEXANDER ROBERTSON, ESQ.,

Secretary, etc.

DEAR SIR,

I have to acknowledge the receipt of a communication addressed to the Chairman of the Harbour Commissioners by the Secretary of Public Works, dated 20th ulto, enclosing a petition regarding the flooding of the South shore of the St. Lawrence in the parishes and the municipalities of St. Lambert, Longueuil and Boucherville, upon which I am requested to report.

The petition is dated May, 1887, and sets forth, in substance, that for four consecutive years the localities mentioned have been greatly damaged by frequent floods on the St. Lawrence, which occur when the ice forms and leaves in fall and spring; that this spring (1887), especially, the water rose to an exceptional height; that "the "immediate cause of those floods is, in the opinion of the "petitioners, the accumulation of rubbish carried away

"by the Montreal Harbor Commissioners and deposited "in the bed of the river near the islands and islets of "Boucherville and the lower part of the parish of Lon- "gueuil."

The petition asks that the Harbour Commissioners be caused to "deepen, widen and straighten the channel of "the St. Lawrence by removing obstructions made by "said Commission" and that an indemnity be granted, etc., etc.

The portion of the petition which more immediately concerns the Harbour Commissioners and that upon which I presume I am required to specially report are (1) that expressing the opinion that the deposit of rubbish, or dredgings near the Boucherville Islands by the Commissioners has caused the recent floods and consequent damage, and (2) the request that the Commissioners be now caused to deepen, widen and straighten the river channel.

Upon the first point I beg to observe that the petitioners merely state it as their opinion that the recent floods are due to the deposit of dredgings, but give no reasons nor facts in support of such opinion.

I think the opinion is a mistaken one, for the following amongst other reasons:—

The depositing of dredgings has been carried on more or less for a number of years previous to 1885, when it was discontinued, but the records of the high water and floods in spring and fall do not show an increase in such heights corresponding to the accumulation of deposit. On the contrary, a comparison of the flood levels since 1852—which is as far back as continuous records extend—show that for the twenty-five years previous to 1875, the average of the high water in fall was 9 inches higher than for the 10 years following, or to 1885, when the depositing ceased; and also that the average high water in spring was 14 inches higher for the 25 years before 1875 than for the 10 years after.

The average flood and high water levels of both fall and spring are thus shown to have actually fallen with the accumulation of dredgings.

During the four years, 1884 to 1887, inclusive, which are specially dealt with in the petition, the fall and spring floods were indeed of frequent occurrence, and some of them were exceptional in height, but the connection between this and the deposit of dredgings is not proved On the contrary, of the high water levels of the fall of 1884 and 1886 and of the spring of 1884 and 1885, only that of the spring of 1885 can be called a flood, and all have been several times exceeded by the high water levels of ten to forty-five years ago, thus showing that in those cases, at least, the deposit of dredgings has done no harm.

An examination of the main circumstances attending the remaining occurrences of high water, or the real floods of the last four yers, shows that some of the conditions were peculiar and that they account for the floods much more clearly than does the deposit of dredgings. The first of the exceptional floods in question was that of January, 1886 ; and it occurred under the following conditions. Ice had formed in December and the beginning of January until it packed and covered the river below Montreal, a good part of the Montreal Harbour, Laprairie Basin and parts of Lake St. Louis. A thaw and rains followed, setting free the Lake, Basin and Harbour ice and frasil, allowing them to be carried down by the current St. Mary, and in great part lodged under the stationary ice, thus gorging the river channel. Immediately following this came a week of extreme cold, reaching 24° below zero and forming great quantities of new floating ice and frazil which still further added to the gorging of the channel and shoving of the surface ice. In conjunction with this, the Ottawa and upper St. Lawrence were higher by a good deal than both together were ever before known to

be. The Ottawa, at the taking of the ice, was as high only twice before in the 42 years embraced by records; and the upper St. Lawrence was as high only once before the 28 recorded years, but nothing like so high winter-water had occurred on *the two rivers together* before, and consequently no such volume of water was ever before discharged past Montreal at the time the winter-shoves were taking place.

A January thaw followed by a cold snap is no new thing, nor is a second movement of ice unknown. Winter water as high occurred once before on the upper St. Lawrence and twice on the Ottawa, but on each river in a different year. There is nothing new in any one of these conditions separately, but looking back over the records of temperatures and heights of water at and about Montreal, Ottawa and Lake Ontario, there is no previous instance in which there was any such a winter-volume of water to be carried away and at the same time such conditions for gorging the channel with ice to prevent its flow.

The result of the unfortunate coincidence was the natural one of a winter flood higher than any before recorded. January 1856 furnishes the nearest parallel, the flood then being only 14 inches lower.

Lake Ontario was then 10 inches lower, and the Ottawa about 2 feet lower than in January 1886, differences which either in winter or summer would fully account for the difference of 14 inches at Montreal.

The next flood was that of the succeeding spring, April 1886, when the water at Montreal and at the localities named on the south shore, rose higher than ever before.

The conditions bearing upon the case are as follows:—

The winter of 1885–6 will be remembered as having been very severe, and one in which both ice and snow were of unusual depth. Early spring thaws set in and raised both the Ottawa and upper St. Lawrence to heights never

before recorded at the season. The "north waters" came down a month before their time and before the Montreal ice had started. The two rivers were swollen higher than either had been in any previous April and their united volume was vastly greater than ever before passed Montreal at a time when the channel was still covered and choked by winter ice. The coincidence of such untoward conditions is entirely without precedent and the disastrous flood which plainly resulted from such conditions is also without a precedent.

Immediately following this greatest recorded flood was the fall rise of December 1886, in which, and notwithstanding all the deposit of dredgings, the water rose to only the average winter height.

The remaining flood is that of last spring when the water rose to about midway between the heights of the two great spring floods of 1861 and 1886. The physical conditions which preceded and attended it were also much the same as obtained in those two floods, and they bore a resemblance especially close to those of the flood of 1886.

The winter was an excedingly severe one; the surface ice was of unusual thickness and strength, and the quantity of frazil packed beneath it was of wonderful depth and extent. During March and April, Lake Ontario rose rapidly, swelling its discharge by the St. Lawrence to much above the average, though not so high as in the preceding spring. But what was lacking in the St. Lawrence was made up by the Ottawa. Its "north waters" came down early, as in 1886, and before the ice had given way at Montreal it had attained a height exceeded only by its height in that year.

The effect of variations in the relative levels of the two separate rivers upon their united volume of discharge, is not precisely known, but it is obvious from inspection of

the gaugings, that the volume to be carried past Montreal at the breaking up of the ice was almost equal to that of the spring before; and the flood, as might therefore be inferred, was also nearly equal.

It will be seen then that while there have been no really new natural causes at work in the floods of recent years, these causes have, in modern fashion, entered into new and mischievous combination, and thus joining forces, have produced effects beyond anything before.

But it may be still urged that the causes mentioned by the petitioners, if not the sole or even the greatest causes of recent floods, are at least contributory; that any reduction of the river channel is by so much an obstruction to the flow of the flood water, and that any deepening and widening must necessarily assist in carrying off the water and obviating a flood.

But even this cannot be borne out by the facts really bearing upon the question. I have already shown in general terms and by reference to record, that the increase in floods is not a gradual one, bearing any relation to the depositing, but it will be well to examine this more in detail.

For several years before and including 1883, the complained of depositing was always going on, but the spring and fall rise of the river continued always low, decidedly below the average, and was lowest of all in 1881 to 1883. For the next two years, little depositing was done about the Boucherville Islands, the dredgings being chiefly placed alongshore at Hochelaga, and in 1885 depositing in the river ceased entirely. Notwithstanding this cessation the river suddenly changed its behaviour and rose to nearly flood level twice in 1884, then skipped a season and remained low in January 1885. After that followed the two great floods of April 1885 and January 1886, and the great one of April 1886. But

again, and with no change whatever in the condition of the river bottom below Montreal, the great spring flood was followed by a very low fall rise and winter level and that again by the flood of last spring.

From 1883 to 1887 then, the bottom remained practically the same, for the depositing was insignificant in so great a river, but in that time there were four floods and six non-floods following each other in erratic disorder. The one thing certain about them is that there is no connection as of cause and effect between the depositing and the flooding. And that the bottom here is not the cause of the recent great floods is shown, too, by the fact that other localities where the conditions of bottom are wholly different, have also suffered from similar recent floods.

At Beauharnois, where the Cascades enter the head of Lake St. Louis with 40 to 80 feet depth and diverging width, the ice gorged this great channel last winter, but especially in the winter before, so as to overflow Melocheville and Vaudreuil and a great tract of country between.

At Aultsville, last winter, the ice blocked and shoved to exceptional height, flooding up to Morrisburg and all low parts of the shore between, to an extent only once before exceeded.

The Richelieu rose enormously high, too, and flooded its valley to an extent almost, if not altogether, without precedent.

At Cornwall, where the Long Sault ends in the deep slack water of Lake St. Francis, there were ice shoves, and disastrous floods beyond all record or precedent.

All these and many more instances that might be cited between Manitoba and New Brunswick, show that the late floods at Montreal and the south shore opposite have been by no means exceptional, and must be attributed to other causes than those supposed by the petitioners.

As to the request of the petitioners that the Montreal

Harbour Commissioners be caused to deepen, widen and straigthen the channel of the River St. Lawrence, I have to answer that two of the Commissioners' dredges have been engaged in such deepening and widening since early in the summer, and it is intended that the work shall be continued till they cut through a shoal which extends across the bed of the river between Longueuil and Hochelaga. This work, it is fair to say, is being carried out merely as part of the general deepening of the Ship Channel, but it also happens to substantially comply with the request of the Petitioners, in that it tends to the removal of what have hitherto been obstructions in the deep, swift-water channel of that part of the river.

In thus dealing with the subject matter of the petition, I have strictly confined myself to the consideration of the points raised in it. But besides this, the reference of the petition gives an opportunity for a fuller discussion of the whole subject of floods, which it might have been well to embrace, were it not that I expect shortly to join in doing so as a member of the Government Flood Commission, and with the help of a mass of information which could not be properly used otherwise.

Yours respectfully,

JOHN KENNEDY,
Chief Engineer.

TARIFF.

Rates & Dues to be levied in the Harbour of Montreal,

Under and by virtue of the Acts, 40 Vic., Cap. 53, and 42 Vic., Cap. 28.

ON AND AFTER THE FIRST DAY OF APRIL, 1881.

Tonnage Dues

To be levied on all Vessels in the Harbour.

On Steamboats, for each day of twenty-four hours, or part of a day, they remain in the Harbour, reckoned from the hour of their arrival to that of their departure... 1c. per Ton Register.
On all other vessels, per day, as aforesaid..... ½c. " " "

Wharfage Dues

To be levied on all Merchandise, Animals and Things whatsoever Landed or shipped in the Harbour.

25c. per Ton—All Goods, Wares and Merchandise not elsewhere specified.
20c. " " —Hay, Straw, Pig and Scrap Iron, Pot and Pearl Ashes.
15c. " " —Apples, Crates and their contents, Flour and Meals, Fish, Meats, Pitch, Potatoes, Tar, Horses, Neat Cattle, Sheep, Swine.
10c. " " —Ballast, Clay, Fire-Bricks, Gypsum, Lime, Marble, Phosphates, Sand, Salt.
7½c. " " —Coal and Coke, Grain and Seeds of all kinds.
Special.....Bricks, 10c. per 1,000; Cordwood, 5c. per cord; Lumber, 10c. per 1,000 feet, board measure.
Free.....Bullion, Specie.

On all Goods, Wares and Merchandise whatsoever, the quantity of which by weight, measurement or other mode of estimate provided for in the Tariff, cannot be conveniently ascertained, it shall be lawful for the Harbour Commissioners to levy a rate of ¼ of 1 per cent. on the value thereof.

Each entry shall pay not less than 5 cents.

All property landed on the wharves for re-shipment, shall only pay one wharfage.

The Ton mentioned in the Tariff of Wharfage dues shall be 2,000 lbs. weight, or 40 cubic feet measurement, according to the Bill of Lading.

STANDARD FOR ESTIMATING WEIGHTS.

Ashes, Pot or Pearl.....	3 brls. to 1 Ton.	Horses	2 to 1 Ton
Apples, Flour, Meal, Potatoes	9 " "	Neat Cattle.....	3 " "
Fish, Meats, Pitch, Tar....	7 " "	Sheep.....	15 " "
		Swine	10 " "

Certified,

H. D. WHITNEY,
Secretary.

HARBOUR COMMISSIONERS OFFICE,
MONTREAL, 26th March, 1881.

PRIVY COUNCIL OFFICE,
OTTAWA, 1st April, 1881.

I hereby certify that the foregoing Tariff has been approved by His Excellency the Governor-General in Council on this 1st day of April, 1881.

J. O. COTÉ, *Clerk, Privy Council.*