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THE ST. LAWRENCE SHIP CHANNEL, 1805-1865

by

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THE SETTING IN 1800 : CITY AND RIVER

Montréal, at the beginning of the nineteenth century, was a rapidly growing cosmopolitan city. Bouchette[1] in 1815, termed the city handsome, and another traveller in 1819 noted that his first impression of Montréal was very pleasing.[2] On approaching the city from Québec, strangers were impressed with the turrets, spires and steeples whose tin roofs glittered in the sunshine. If the entrance to Montréal was made from the Lachine road they were impressed with the fine view presented of the city surrounded with green fields and orchards, with the mountain as a backdrop.

The harbour

The harbour at this time was very simple. There were a few private wharves jutting out into the river, but generally the ships anchored by the shore and unloaded their goods onto the bank. The river between Market Garden Island and the town was particularly good anchorage, being protected from the currents. Canoes and *bateaux* were generally pulled up onto the beach for unloading.

The state of navigation

The government of France had decreed that the city (then referred to as Ville-Marie) be built « as high up on the St. Lawrence as it were possible for vessels to go by sea ».[3] In choosing the site of Montréal this command was complied with in the strictest sense.

The Saint Mary's current passing before the city made it difficult for craft to enter the harbour area. As a rule ships could only progress as far as Hochelaga at the foot of the current, about two miles below Montréal proper. To reach the harbour it was necessary to be towed up the current by ten to sixteen oxen, depending on the size of the ship and the direction of the wind.

The channel of the river itself was sufficiently deep for the craft navigating it. But Lake Saint Peter, even then, was considered shallow and hazardous.

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[1] BOUCHETTE, J., *A topographical description of the province of Lower Canada*, London, 1815, p. 41.

[2] SANDHAM, A., *Ville-Marie, or sketches of Montreal*, Montréal, 1870.

[3] WELD, I., *Travels through the states of North America and the Provinces of Upper and Lower Canada*, London, 1800, v. 1, p. 309.

Ships usually lay at anchor at night, rather than make the passage in the dark and run the risk of going aground.[4] Ice prevented navigation in the river during the five months of winter.

Lights and buoys were unknown in the first years of the nineteenth century. Charts were scarce and unreliable. Ships, generally, only sailed in daylight.

The French Canadians were fine rivermen and excellent boat builders, and they controlled the navigation on the Saint Lawrence below Montréal by controlling the river pilotage, which was virtually hereditary. The officer and crews of the sea-going ships were, in the early 1800's, English speaking; and the merchants who handled the cargoes were nearly all British.

Type of vessels

Many types of craft were to be found on the Saint Lawrence River and in the harbour of Montréal in the early 1800's. Canoes were still very much in evidence, and were used as late as 1855 to cross the river when there was broken ice. The canoes were made of birchbark and ran from ten to twenty feet in length, carrying from two to fourteen persons. The large ones were used for transporting merchandise and provisions, and were safe and steady.

The canoe was eventually supplanted by the *bateau* for heavier commerce. This was a large flat-bottomed skiff, pointed at both ends, about forty-feet in length. It was capable of carrying about five tons of cargo. It in turn was superseded by the Durham boat, an American invention, introduced to the Saint Lawrence about 1812, though a few were seen in Montréal's harbour as early as 1800.[5] The Durham boat was a flat-bottomed barge, with a keel and centre-board. It was eighty to ninety feet in length, with a nine to ten foot beam, rounded at the bow, and had a cargo capacity ten times that of a *bateau*.[6]

Sailing ships had first arrived in Montréal when Jacques Cartier visited the Indian village of Hochelaga in 1535. At that time his progress was impeded by the Saint Mary's current and he was forced to row ashore in a small boat. During the first three decades of the nineteenth century, however, very few sailing ships mounted the river to Montréal. Those that came had to be hauled up against the current by long teams of oxen, or else wait for a favourable wind. Transshipment of goods was usually made at Québec to *bateaux* which carried almost all of the trade.

The first steamship of the Saint Lawrence was the *Accommodation*, which made her maiden voyage in November, 1809, sailing from Montréal to Québec in sixty-six hours, thirty of which had been spent in anchor at the foot of Lake Saint Peter awaiting a favourable tide. By 1816 steamboats were going from Montréal to Québec in twenty-four hours, and making the return trip in thirty-six, and not long after daily service was regular and dependable. It was not

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[4] HODGSON, A., *Letters from North America written during a tour of the United States and Canada*, London, 1824, v. 1, p. 378.

[5] ATHERTON, W. A., *History of the harbour front of Montreal*, Montréal, 1935, p. 3.

[6] TOMBS, L. C., *The port of Montreal*, Montréal, 1932, p. 16.

until 1823 that the tow boat *Hercules* became the first steam-powered vessel to ascend the current unaided; and so it became possible to tow full-rigged sailing vessels up the Saint Mary's current to the wharves of Montréal.

Rafts were common in Montréal's harbour and in the Saint Lawrence River. Various types of ferries were common in the Montréal area. Canoes were used originally, then barges and later steam propelled vessels.

The economy of the town and the demands made on shipping

Montréal at this time lay at the effective head of ocean navigation on the Saint Lawrence River, further progress being prevented by the Lachine Rapids. Canoes and *bateaux* carried the trade inland. Montréal thus became the forwarding point for all goods going west and a depot for all inland products awaiting transshipment to the markets of Great Britain.

Generally, the exports from Montréal were largely meats, grains, timber, pot and pearl ash, and furs. Such produce as flax-seed, butter, lard, soap, candles, grease, tallow, ale, porter, essence of spruce, hemp and castoreum were also important exports. French Canadian horses were among the finest in North America at this time, and were regularly exported as there was great demand for them.[7]

Among the regular imports were such items as rum, coffee, brown sugar and molasses from the West Indies; wine, oil and salt from Spain, Italy and Portugal; cloth, furniture, tea, refined sugar, tools, glass, hardware crockery, coal, and many types of manufactured articles from England.

To accommodate this growing trade Montréal needed a harbour which was more than a strip of beach with a few private wharves jutting into the water, and a river which would accommodate the increase in trade foreseen by the enterprising and far-seeing merchants of the town. Before the introduction of steam the supremacy of Québec as a port was assured. The delays in ascending the river were serious impediments and rendered it difficult for vessels, even of small tonnage and draft, to reach Montréal. With the coming of the steamship, however, and all the possibilities it offered, Montréal's inhabitants would not rest until their river had been made navigable for the best ships of the day, thus increasing Montréal's importance as a port until it overshadowed the older city. It is with the measures taken to obtain this end that this paper deals.

PHYSICAL CHARACTERISTICS OF THE SAINT LAWRENCE RIVER

The Saint Lawrence basin between Montréal and Québec

The Saint Lawrence River flows today in a fairly straight channel across a wide physiographic basin, usually called the Saint Lawrence Lowlands. Montréal lies near the centre of gravity of this basin, and Québec City near its apex;

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[7] JONES, R. L., *Agriculture in Lower Canada, 1792-1815*, p. 37 in *The Canadian Historical Review*, v. 27, No. 1, 1946, pp. 33-51.

below Québec, in fact, the Saint Lawrence is entrenched between the Laurentian Shield and the Canadian Appalachians, with little or no true lowland. But in the hundred and fifty miles above Québec, the bounding escarpments of these hilly areas swing mutually apart, and near Montréal are over one hundred miles from one another. In its course towards the sea, therefore, the river flows into a sort of physiographic funnel pointing north-eastwards.

Below Québec, the Saint Lawrence is properly regarded as an arm of the sea, the Gulf of Saint Lawrence. Above Québec it is manifestly a river, and the problems of navigation are those of an inland waterway. But the distinction is not perfect; as we shall see, the river is tidal up to Lake Saint Peter, halfway to Montréal. In a sense, the Montréal-Québec section owes part of its distinct identity to the facts of economic history. In the beginning, and throughout the eighteenth century, Québec was the seaport, and Montréal an inland river town with only minor maritime interests. With the completion of the work to be described in this paper, the effective head of maritime shipping became Montréal. The head of ocean navigation thus took a sort of quantum-jump inland; and, notwithstanding the local importance of the river harbours, we have ever since regarded the Québec–Montréal section primarily as a channel leading to Montréal harbour.

The Saint Lawrence Lowlands, across which the river flows, are underlain by gently tilted sedimentary rocks of Lower Palæozoic age. The outcrops of harder bands in these rocks, or of igneous intrusions into them, cause local breaks in the river profile, as at Lachine Rapids, Saint Mary's current and Cascades Rapids. But these are at or above Montréal; below the city the bedrock is covered by varying thicknesses of recent drift, and plays no role in the ensuing story.

This drift is of two main sorts. Immediately above the bedrock is a varying mantle of glacial till, much of it bouldery. The boulders are often washed out of the till by running water, and great numbers of them occur in the beds of all Québec's watercourses. This till is, of course, ground moraine; it seems likely, though at present unsubstantiable, that a ridge of such material help up the water-body that cut the raised shorelines visible around Lake Saint Peter. Above the till there lie layers of clay and sand deposited in the post-glacial expansion of the Gulf of Saint Lawrence (the *Champlain Sea*) or in the evanescent fresh-water lakes that followed the subsequent uplift. The present river channel has been excavated by natural erosion of these clays and sands, with local exposures of the underlying till.

In 1800, before the attempt to improve the channel, we must therefore visualize the river occupying a trench self-excavated in the drift. Above Sorel and below Louiseville, this channel was well defined. In mid-course, however, lay the old lake bed of Lake Saint Peter. At one stage in post-glacial evolution, certainly more than three thousand years ago, Lake Saint Peter was a much larger water-body. Its shore-lines may have extended above Montréal. With the removal by erosion of the morainic dam that held it up, however, the lake shrank to its present shore-line and feeble depth. Floored by marine and

lacustrine clay, with occasional sandy shoals, Lake Saint Peter was the prime obstacle in the path of Montréal's maritime ambitions.

In attempting a physical description of things as they were—of the obstacles to be overcome—we must, however, also consider the channel as a whole, the level of the water, the annual ice cycle and the phenomenon of the tide. To this we shall now proceed.

The channel

From Montréal the Saint Lawrence River flows in a north-easterly direction for a hundred and sixty miles to Québec, with a fall of about twenty-five feet. It averages two and a third miles in width, the maximum of seven and a quarter miles being reached in Lake Saint Peter, and the minimum of about half a mile a short distance above Québec. Between Montréal and Lake Saint Peter the river channel is broken by a series of low-lying islands, which have a delta-like conformation at Sorel as the river enters Lake Saint Peter. The lake itself is very shallow. From Pointe-du-Lac down to Québec the river flows through a deeper channel, relatively free of islands.

Several tributaries join the Saint Lawrence between Montréal and Québec, notably the Saint Francis, Saint Maurice, Yamaska, Richelieu and Chaudière. Some of these are of ancient origin, having glacial deposits on their floors, with traces of former channels being found in their valleys.

Between Montréal and Lake Saint Peter the channel was, during the first half of the nineteenth century, an average of thirty feet deep, and below the lake thirty to forty feet, deepening towards Québec to between sixty and a hundred feet. The one exception in the lower sections of the river was near Sainte-Anne-de-la-Pérade, where the water was generally twenty-four feet deep at low tide, with the bed strewn with large rocks and boulders, and a narrow bar of blue clay sixteen feet below the water at low tide.

Commencing at Montréal the modern navigable channel of the Saint Lawrence River runs along the left bank. It is deflected by shoals of stones, and at Pointe-aux-Trembles it is almost in the middle. At Bout-de-l'Île, where the Ottawa joins the Saint Lawrence in the form of the Rivière des Prairies and the Rivière des Mille Îles, the river is broken by a series of islands. The stream of the Saint Lawrence is broken into three, with the main channel taking the middle course. At Île Sainte-Thérèse the channel veers towards the right bank and Cap Saint-Michel, thus avoiding the dangerous cross currents at the confluence of the Rivière des Prairies and the Saint Lawrence.

The navigable channel continues along to the right of the Verchères Islands, then swings towards mid-stream past the Contrecœur Islands to avoid the flats. It then passes to the right of Île Saint-Ours, after which it rejoins the main river channel, which it follows as far as Sorel. At Sorel it turns northward between Île Lapierre and Île des Barques to enter Lake Saint Peter, through which it passes in a broadly curved course.

Leaving the lake, the channel keeps to the left past Trois-Rivières, then swings right to Île Dorval, then again left towards Champlain to avoid the

Batture de Gentilly.[8] It continues along the « north shore » as far as the Batiscan River, where it turns to the right again, towards Cap Lèvrard, to avoid the shoal caused by the entrance of the Sainte Anne River into the Saint Lawrence. The right bank is followed to Cap Charles, from whence the channel keeps roughly to the middle of the stream, where it is wide and deep the remainder of the way down to Québec. Below the Pointe-aux-Trembles shoal (between Donnacona and Neuville) the channel stretches almost from shore to shore. At the confluence of the Chaudière and the Saint Lawrence the latter narrows to half a mile, the stream flowing between steep banks on either side, in contrast to the low-lying country it has passed through.

This, as we have indicated, is the navigable channel, containing the modern shipping lane. But it was probably also the course of the main flow in the preimprovement age. For it was discovered, by painful experience, that the natural course of the main river, through its complex of islands and the shallow expanses of Lake Saint Peter, was the only channel that could be successfully deepened.

The level of water

The present (1961) level of water in the Saint Lawrence River fluctuates seasonally, varying from a spring maximum (due to snow-melt) to an autumnal minimum. Continued dredging in the channel, since 1844, has also lowered the level, particularly in the harbour of Montréal. The various underwater ridges in the river used to act as a sort of dam to keep the water back. With their gradual removal the water has been given more freedom in flowing to the sea, and so the level has fallen. Partly to counteract this small dams have been built in many places, such as between the islands at Sorel, to help hold the water back, particularly at low level. In fact the Department of Transport, under whose jurisdiction lies the navigation of the river, has become worried about this worsening condition, not only because of Montréal's harbour, but also because of the Saint Lawrence Seaway. If the water level is allowed to drop the larger vessels now using these facilities will no longer be able to do so. Contributing factors to the lowering of the level of the water in the Saint Lawrence River at Montréal and below are the deforestation of the valleys of the tributary rivers, causing faster runoff and a rapid loss of water early in the season ; and, the continuing search for fresh water in the region of the Great Lakes, which threatens to lower the water level in them by two inches in the next seventeen years, and, subsequently, in the Saint Lawrence River. It has therefore been deemed necessary to increase the flow into Montréal harbour rather than below the island, as at present, or to construct a chain of underwater sills or grated sluices between the islands on either side of the channel to reduce the rate of flow of the water.

[8] There are three terms used locally on the Saint Lawrence River to denote shallow areas. A *poulier* is a small area which is always under water. A *batture*, defined by the Oxford English Dictionary as « a river- or sea-bed elevated to the surface », is greater in area than a poulier, and is sometimes dry at low water. A shoal is used to denote a very large area which is covered with water at the flood stage, and which gradually becomes dry as the river level lowers.

In 1800 the problem of the level of the water was also crucial. But this was before the days of dredging, and fluctuation of the water level was wholly due to the change of seasons. In May and June, after the ice had left the Saint Lawrence River, the water level throughout the channel was at its highest, and it was then that vessels navigating the river had the easiest time mounting the river to Montréal. As the season wore on the depth of water in the channel became lower, and heavily laden vessels of bigger draught were forced to use lighters to pass through Lake Saint Peter. The lowest water for the season was generally recorded just before the ice dams formed.

Floods

Flooding was a common occurrence along the Saint Lawrence in early winter and late spring. Winter floods, particularly in that area between Montréal and Sorel, were the result of thaws and rain increasing the water in a river already being blocked by ice dams and covered with ice, though the water supply in the river at this period was at its lowest. The winter floods generally occurred in January, when the water would rise ten feet or more. These floods regularly damaged the settlements along the banks, so that a revetment wall of twenty-one feet was built at Montréal, along the harbour front, in the 1840's. In Lake Saint Peter the winter level of the water was about four to five feet higher than the summer, when the channel below the lake remained open, and seven to eight feet higher when the river was closed over by an ice bridge.

The spring floods were produced in very much the same manner as those of winter, but were usually of greater height due to the increased quantity of water shed by the land and the greater amount of ice thawing in the river. Such floods lasted anywhere from a few hours to several days. The flood of 1838 is said to have lasted fourteen days «but was probably less than half of this time above the ‹flood level,› which was established by the revetment wall several years later».[9]

River floods at Montréal have always been a common occurrence. Champlain, in 1611, took time to build a wall of local clay to see how it would withstand the spring floods;[10] and Maisonneuve, in December 1643, took precautionary measures to prevent the inundation of Ville-Marie in its first year.[11] After the floods of 1838 (the first to be measured by a known standard), 1840 and 1841, a revetment wall was built standing twenty-one feet above the summer level of the harbour, and supposedly one foot higher than the highest flood. The top was called the «flood level» because, until the water rose above it in 1861, there were no general inroads on the area immediately along the river, though a few streets along the city shore were flooded by the river through the sewers. In Montréal inhabitants of buildings along the shore were often forced to retreat

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[9] KEEFER, T. C., *Ice floods and winter navigation of the lower St. Lawrence*, p. 4, in *Royal Society of Canada*, Transactions, section III, 1898, p. 3-30.

[10] BIGGAR, H. P., *The works of Samuel de Champlain*, Toronto, 1922-36, v. 4, pp. 128-129.

[11] CHOUINARD, H.-J.-J.-B., *Paul de Chomedy, Sieur de Maisonneuve, fondateur de Montréal*, Québec, 1882, p. 44.

to the upper stories as the lower ones became inundated, and transport along the waterfront streets was conducted by small boat.

Other than piling ice on the bank of the river in the harbour area, and later on the wharves, winter floods had no effect on the shipping of the Saint Lawrence. Wharves were not usually removed in the winter, but every spring expensive repairs had to be made because of the damage done by the ice. It was generally recognized that the wharves would be submerged in the winter by water and ice. However, temporary sheds erected on the wharves in the summer were removed at the close of the season. There is, even today, a shed on the Victoria Pier which is erected and removed every year. Vessels left in the river were also damaged by the ice, and often by the elements. Buoys were removed from the river for the winter, and sometimes the lighthouses.

Tides

Tides had little effect on the navigation of the Saint Lawrence River, although they were measured in feet at Québec and inches at Trois-Rivières, because between the two points the channel was sufficiently deep to afford passage for the largest ships of the time, even at low water late in the season. The range of the tide was affected by the state of the river, being greatest at low water stage, so that there was a variation in the range of tide of about one foot. Also in the spring, when the water in the river was at its highest, the tide took longer to progress upstream than in the fall when the water was low.

The tide in Lake Saint Peter was berely perceptible, being only three to four inches, unless assisted by an easterly wind, and thus had no effect upon navigation. There is no record of a vessel being stranded by tide or refloated after grounding. The tidal effect was lost altogether in the islands at the head of the lake.

Naturally in modern times, a far more detailed picture of the tides has emerged. The tidal surge comes from the Gulf into the estuary and so up the river. The crest of the tidal wave takes about seventy minutes to go from Sept-Îles to Tadoussac, after which it becomes slower as the river becomes shallower. High water at Saint-François-d'Orléans is about three hours later than at Tadoussac. In the shallow and narrower portions of the river the range of the tide does not increase, and eventually disappears in Lake Saint Peter.

As the river becomes narrower the rise in high water level rises, and where it widens it falls, as for instance, above the Québec Bridge. The rise in high water level is balanced by a rise in the low water level due to the slope of the river; and as the slope increases the high and lower water levels converge until they meet at the highest point on the river reached by the tides.

Above Québec the water draining off the land into the river may cause the river level to vary some seven to eight feet, and so the tidal variation at its extreme point in Lake Saint Peter is virtually insignificant.[12]

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[12] CANADA, HYDROGRAPHIC SERVICE, *Atlantic coast tide and current tables*, 1961, Ottawa, 1961, pp. 139-140.

Table 1 (on pp. 286-287), taken from the *Atlantic Coast Tide and Current Tables, 1961*, gives the average heights of the highest high waters and lowest low waters for each month of the navigation season, relative to chart datum.

Ice

During the 1830's, when improvements to the navigation channel were being considered, the ice in the river during the winter months stopped shipping completely. The Saint Lawrence was usually frozen over from December to March, and navigation was closed from about November 25th, when the buoys were removed from the channel, until April 25th. Ships remaining in the river after that time found the passage extremely dangerous. However, by the 1870's enough ships stayed after the deadline to necessitate leaving the buoys in the channel until the last vessel of the season had left. Because of this many of the buoys, constructed largely of wood, became frozen in and were destroyed by the ice movements during the winter. Some were recovered by cutting through the ice, and others were total losses. However, it was felt that the cost of replacing these buoys was justified by the benefit derived from the late ships in not suffering loss, injury or detention. It was later found that iron buoys suffered little damage from the ice and could be left out all winter in that part of the channel passing through Lake Saint Peter. Ships left in the river for the winter were generally pulled up onto the beaches, so that they would not be crushed by the ice. Captain Bayfield reported[13] that anchors laid down below the high water mark to secure vessels which had been hauled onto the shore had to be removed in the spring, or risk being carried away by the ice. In one instance an anchor weighing about half a ton was moved several yards by the ice, breaking the heavy chain-cable which secured it. Had the anchor not been cut out of the ice it would have been lost in deep water when the ice melted.

It was not an uncommon occurrence for ships to be caught in the ice and detained all winter in the river; in fact it was a definite hazard to navigation late in the season, so much so that *The Gazette*, Montréal, for September 4th, 1832, carried an advertisement for a local shipping firm stating that if their ships were caught in the ice the owners of the cargoes would only be charged for the distance carried, and that the cargoes could be forwarded by sleigh, at the owners' risk, when the winter roads had been formed.

The Saint Lawrence passed through a region of severe winter conditions. Early in December ice usually started to form along the shores, around the islands and rocks, and in the shoals. The wind caused pieces to break off, and they followed the current downstream and became attached to the shore ice there. As the ice spread from either bank the ice floes became jammed between them. After a night of severe frost an ice bridge might be formed, generally by the end of December. When this happened, usually where the Saint Lawrence,

[13] BAYFIELD, H. W., *A notice on the transportation of rocks by ice*, in *Geological Society of London, Proceedings*, v. 2, No. 43, 1835-36, p. 223.

split into many channels, enters Lake Saint Peter, the floating ice packed in upstream towards Montréal. The ice packed in so tightly that little room was left for the unfrozen water to flow in, and there was a noticeable rise in the waters upstream.[14] Lake Saint Peter, in its shallower reaches, froze to the bottom. In spite of the work of the modern icebreakers, this still happens on a smaller scale.

Table 1 ***Québec to Lake St. Peter : average of highest and lowest levels, at high and low tide Heights are above chart datum.***

Place	*May*		*June*		*July*		*Aug.*		*Sept.*	
	H'st.	*L'st.*	*H'st.*	*L'st.*	*H'st.*	*L'st.*	*H'st.*	*L'st.*	*H'st.*	*L'st.*
	Feet		*Feet*		*Feet*		*Feet*		*Feet*	
Québec (Lévis)	19.8	0.6	19.1	0.5	18.8	0.2	18.6	0.1	18.5	−0.1
Neuville	18.5	1.9	17.2	1.4	16.4	0.8	16.1	0.6	15.9	0.1
Pointe-Platon	19.3	3.4	17.8	2.5	16.8	1.8	16.0	1.1	16.0	0.8
Lotbinière	16.8	4.4	15.2	3.5	14.4	2.4	13.2	1.3	13.3	1.2
Grondines	15.2	4.1	13.0	2.3	11.9	1.4	11.5	0.7	11.3	0.1
Cap à la Roche	13.3	4.0	11.4	2.4	10.2	1.4	9.7	0.8	9.6	0.3
Batiscan	10.3	4.3	8.2	2.6	7.0	1.6	6.4	1.0	6.2	0.4
Trois-Rivières	9.1	4.4	6.1	2.6	4.5	1.5	3.8	0.8	3.5	0.2
Lake St. Peter	8.1	4.1	5.0	2.2	3.3	1.2	2.6	0.6	2.3	0.1

Sir William Logan was impressed by the shove of ice at Montréal.[15] He stood fascinated for hours watching the Saint Mary's current as «league after league» of ice flowed past him to be crushed on the ice bridge downstream and be crammed beneath it, causing the water to rise gradually upstream. The Saint Mary's current itself, however, was too swift to freeze over, and was largely responsible for the immense ice jam at Pointe aux Trembles.

Ice jams below Lake Saint Peter generally formed during late December and early January at Portneuf or Cap-Rouge, though sometimes the river remained open from the foot of the lake to the Gulf.

The ice eventually attained a thickness of ten to twenty feet. With a rise in the water level, large pieces of ice were raised up and put into motion, only to pile up once more on every obstacle encountered. When the ice was forced into narrow channels the lateral pressure exerted would drive the shore ice up onto the banks where it accumulated to great heights—forty to fifty feet. In Montréal it covered the wharves, and often damaged the storage sheds along them, as in 1836, when the ice shove pushed down Handyside's distillery at Pointe à Callières.[16] Logan mentions a warehouse built on the waterfront in Montréal before the construction of the revetment wall. The ground floor was about eight feet above the summer level of the river. When the ice formed the

[14] LOGAN, W. E., *On the packing of the ice in the River St. Lawrence*, in The *Canadian Naturalist and Geologist*, and *Proceedings of the Natural History Society of Montréal*, v. 3, 1858, pp. 115-122, pp. 166-117.

[15] LOGAN, W. E., pp. 117-118.

[16] CANADA, PARLIAMENT COMMISSION to enquire into the causes of the floods at Montréal, and to suggest the necessary remedies to prevent their recurrence : Report, Montréal, 1890, p. 11.

ground floor was soon inundated, and the whole building was surrounded by ice. Ordinarily, the shove of the ice would have been sufficient to knock the building down. However, the owner had taken a very simple precaution against this. Oak logs were laid against the walls of the building at an angle of about forty-five degrees. As the ice approached the building it was pushed up the wooden ramp, and, on reaching the vertical wall at the top, fell back upon itself, thus forming a wall of ice protecting the building from further danger. Another warehouse built close by, without the protective logs, was immediately razed by the ice. The building of the revetment wall put an end to this destruction.

respectively, for each month.

Oct.		*Nov.*	
H'st.	*L'st.*	*H'st.*	*L'st.*
Feet		*Feet*	
19.0	−0.7	19.3	−0.6
16.6	−0.3	16.6	−0.1
16.5	0.6	17.4	1.5
13.8	1.1	14.8	1.6
12.8	0.2	12.3	0.8
10.1	0.4	9.9	0.9
6.8	0.6	6.8	1.1
4.0	0.3	4.1	0.5
2.6	0.0	2.7	0.1

The ice shove also caused huge boulders on the shore to be pushed farther up the banks, though not often to any great distance, and left. Boulders thus deposited on Montréal's wharves were a constant source of dismay.

With spring break-up the great bodies of ice in the middle of the river were carried away, leaving the marginal ice to be melted by the warmth of the sun. Boulders in the middle of the stream were also moved by the ice, sometimes further downstream, and at other times towards the shore, and even up onto the bank until they were pushed beyond the limits of the influence of the ice. Keefer says [17] that the boulders were sometimes dropped in the ship channel below Montréal. These must have been a considerable hindrance in a shallow channel.

Lake Saint Peter

Having considered the channel, the water levels and the hazards of ice and tide, we must now revert to the prime obstacle—Lake Saint Peter. Its broadest part was about six miles, and its length, taken in a southwest-northeasterly direction, was about eighteen miles, according to the navigational pilot for 1860. However, owing to the islands at the head of the lake its length has been given variously as fourteen miles, sixteen miles, and twenty miles. It was naturally very shallow, there being a general overall depth of about twelve feet at low water, here and there silted up to a few feet. The slightly deeper main channel of the river took a northerly gently curving course through it, the result, according to Captain J. Beaufort in a letter to Captain (later Admiral) Henry W. Bayfield, of the action of the Yamaska and Saint Francis rivers. Along either shore of the lake was a broad margin of shoal water some two miles wide on the north side and three and three-quarters miles on the south.

At Sorel the river branched around a large group of islands before entering the lake proper. The pattern of these islands indicates that the delta was made of «silt washed into the lake by the Saint Lawrence river, without noteworthy

[17] KEEFER, T. C., *Ice floods and winter navigation of the lower St. Lawrence*, p. 11.

contribution from the Richelieu, which enters at one side of its apex, near Sorel. »[18] The silts of this delta originated in the Saint Lawrence's channel cutting near Verchères Wood.

The lake itself was crossed by three « banks » or « bars » enclosing two pools or sections in the channel more than twenty feet deep. The upper pool was one and a quarter miles long and nearly half a mile wide. The main bar dividing the two pools was known as the « flats of Lake Saint Peter » and for about nine miles it restricted the channel to a depth of about twelve feet. The top of the bar was almost level, being eleven to twelve feet deep at low water. The upper bar was known as Batture du Lac, and it was one and a half miles, between the depths of twenty feet at low water in the pools on either side. The lower bar (opposite the Nicolet River) was about sixteen feet deep, and it was about one and a quarter miles from the twenty foot soundings on either side.

The flats were formed of fine clays swept out from the numerous channels formed by the islands at the head of the lake. However, this action took place at a remote period in time, probably in the late Nipissing–Great Lakes stage ; the supply from which they were formed has since been exhausted. « ... and the river having cut out its required dimensions of channel, has protected these from further encroachments by lining of stones, sand and gravel ».[19]

The bed of the lake is largely thick layers of blue clay with a limited amount of very fine sand. Logan, reporting in 1850,[20] found that the clays taken from bores made in the lake were nearly pure clay, with such small proportion of sand as to be negligible. This clay, however, was covered with a small and varying film of sand which was sufficient to resist the currents. He said that « very probable the whole of the bed of the lake will be found to consist of soft argillaceous mud ... ».

It is interesting to note that in the early days of the controversy over the channel in Lake Saint Peter even the most experienced navigators of the river were convinced that a channel through the lake, once dredged, would not maintain itself, but would need constant care ; though as early as 1826 Col. John By, of the Royal Engineers, had declared that the specimens of soil from the bottom of the lake that had been shown to him were of such tenacity as to make him believe that the dredged channel would « remain clear for ages ». Later experience proved By to be right. The channel once dredged is almost permanent. This is graphically shown on a portion of the Canadian Hydrographic Service's chart for Lake Saint Peter. The remains of the straight channel can still be seen, though dredging stopped there over a hundred years ago. The nature of the bottom of Lake Saint Peter, and the absence of rock, thus meant that the dredging of a shipping channel through it was a definite possibility.

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[18] GOLDTHWAIT, J. W., *The post-glacial marine submergence of the St. Lawrence valley*, p. 108.

[19] GOLDTHWAIT, J. W., p. 108.

[20] MONTRÉAL, BOARD OF ENGINEERS, Report, Montréal, 1850, pp. 19-20.

THE IMPROVEMENT OF THE CHANNEL

Enough has been said in the previous chapter to make it clear that Montréal could be made into a major seaport only by ambitious and far-reaching measures. Whatever the ambitions of Montréal's merchants—and they *were* far-reaching—they had to contend with formidable natural obstacles. It was a battle fought, and won, in the first half of the century that saw the triumph of steam over sail, and of the iron ship over the wooden ship.

In this section we shall analyse the process in terms of three topics, not by any means independent, but forming natural groupings. The first is the Trinity House movement, which represented the extension to the Saint Lawrence of officially disciplined navigation. The second topic is the history of channel marking by means of lights and buoys. And third comes the deepening and straightening of the channel. These three items together combined to transform the inland city's status, and to lay the foundations of her modern paramountcy.

Trinity House

In 1805 the need for regulating pilots and shipping in the harbours of Montréal and Québec and for improving the Saint Lawrence River being felt, a «Trinity House» was founded at Québec with complete control over pilotage and navigation on the river, and Montréal came under its jurisdiction. Three of the seven wardens were to reside in Montréal, while the Master of the Trinity House of Québec could appoint the Harbour Master of Montréal and other officers. Meetings were to be held in both cities. This Trinity House was responsible for the safe navigation of the Saint Lawrence from the first rapid above the city of Montréal downstream to Québec. It was also responsible for the buoys, lights, beacons and landmarks necessary to mark the channel, the clearing away of rocks and other debris, the improvement of the two harbours of Montréal and Québec, the ships anchored in port and their safety measures against fire, and for the pilots and their apprentices.

It was not until 1832 that a Trinity House was established in Montréal, independent of Québec. Even then it was by a temporary statute which expired on May 1st, 1837. In 1839, however, an ordinance of the Special Council was passed entitled *An ordinance to suspend in part certain acts therein mentioned and to establish and incorporate a Trinity House in the City of Montréal.* This Trinity House was to be independent of that in Québec, and was enabled to make its own laws, license pilots, appoint harbour masters, clerks, bailiffs, etc. It was to place the lights, buoys, and other aids to navigation in the ship channel of the Saint Lawrence within the limits of the port of Montréal (i.e. Portneuf basin to the provincial line). It could hear disputes between the masters of ships and pilots, complaints against pilots, and complaints between pilots and the harbour authorities. It could also hear and determine all matters relating to any beach along the Saint Lawrence River, or of any other rivers within the

jurisdiction of the Corporation. It was empowered to purchase islands, lands, premises, etc., for use in improving the navigation of the river; for building lighthouses and erecting beacons and landmarks, as well as for building a headquarters in Montréal; and it could buy either a sailing vessel or steamboat to facilitate the examining of the channel of the Saint Lawrence and other navigable streams within its jurisdiction, and to help maintain buoys, lights, beacons, etc. It was also the responsibility of the Trinity House to establish funds for pilots no longer able to work, and for widows and children.

The Trinity House of Montréal remained active until 1873, when all its powers and liabilities were transferred to the Corporation of the Harbour Commissioners of Montréal. The Trinity House of Québec, however, was continued on a reduced scale after 1870, attending only to pilotage matters connected with the Saint Lawrence River below the city, harbour-master duties, and «other questions relating to shipping as provided by law». The management of all the lighthouses, light-ships, buoys and beacons formerly under the control of the Québec Trinity House was transferred to the Department of Marine and Fisheries by an act passed in the Legislature the previous year, but since it was not deemed advisable to change the management in the middle of the navigation season, fearing that it might interfere with the «efficient working of these important services at a time when they are most required», the Department did not take over until 1870.[21]

Lights and buoys

Before the early 1830's the Saint Lawrence was a difficult river to navigate. Lights and buoys were virtually unknown, and charts were scarce and unreliable. Therefore, ships could only be sailed in daylight and instead of those more conventional aids to navigation, churches, houses, trees and the like were used by the pilots to mark the channel.

It is interesting to read the following questions and answers made at the examination on June 28th, 1845, of one Hector Hamelin, a candidate for a pilot's license. Though his answers seem to be consistently incorrect they do give some idea of the mode of navigation of the time.[22]

> «2°. *Question by Captn. Coffé.* — When coming off the Batture des Grondines, what are your marks for knowing you are in the Channel?
>
> «*Reply.* One is, a tree in a line with a house or barn; another is, a tree between the two steeples of the Church of Lotbinière.
>
> «This reply was objected to, because if those marks are followed a Pilot would get his vessel ashore.
>
> .....
>
> «9°. *Question.* What marks are known to you to point out when to draw to the Northward, on leaving the upper end of Lavaltrie island?

[21] CANADA, DEPARTMENT OF MARINE AND FISHERIES, *Annual report*, 1870, p. 17.

[22] MONTRÉAL, TRINITY HOUSE, *Minute book from 1839 to 1847*, pp. 277-279.

« *Reply*. A windmill on the Isle Bouchard opens with a channel: and when so open, I shape my course to the Northward & consider myself clear of the Lavaltrie Shoals. I have no other mark.

« Objected to, because those marks the pilots declared are not those that are required for the safety of a ship.

. . . . . .

« 13°. When the Varennes Islands are overflowed, have you any marks by which you can steer through them in safety?

« *Reply*. No,—I have no marks.

« Objected to, because he should know marks. »

Needless to say, he was not granted a license at this time!

This tradition of navigating the Saint Lawrence was not entirely abandoned when the channel was finally lighted and buoyed, as evidenced by the following excerpt from the Saint Lawrence pilot of 1894 :[23]

« Buoys—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should therefore be regarded as warnings and not as infallible navigating marks, especially in exposed positions; and a ship should always, when possible, be navigated by bearings or angles of fixed objects on shore and not by buoys. »

The same paragraph is repeated in the 1906 and 1916 editions of the pilot.

As early as 1831 a range light was in use for the traverse at Lavaltrie. Others followed, such as that at Cap-de-la-Madeleine, built in 1843, Batiscan and Champlain built in 1844, and Port St. Francis, built in 1849. The « second light » in the middle of Lake Saint Peter has been in use since 1816, and was later incorporated into the range light there.

As late as 1854 the Harbour Commissioners reported that the channel of the river between Montréal and Québec was not as well lighted and buoyed as the safety of the navigating vessels required, as adduced from the numerous accidents occurring every year. Buoys were often too small to be seen, and were moored insecurely. Complaints were regularly received by the Montréal Trinity House, such as the following, made by Oliver Boudreau, two Charles Hamelins and David Bouies on May 16, 1846 :[24]

« 1° That the Beacon on L'islet à Mèrand is not placed this year.

« 2° That the Buoy on the Batture du Lac, between the Upper Floating Light and L'isle aux Raisins was out of its place, a distance of three acres.

« 3° That the Buoy on the Batture des Isles Plattes was about an acre & a half out of its place.

« 4° That, since the Windmill at Windmill Point, above the Harbour of Montréal, has been removed pilots have had no mark whereby to lead through the channel above the Island Wharf. »

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[23] BAYFIELD, H. W., *The St. Lawrence, comprising sailing directions for the gulf and rivers*, 6th ed., London, 1894.

[24] MONTRÉAL, TRINITY HOUSE *Minute book, from 1839 to 1847*, p. 300.

These complaints were attended to as a matter of course; for example, a buoy was placed on the batture at Windmill Point to replace the windmill as a navigational aid.

Buoys, moreover, did not always go astray by themseves, as indicated in a complaint, *the Harbour Master versus Paschal Mercier.* Mercier was accused of having wilfully removed a navigational buoy from the river. It had been necessary to provide an act whereby anyone caught purposely destroying buoys, lights, beacons, landmarks, or any other aids to navigation could be given a year's jail sentence, and severely fined. Vessels passing too near to buoys sometimes dislodged them; rafts were notorious for doing so.

In 1822 an act was passed in the Provincial Legislature requiring that all boats navigating the Saint Lawrence at night, or at anchor in it, should carry lights between dusk and day-light. In the Minutes of the Trinity House of Montréal for March 1828 a suggestion was made that a floating light be established in Lake Saint Peter at the « Trow, » a spot where the course of the channel changed abruptly, and the water shoalled suddenly. This light would enable vessels to sail at night through this difficult portion of the river and lessen the number of accidents common there. In April of the same year a notice went out that a Durham boat, or a similar vessel, was wanted to act as a floating light in Lake Saint Peter.

A petition dated 8th January 1842 was made by the Trinity House to the Board of Works to build lighthouses within the limits of Montréal harbour, that is, between the basin of Portneuf above Québec to the provincial boundary line, including Lake Saint Peter. These included:

1. near Saint Croix Mill, where there is a sudden turn in the channel; it would be of service to navigators from Saint Augustin to the foot of the Richelieu Rapids;

2. on the south shore at Grondine, where there was another quick turn in the channel. This light would service the fourteen miles between the Richelieu Rapids and Cap Roche;

3. at Point Saint Pierre, to indicate a quick turn;

4. at Batiscan, to indicate a narrowing of the channel;

5. at Provanché Bay, to indicate the narrows off Batture à Bigo;

6. on the point below Poulier Provanché, to indicate the narrow channel;

7. at Pointe-du-Lac, to show the course up the lake;

8. at the Little Traverse a floating light was suggested to show the channel between the shoals formed by the Saint Francis and Du Loup rivers;

9. on Isle du Raisin, at the head of the lake, being indispensible to vessels ascending the lake after dark;

10. at Isle Sainte Thérèse.

This petition went on to say that should all ten of these lights be provided, in addition to the ones already in existence, most of the serious difficulties in navigating the river would be met, and vessels would be able to sail up and down

the river at all times, except during fogs and stormy weather. A letter dated February 14th, 1842, from Mr. Charles Atherton, of the Board of Works, informed the Montréal Trinity House that the lights, as suggested above, were to be installed.

Up to the early 1840's a variety of lamps had been used to light the channel, no two lighthouses being supplied with lamps, reflectors, glasses, and other equipment of the same make. This caused a good deal of trouble and expense. By 1844-45 a good many of the lights were in need of repair, and the Board of Works reported to the Legislative Assembly of the Province of Canada that since nearly seventy new lights were required they should endeavour to outfit them with the best equipment procurable, and all of the same description, as well as to provide spare parts where necessary. The report went on to state that, since even the best equipment could not function properly without proper and adequate care, future lighthouse keepers should be appointed from the « naval class », these men being most acutely aware of the necessity of watching a light faithfully. Any keeper found neglectful should be immediately dismissed. By 1847 the lamps had been greatly improved, and standardized.

The lighting of the channel between Montréal and Portneuf was under the management of the Trinity House of Montréal, the expense being defrayed out of the provincial coffers. The cost of the buoys marking the channel between Montréal and the lower end of Lake Saint Peter was provided by the Harbour Commissioners of Montréal; this body had been created by an act of the Legislative Assembly in 1830.

There have never been any fog signals in the Saint Lawrence River above Québec, though there are frequent fogs in the area, and in early spring and late fall there are very dense snowfalls which severely limit visibility. At sea a vessel could safely change its course when warned of land by a fog signal. In the river, where the channel is comparatively narrow, course could not be changed without endangering the safety of the vessel. At such times the vessels anchored, as they do today, until it was safe to procede.

By 1847, when the shipping channel of the Saint Lawrence was finally settled on, navigation aids along the river had been greatly increased and improved, and as passage up the river to the ever-improving harbour of Montréal became less dangerous, more and more ships were induced to make the voyage. The one deterrent to easy access to the harbour of Montréal remained the Saint Mary's current, the name given to the passage of the main bulk of Saint Lawrence River water between Île Ronde and Montréal. The rate of this current was ordinarily four and a half knots.

Deepening and straightening of the channel

Discontent with the natural state of the Saint Lawrence River and the lack of navigational aids on it grew steadily, until in February 1826 a committee of merchants of Montréal made a petition to the Legislative Assembly of Lower Canada, stating that because of the shallowness at Île Platte, and in Lake Saint

Peter, ships found the passage up to Montréal difficult, except in the early spring when the water was high ; during the rest of the season large vessels were either prevented from going up to Montréal, or could only do so after discharging most of their cargoes into lighters, thus increasing the cost. The merchants requested that the obstructions in the channel be moved so that the river would be navigable from the sea at all time during the navigation season. The petitioners pointed out that, as a result of investigations made by their committee, it was known that the channel could be deepened without too great expense to a depth (unstated) that would allow ships of two hundred and fifty tons burden to pass without difficulty at low water. The House resolved to refer the whole question to a committee of five.

This committee took its responsibilities seriously, and called several witnesses to answer its questions on the nature of the bottom of Lake Saint Peter and the shoals in the channel, and to make suggestions for the improvement of navigation. As a result of their investigations the committee doubted that the undertaking could be successful because the members thought that a channel dredged in Lake Saint Peter would be immediately filled with sand, particularly when the wind moved the waters of the lake, However, since the matter was of great importance they were interested in looking into it in greater detail, and examined witnesses who could give them first hand information, such as pilots and « river craftsmen ». It was not until the late 1850's, after many investigations had been made, that the idea that the channel would continuously fill itself in was finally dispelled.

In the spring of 1831 Captain Henry W. Bayfield agreed to make a survey of Lake Saint Peter for the Province. As he was already surveying the Saint Lawrence for the Royal Navy there was no cost to the Province for his services. The survey was completed in October, and a detailed report on Lake Saint Peter presented to the House in December of the same year.[25] In this report Bayfield pointed out that the channel between the islands at the head of Lake Saint Peter was already sufficiently deep for vessels. However, the lake itself was crossed by bars, the largest one, in the middle of the lake, being six nautical miles across. He was of the opinion that this could be cut through, although it was a great distance to deepen a channel. However, it would be necessary to have a dredge constantly at work as the sand would be continuously washing into the channel, and he was doubtful whether a deep channel could be maintained.

In 1836 another petition was presented to the House by « divers Merchants and other of the City of Montréal » praying for a grant of money for the purpose of making an accurate survey of the obstructions in the navigation of Lake St. Peter, and the River St. Lawrence upwards to Montréal. » Captain Bayfield, who was again surveying in the Saint Lawrence River, was asked if, to his knowledge, he thought it would be possible to deepen the channel sufficiently to allow ships of a greater burden to proceed to Montréal than those then employed. He replied that he considered it « a work of great difficulty », but suggested excavating the channel through the Saint François shoal, a distance

[25] *Journals of the House of Assembly of Lower Canada*, v. 41, 1831-1832, pp. 174-176.

of about two miles, or through the flats, a distance of about four and a half miles. He was still of the opinion that the channel might be filled by sand washed down by the river, as the current over the flats was too weak to keep the channel clear. Since the flats were of clay covered with a thin layer of sand, however, a dredge would be able to keep it clear, particularly since there were no quicksands in the part to be deepened.

Nothing more of an official nature seems to have been done until 1841, when a Special Committee, appointed to investigate the petition made by the Montréal Board of Trade, reported that Mr. David Thompson, the noted explorer and surveyor of western Canada, then living in Longueuil near Montréal, had been instructed to survey Lake Saint Peter, and had estimated that it would take three years and cost about £35,000 to do the job. In the evidence given before the Committee Mr. Edmonstone, of the firm of Millar, Edmonstone and Allan, was asked what portion of the navigation season ships of sixteen foot draught found it necessary to employ lighters on passing through Lake Saint Peter on the way to Montréal. He replied that, even though the water level began to fall as soon as the ice went out of Lake Saint Peter, the ships seldom required lighterage in the spring, the waters coming downstream in the middle of May and beginning of June being sufficient to allow ships of sixteen foot draught to proceed up to Montréal fully loaded; as soon as the spring high water had passed, however, the vessels required lighterage. Mr. Edmonstone was also asked if he thought ships of sixteen foot draught were a suitable class of vessel for the trade to Montréal. He replied that he thought they were very well suited for the existing state of navigation, except in the middle of the season, when the water became so shallow in Lake Saint Peter (and a few places above it) that ships with a draught greater than twelve and a half feet, and sometimes even less, could not pass. The regular trading vessels could take little freight on board at that time of the year. He testified further that if the channel were deepened to a depth of sixteen feet throughout, for the whole of the navigation season, there was no doubt that many more vessels would mount the river to Montréal. If they did not obtain full cargoes of flour, wheat and ashes they could resort to lumber for part of their cargo. A greater number of vessels had resorted to Montréal that year (1841) in the expectation of large quantities of wheat and flour to be shipped during the summer; in fact more arrived than were necessary. Many took cargoes of lumber instead, and some had to return to Québec for their cargoes of wood. He remarked that these ships would profit more in carrying freight between Montréal and the United Kingdom if they did not have to pay the high lighterage and towing fees, so the quantity of lumber shipped from Montréal every year would increase and be in regular supply to shipping.

The representatives of other Montréal shipping firms gave similar answers. Mr. Andrew Shae, of Montréal, said he was of the opinion that « 16 feet of water during the season would double the number of vessels in one year ... »; also, if the navigation were improved to sixteen feet at low water, many ships would no longer need to be towed on their downward trips in fear of going aground in

Lake Saint Peter, when their ships were drawing almost as much water as was reported on the shoals.

Grounding on the shoals seems to have been a common occurrence, and accounts, such as this one published in *The Gazette*, Montréal, May 14th, 1833, show that they were the rule rather than the exception :

> « The *Richard Watson*, on her way from Montréal to Québec in tow of the *Voyageur*, got aground in the Lake on Friday forenoon, although drawing only 14½ feet. She immediately commenced discharging into the *Voyageur*, and would soon be got off. The *Canadian Eagle*, on her last trip down was aground at Berthier nearly thirty-six hours, but got off without damage. »

The result of the official, lengthy and detailed report to the Legislative Assembly made by the *Special Committee to Whom was Referred the Petition of the Board of Trade of Montréal* ... was that the Board of Works in its Report for 1841 recommended that about £1,000 should be made available to the Harbour Commissioners to have their steamship outfitted « so as to have the nature of the work fully and practically tested, prior to any large expense being entered into ».[26] Operations soon followed, together with a lengthy, not to mention expensive, dispute over the « straight » or « new » and the « crooked » or « old » channels through the lake.

The decision was made by Mr. Hamilton H. Killaly, Chairman of the Board of Works, Canada, on the advice of Captain Bayfield, to adopt the straight channel through Lake Saint Peter. The shoal at the head of the lake would be dredged, and the channel generally deepened by rakes. « Groins », formed of piles, interlaced with large brush, would be built across the channels not being used at the head of the lake in order to help turn their waters into the direct course.

Mr. Killaly was enthusiastic about the proposed channel. He wrote to Captain Bayfield that he was convinced that, if anything was going to be accomplished, it would be with the straight channel, and that the advantages to be gained by the new channel, such as the lessened risk of collision, and the great facility of working in it as compared to the circuitous channel then being used by trade, were sufficient to justify the experiment. Killaly felt that a lighthouse built on a substantial isolated pier should be constructed at each end of the channel. These, in conjunction with the straightness of the channel, would enable it to be used at all times, and he had no doubt that « the constant passage of the steam vessels [would] much aid the stream in the keeping clear and deepening of the channel ».

During 1843 little actual work on the new channel was done, although there were tests of the machinery to be used. However, the progress made during the next season was reported to be very satisfactory, in fact far greater than expected, so that Mr. Killaly ventured to note that it was his conviction that success would be certain and speedy. Two steam dredges were in use,

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[26] *Journal of the Legislative Assembly of the Province of Canada*, v. 1, 1841, Appendix DD, no pagination.

with two engines and one chain of buckets each, also two steam-tugs, one working with the scows dumping the material dredged as near the «south» shore as possible, and the other, when not assisting the first, working with the rakes. Discharging scows, fuel and lighters completed the vessels used.

In his report of 1843 entitled *Report on proposed proceedings in Lake St. Peter,* Charles Atherton, then superintending Engineer of the Lake Saint Peter Improvements, wrote that in his opinion the old winding channel should be improved, lighted and buoyed, as the only means of achieving a passage for deep draught vessels; he suggested that «*each season's* operations to be in a degree beneficial throughout the whole line, and affording a test whereby the propriety of further expenditure may be determined».[27] Atherton then went on to give his reasons for preferring the old «tortuous» channel to a straight one. Though the straight channel proposed to make use of the pool of thirteen foot water extending from the mouth of the Saint Francis River to Pointe-du-Lac, it necessitated cutting through the widest part of the Saint François Bank, a distance of about two and a half miles. Doing so would not divert a significant amount of water, and, he thought, the bank would, in time, be naturally restored to its original condition. The channel proposed would be twelve to thirteen feet deep, and would therefore need to be dredged for a distance of eight and a half miles to equal the depth of water in the pools. Further, he did not agree with the closing up of various channels into which the Saint Lawrence divides itself on entering Lake Saint Peter, in order to divert the main flow into one channel. He felt that the scouring effect so produced would only be lost when the water was allowed to spread out on entering the lake, and would not restrict itself to the dredged channel. At the suggestion of building a dam across the outlet of Lake Saint Peter at Pointe-du-Lac to raise the level of the lake to the desired height he scoffed «Even admitting that all this were effected, the lake would be converted into a sort of cesspool, having a gradual tendency to equalization throughout.»

By 1845, at the height of the controversy over the channel being prepared, Mr. C. D. Armstrong, a mariner, in his petition to the Provincial Secretary, remarked on various points which those in favour of the straight channel had chosen to ignore. These included the fact that the «very crooked» and «very circuitous» route of the old channel was not grossly unsuitable, and was sufficiently safe and wide for navigation; that the depth of water in the old channel, with the exception of one bar which could be easily dredged, was between eighteen and twenty feet, that the cost of deepening the channel from Rivière du Loup in Lake Saint Peter to deep water would be the same as deepening the whole of the old channel through the lake; that the distance saved by straightening out the channel was only about one mile; that it was easier to work in the old channel than in the new; and finally, that if dams were built between the islands at the head of the lake they would possibly cause the flooding of valuable farm-

[27] *Journal of the Legislative Assembly of the Province of Canada,* v. 5, 1846, Appendix UU, no pagination.

lands, and the increased current in one narrow channel would increase the risk of ice jams.[28]

After one year's work on the project one ship, the *James Campbell,* had made its way up the new channel without mishap; the channel was then still only twelve to thirteen feet deep at its shallowest point. Public opinion by then was hardening against the project. *The Gazette,* Montréal, for October 9th, 1845, suggested abandoning the new channel in favour of improving the old, as the cost would be less, the work easier and the result a channel safer for navigation than the straight one.

In spite of this, in his report of 1846, the Chairman of the Board of Works announced that the operations had progressed satisfactorily during the year. Soundings had been taken accurately during the winter through holes drilled in the ice to show exactly how much work had been done. It was their aim to have a channel one hundred and fifty feet wide, and fourteen feet deep at lowest water.

The *Commissioners of Enquiry into the Management of the Board of Works,* set up by the Legislative Assembly, were appointed in response to a petition that an inquiry be made into the mode of doing business of the Board, the discharging of their duties, and the expenditure of public funds. They had an extensive survey made of the work done and to be done in Lake Saint Peter, and after consideration of the information derived from the various sources they supported the action of the Board in choosing the straight channel, stating[29]

> « That the new and straight line adopted by the Board of Works, and now in progress, is preferable to the old and circuitous channel, and that the Board is fully borne out in the adoption of this line by the valuable opinion of Captain Bayfield and other scientific men in England. »

They argued that though it was not admitted that it would have cost half as much to improve the old channel as it did to make the new, the advantages of a straight over a crooked channel, from the standpoint of navigation, and also the fact that it would be easier to keep open, justified the added expense. Also, when the new channel was finished, shipping would have two usable channels, one to serve vessels of a shallow draught and the other for those of a larger draught. This would diminish the risk of collision, and the arrangement could be put into effect by a by-law of the Trinity House.

In their report to the Board of Works made in 1846, the Commissioners of the Enquiry noted that between December 1841 and December 1845 a total of £59,994 had been expended on operations in Lake Saint Peter, of which £37,937 had been spent on steamers, dredges, scows and machinery. By December of the following year the total expenditure amounted to £68,246.

The controversy still raged. Everyone held firm opinions about what should be done, what would happen if it was, and what disasters would occur if the « other » course of action was followed.

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[28] *The Pilot,* September 2nd, 1845.

[29] *Journal of the Legislative Assembly of the Province of Canada,* v. 5, 1846, Appendix PP, no pagination.

The Select Committee to Whom was Referred that Part of the Report of the Chairman of the Board of Works Which Refers to Lake St. Peter in May 1846 inspected the disputed waters in a ship loaned to them by the Board of Works. The weather proving « propitious » they made their own set of soundings in both channels, at four minute intervals, and then reported on their findings to the Legislative Assembly on the 1st of June following. They also collected the opinions of various of the protagonists, some of which are given below.

Captain Bayfield was asked if he thought it would be practical to deepen the channel through Lake Saint Peter to allow larger vessels to proceed to Montréal than were then capable of doing so. He replied « Yes, I think it is possible, although I consider it a work of great difficulty. » Part of his testimony is of direct interest and is cited *verbatim* :

> « ... it may be done by excavating the present Channel through the St. Francis shoal for a distance of two miles, by which, however, only six inches or at the most one foot increase of depth would be gained. To obtain a greater depth a Channel must be excavated through the Flats of Lake St. Peter four and a half miles in length, a work which would require so much time and labour, that, with the means contemplated, it is not impossible that the end first excavated might be filled up by sand washing in by the time the other was reached. The magnitude of such a work will be best understood by the statement that if it were contemplated only to obtain an additional increase of two feet in depth, and to limit the width of the excavation to 200 feet, and it could not well be less to allow vessels to turn in and to pass each other without risk, no less than eleven millions of cubic feet of soil would have to be removed to effect it. »

Captain Boxer, R. N., confirmed the latter part of Bayfield's remarks. He agreed that it would be dangerous for the ships to pass in a channel three miles long and one hundred and fifty feet wide at any time, « indeed it would be madness to attempt it. » He considered a straight channel to be more dangerous than the crooked one, as the increased current in the straight channel would compel rafts and other crafts to use it, whereas the old channel was quite clear of them. He also pointed out that

> « a curve [*sic*] Channel has an advantage over a straight one at night, from the facility it affords of ascertaining whether vessels are approaching or going from you, which is difficult to ascertain in a straight one, and collisions would be likely to take place in consequence. »

Mr. J. D. Armstrong, master of the steamer *Montréal*, said much the same as Boxer, emphasizing the fact that because the water was so shallow passage steamers and small craft could not safely give room to ships in tow; that a vessel at anchor across the current of the channel would block it to the point where it would be dangerous for all other craft to pass; and that it would be inevitably blocked by rafts.

Rafts were obviously considered a major prospective source of trouble to the new channel, although it was argued to the contrary that since they only drew three to four feet of water thy were not limited to any channel, and so

could travel over the whole lake. As noted above by Captain Boxer, a strong current would attract them, and they would easily become grounded. However, in practice, the positions of the rafts depended partly on the direction and strength of the wind.

Captain J. D. Armstrong, when questioned on the relative advantages of the two channels, said that he considered, disregarding the cost, that the old channel should be improved from the lower lighthouse down to deep water, because it had at least eleven feet of water throughout the season, and was, furthermore, fifteen hundred feet wide. There would thus be a channel of fourteen or fifteen feet for four and a half miles, a hundred and fifty yards wide, on each side of which would be eleven feet of water, and for five miles above the lower lighthouse there would always be enough water for ships to ride at anchor, and to get under way. For taking ships in tow he considered a wide and deep channel indispensable.

Having considered the foregoing remarks, together with a good many other opinions, as well as forming a few of their own, the Select Committee, being mindful of the cost, decided that they could not discover any «rational motives» for the adoption of the straight channel, and they imagined that the decision to build a straight channel must have been made, and the work started, without any consideration having been made as to the respective cost of the two channels. They realized that the trade of the port of Montréal was increasing in importance. It was imperative to improve the navigation of Lake Saint Peter as quickly as possible, and to make it usable by ships of greater burden. They also said that rafts, being very wide, would run aground if the new channel were completed, and block the channel because the water along the sides of the channel was very shallow, which was not the case in the old channel. In summing up, the Select Committee stated that they recommended that the work on the new channel be abandoned and the improvement of the old channel commenced, and a saving of £44,788 would be made by the Province.

As a result of this report the work was suspended on June 8th, 1846. Later that year the Executive Council of the Legislative Assembly requested that Captain Bayfield return to Lake Saint Peter from the Gulf of Saint Lawrence where he was surveying, in order to inspect both channels again, and to give his advice to the government as to which channel he thought they should use under the circumstances.

Once more Captain Bayfield went to Lake Saint Peter, and once more he wrote saying that he thought the new channel should be continued and completed. On the strength of this report it was recommended by the Executive Council that the work be resumed, that the channel be broadened to one hundred and fifty feet, though Bayfield had said he thought it should be three hundred feet, and they hoped that the current coursing through the new channel as it was deepened would help to speed the work along.

Dissenting voices were still heard. It was pointed out that it was not possible to navigate the straight channel at night ; that steamboats could navigate alone in the daylight, but sailing vessels could not ; that rafts could not be permit-

ted to use the channel. The Select Committee thought that work on the new channel should cease, but that the channel should be left open and used as an auxiliary, in daylight when necessary.

In May, 1847, Mr. F. P. Rubidge, an engineer, reported on the channel through Lake Saint Peter to the Commissioners of Public Works (who had taken over from the Board of Works the year before, when work had again commenced on Lake Saint Peter.) He felt it was not his object to compare the relative merits of the rival channels, but he had observed a considerable current in the new channel, even on a calm day. He considered this «... remarkable as occurring in a lake seven miles in width, where it might be supposed all sensible current would be lost in the expanded waters.» He continued that he was of the opinion that the new cut was not filling up, though he had not observed it. When sounding the previous summer, he had found sharp and distinct ridges of two to three feet. If, indeed, filling was going on, these ridges would have been made less distinct by the moving sand, or would have been buried in the accumulating drift. He also mentioned that he thought that the mud disturbed from the bottom of the channel by the dredges would be carried along by the current until its velocity was checked over the flats, where it would gradually settle on the bottom. He took it for granted that this actually happened to some extent.

Public opinion was becoming most discontented with official indecision. On July 17th, 1847 the *Quebec Mercury* stated:

> «It has been determined that no additional grant shall be made for the Lake St. Peter infatuation; we believe that an effort will be attempted to save the Province the remaining £4,000 out of the £27,000 destined to be sunk in the mud of the Lake.»

The Quebec Gazette[30] called it the «outrageously scandalous job of the Lake St. Peter Straight Channel», and objected that the money for such folly should come from the people who «must console themselves with the reflection that they are in full enjoyment of ‹responsible government.›»

Finally, on the 16th of September 1847, the work on the new channel was stopped. About a year later the Commissioners of Public Works made an excursion to Lake Saint Peter to ascertain the true depth and width of the channel throughout, and to check whether it was being filled with sand since the dredging had ceased. As seemed usual on such occasions, they reported that the weather was most favourable. The lack of wind and the clear sky enabled them to make their soundings uninterrupted for several hours, results showing that there was very little difference in depth from the year before. They could find no evidence of a sand bank which had been reported to be forming at the upper entrance to the new channel; rather they found the current rapid, and the soundings there averaged fifteen feet. They stated that the channel here had been cut through a sand bank about a mile and a half in extent, which had about five feet of water on it; however, the sand there was mixed with clay, to

[30] *The Quebec Gazette*, Friday, July 23rd, 1847.

which it adhered, and so was stationary rather than drifting with the current. The width of the straight channel, the Commissioners noted, varied from one hundred to one hundred and fifty feet, and the dredges had opened up some seven hundred feet, so there remained up to two miles more to be excavated. They would not state their opinion on the merits of this channel alone or compare it with the old natural channel. They did point out, however, that a few people were now ready to admit that the money expended on the straight channel would have been better spent in improving the natural channel which would, by then have been the equivalent at all seasons of the other parts of the channel of the Saint Lawrence River from Montréal to Québec.

In 1850 the Harbour Commissioners of Montréal took over the maintenance and improvement of the channels of the Saint Lawrence River from the Board of Works. Another inspection trip was made to Lake Saint Peter, and it was decided that nature should be aided in her own choice (through doubtless at an earlier date she too had chosen the straight channel). The old channel should be modified and deepened, as it was the most central through the lake, and drew the larger portion of the waters of the Saint Lawrence without artificial assistance. So ended a long, costly and unprofitable debate, and the way was open for the final improvement of the navigation channel on the river's preferred course.

THE CONTINUATION OF IMPROVEMENT

When the old channel (that is, the crooked natural channel as differentiated from the « new » artificially straight channel) through Lake Saint Peter had finally been decided on, efforts to improve the condition of the shipping channel in the Saint Lawrence River and the harbour of Montréal were consolidated. In June 1851 the Harbour Commissioners began work on the present channel. The first season's operations resulted in the old channel in Lake Saint Peter being deepened two feet, and widened to seventy-five feet, so that in November the *City of Manchester*, loaded down to fourteen-foot draught, was able to sail through the newly dredged channel, without slacking speed, although there was only twelve feet of water on the flats. It was hoped that the channel would be completed by 1854, with beneficial results not only to the city of Montréal but to the whole of the province.

A vessel of five hundred tons burden will carry about six hundred tons of dead weight, or one thousand of « weight and measurement goods », and will draw about sixteen feet of water on the trip up the river to Montréal. However, if the same vessel were to draw only eleven feet of water, in order to be able to pass over the flats of Lake Saint Peter it would have very little cargo on board, and would in fact have trouble in keeping upright. But, if the draft were increased by one foot, the vessel would carry some two hundred and fifty tons of dead weight, or three hundred and fifty to four hundred tons of « weight and measurement together. »

Therefore, if the channel were not deepened in Lake Saint Peter a vessel of five hundred ton burden, bound for Montréal, would have to discharge six

hundred tons of cargo on to lighters to pass through the lake over the flats, costing an additional £165 to send it from Québec to Montréal. Moreover, the cost of sending the same ship, fully laden, up to Montréal through the improved channel would only be £12 10s in duty, a rather conclusive saving being realized. For the same reasons ships could make more profit on their outward trips, too. If such was the case larger vessels would be used in the trade with Montréal after the improvements were completed. Thus vessels of eight hundred to one thousand tons burden would, in time, be able to reach Montréal throughout the whole of the navigation season, and connect directly with the large craft employed in the trade with the interior of the continent, putting Montréal in an extremely good position to compete with the Atlantic seaports further south.

Subsequently various acts were passed authorizing the necessary work: 1852, *An act to provide for the enlargement of the harbour of Montréal and for the deepening of Lake Saint Peter and the improvement of the navigation of the St. Lawrence between the said points and for other purposes;* 1855, *An act to provide for the management and improvement of the harbour of Montréal and the deepening of the ship channel between the said harbour and the port of Québec* ... allowed £100,000 for the building and improvement of the wharves, and the same amount for deepening the channel in Lake Saint Peter to a depth of not less than twenty feet at low water; 1857, *An act to amend the act to provide for the management and improvement of the harbour of Montréal and the deepening of the ship channel between Montréal and Québec* granted the Harbour Commissioners the right to make by-laws for the control of ice in the harbour during the winter months, and to place buoys on the Saint Lawrence River and in Lake Saint Peter; in 1861 and 1864 further acts to improve the channel were passed. In 1865 *An act to provide for the deepening of the ship channel between Montréal and Québec* allowed the Corporation of the Harbour Commissioners of Montréal to borrow £25,000 to complete the channel to a depth of not less than twenty feet at low water, and three hundred feet wide throughout its length between Montréal and the tide water above Québec. *The Montréal Transcript* (Aug. 26, 1853) had pointed out that even four feet of water made the difference between a small sized merchantman lightened and a very large one with a full draught coming up to Montréal.

At the close of 1854 the channel was finished except for ten days work as yet undone. The channel in Lake Saint Peter had a depth of sixteen and a half feet at low water, and was between two hundred and fifty and three hundred feet in width.

However, the work of deepening the channel went on. By 1858 vessels drawing eighteen feet of water were able to ascend the river to Montréal. By 1865 the channel attained a depth of twenty feet and a width of three hundred.

> «The completion of the 20-foot channel marks an important era in the history of the St. Lawrence route. The success of the work amply demonstrated that the St. Lawrence could be made available up to Montréal for navigation by the largest class of ocean merchant ships, and the extraordinary increase of Canadian commerce that attended the improvement of the channel showed how imperatively it was demanded by the trade of Canada.

> « No sooner was the 20-foot channel fairly in use than the rapid increase in ocean traffic — which was yearly calling forth not only a greater number of vessels, but much larger ones — required a further deepening of the channel, in order to retain, and if possible increase, the share [of] the St. Lawrence in the carrying trade of the broad west. Agitation to deepen the channel to 24 feet was vigorously commenced and through the exertions of the late Hon. John Young and able coadjutors the agitation took definite shape ... » [31]

Effective canalization of the Upper River

Included in the improvements made for the betterment of the port of Montréal and the improvement of the Saint Lawrence as a navigable waterway into the interior of the continent were the various canals built above the city. These works are beyond the scope of the present article, and will be mentioned only briefly.

A letter printed in *The Gazette*, Montréal, December 6th, 1832 stated the importance of completing a system of internal navigation, enabling the transportation of produce and merchandise to and from the markets at the cheapest possible rates. « Why then procrastinate? » asks the writer, « Let facts have their due weight. Let Upper Canada commence the good work, and the Lower province will be goaded on by you to make a corresponding one ».

Inland navigation commenced at Lachine, which was, in the early 1820's, two days freight haul from Montréal when the roads were bad. At Lachine goods were unloaded and put into *bateaux* to be carried up to Cascades where they were again unloaded and portaged to Coteau. Here the freight was taken by boat to Cornwall, again unloaded and reloaded at Dickenson's Landing, from whence the water route was maintained to York. The Lachine Canal was opened in 1825, and made bulk transportation through the section to Cascades much faster and cheaper. By 1829 it was generally agreed that it was necessary to enlarge it for navigation of large boats and *bateaux*. The enlarged Lachine Canal was complete in 1848. It had a depth of nine feet throughout, and locks two hundred feet by forty-five feet. Further canals built along the Saint Lawrence River route between 1840 and 1870 were the Beauharnois, Rapide Plat, Farran's Point and Gelop's, all having the same capacities as the Lachine Canal.

Along the Ottawa route were the canal at Vaudreuil built originally in 1816, and improved in 1841, which was in use until the Sainte Anne's lock was opened in 1843. There were also canals at Carillon, six feet six inches deep, with locks a hundred and twenty-six feet six inches long and thirty-two feet six inches wide; and at Grenville, a hundred and six feet long, nineteen feet wide, and six feet, six inches deep. 1831 saw the completion of the Rideau Canal joining Kingston and Bytown to the Ottawa canals, and thus to the Saint Lawrence. The Rideau Canal was originally planned as a military route, but also had some commercial value, though not, for example, on the scale of the Erié Canal. It is possible that it encouraged the demands made by the river towns for the

[31] MONTRÉAL, HARBOUR COMMISSIONERS, *Official documents and other information relating to the improvement of the ship channel between Montreal and Quebec*, 1884, pp. 286-287.

improvement of the Saint Lawrence. In 1833 both Upper and Lower Canada appointed commissions for the improvement of inland navigation, and in 1851 two members of the Legislative Assembly of Upper Canada petitioned the house to take the necessary steps at the earliest opportunity to remove all obstructions from the channel of the Saint Lawrence from Lake Ontario to tidewater, so that vessels capable of carrying ten thousand barrels of flour might safely navigate a channel with a minimum of ten feet of water.

It is thus apparent that the measures outlined in this article to open up Montréal to ocean shipping were paralleled by contemporaneous efforts to improve the waterways above the city. The essential transhipment function of the city was emphasized, not lessened, by these measures, for the works above Montréal were never abreast of the ship channel in depth. In fact even today, the ruling depth of the seaway—twenty-seven feet—is eight feet less than that of the deep waterway from Montréal to the sea.

CONCLUSION

Since this has been a plain narrative history, little is needed by way of summing up. We set out to show how the city of Montréal was changed, in sixty years, from an inland river town to a seaport with a large overseas connection. The treatment was concerned almost exclusively with the technical problem of opening the river to sea-going ships. As we have seen, this was achieved by means of improved pilotage, improved lighting and marking, and channel deepening. To these we must add the ambitious harbour works in Montréal, which are not dealt with in this article. Crucial to the whole process was the evolution of public institutions concerned with the regulation and improvement of navigation. Trinity House, with its Montréal and Québec offices, must rank first in this process.

The period chosen—1805 to 1865—was defined by two symbolic events, the creation of Québec's Trinity House, and the final completion of the twenty-foot channel. Needless to say, the river had been navigated before this period, and continued to be improved after it; indeed it is constantly under modification today. Nevertheless, the period is well-chosen. Not only did it witness the completion of a channel for the first time navigable by the large merchantmen of the oceans—for twenty feet was the ruling depth at that date—but it saw the inception of Canada's main marine institutions. Above all, it saw the coming to manhood of a Canadian tradition of channel engineering. This was the beginning, in fact, of a national skill that was to culminate in the Saint Lawrence Deep Waterway, the immense and efficient modern harbour of Montréal, and the Saint Lawrence Seaway.

The course of events, as we have seen, served to confirm, indeed to emphasize, Montréal's role as a transshipment point. At each stage, the channel below Montréal has been accessible to much larger shipping than the rivers and canals above. In 1865, the twenty-foot deep, three hundred foot wide channel from Québec allowed the mainstream of ocean shipping to tie up below Bonsecours.

In constrast, the Lachine and Saint Lawrence canals permitted only narrow, nine-foot navigation to the Lakes. Successive deepenings, both above and below the port, have preserved this differential. It remains today, and excludes the large shipping from the Seaway and the Lakes.

The actual process of improvement within the crucial sixty years looks, from the perspective of 1961, like an inefficient and unnecessarily protracted affair. The Lake Saint Peter controversy, which we have chronicled in detail, is strikingly similar to the indecisions, false starts and acrimonious debate typical of public works in modern Montréal. Contemporary observers often saw the process as wasteful and humiliating — as we do some of our own endeavours.

But a more charitable view ought to prevail. For the achievements of those years, slow though they may have been, have indeed borne extraordinary fruit. Montréal has become one of the world's largest and most versatile ports. The channel through Lake Saint Peter, so often surveyed by the unlucky Captain Bayfield (for whom one feels much sympathy !), now bears an astonishingly varied and rich commerce, as well as large passenger liners. Some of that traffic, of course, is destined for (or originates from) the Great Lakes, via the Seaway. But still the greater part is Montréal traffic. In the face of this, it is hard to feel critical of the pioneers who first opened the channel.