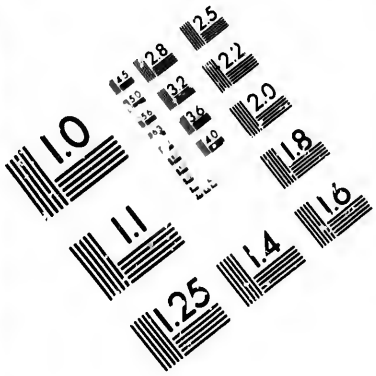

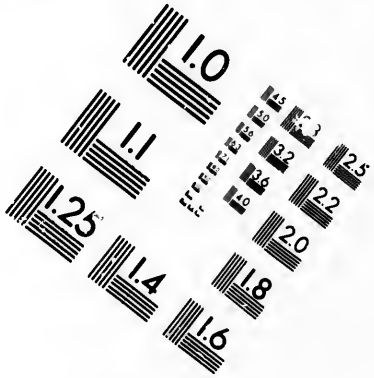

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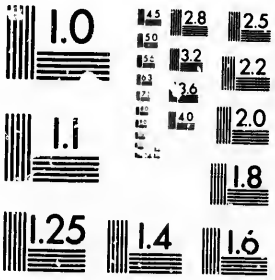

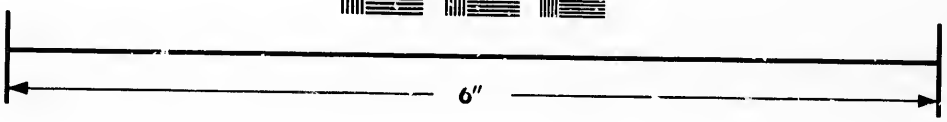

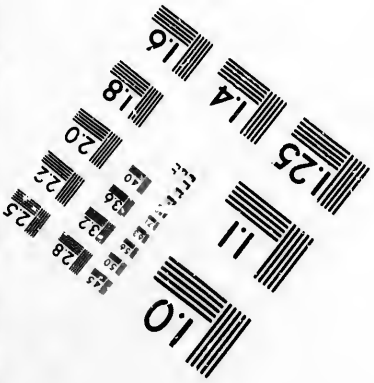

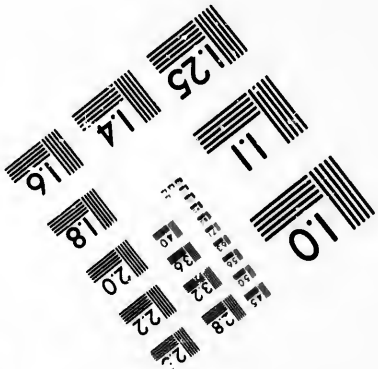

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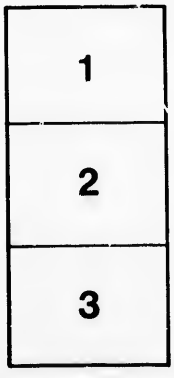

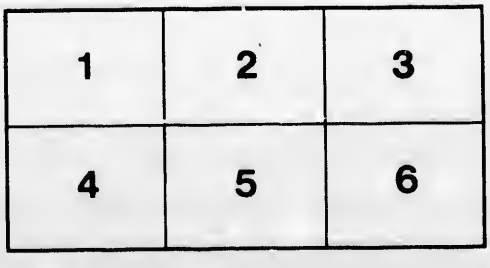

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REPORT

ON THE

PLAN FOR THE IMPROVEMENT

OF THE

HARBOUR OF MONTREAL,

PREPARED BY

Messrs. JAMES H. SPRINGLE and CHAS. F. H. FORBES,

CIVIL ENGINEERS, MONTREAL.

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To Hugh McLennan, Esq., President of the Board of Trade, &c., &c.

Sir,—Having had conversations at different times with yourself and other members of the Board, anent developing the great natural facilities possessed by the Harbour of Montreal, for meeting the requirements of its annually increasing trade, and on the necessity of having some comprehensive plan showing how those natural facilities may be turned to account as the trade of the port may demand. I also, at the same time, promised to submit such a plan for your inspection, and now, in connection with Mr. C. F. H. Forbes, Civil Engineer, take the liberty to present herewith a general plan of the Harbour of Montreal, from Victoria Bridge to Hochelaga: exhibiting the shoals and deep water thereof, and the position, velocity and direction of the river currents which are detrimental to the convenient access and service of the Port, and the means which may be adopted for mitigating the same. Also the most advantageous localities and positions for extending and constructing such additional piers, wharves and basins as the present and future business of the Port may require, and connecting the same with the present wharves: the Lachine Canal; the Grand Trunk; and such other railways as may enter the city and communicate with the harbour.

A reference to the Plan will show, that with the exception of some additional wharves at Hochelaga, extending downwards from the present wharf, so as to render available that splendid piece of deep water known as Hochelaga Bay; no change is contemplated in the present wharves now in progress, but at the upper part of the harbour very extensive wharves, docks and basins are proposed, in order to connect in the most complete and ample manner the immense business to and from the West, with the ocean marine of the Port. We propose, in the first place, to construct on the Island shoal the extensive wharf marked A, and to connect the same by the wharf B, with the present "Windmill Point wharf," as shewn on the plan. We also propose to close up the present outlet lock of the Lachine Canal and reconstruct the same so as to debouche into the channel marked D, in front of Windmill Point wharf; we should by this means secure an uninterrupted communication between these

extensive new wharves (which would enclose one of the finest pieces of deep water in the harbour) and the city, without having to cross the canal, and without obstructions or hindrance of any kind: while the present muddle of coal and lumber barges which discharge and make up their "Towage lines" at this point, would be transferred to another locality especially adapted for such purposes. In order to derive the full benefit of the works here proposed, it would be necessary to carry out an improvement first suggested by us some years ago, viz: that the present line of Common street be set back to the corner of Messrs. Allan's Steamship office, and to the corner of Brennan and Princess streets, as shewn on the Plan. If the space outside this new line of Common street is given to the wharves, and a new ramp constructed from the wharf level to McGill street, this portion of the wharfage of Montreal, which is now the most contracted, ill-contrived, and inconvenient of the whole harbour, would become well adapted for the large and increasing business of that important locality.

The removal of the outlet lock of the canal would necessitate the enlargement of Basin No. 1, as shewn on the Plan, but as that enlargement has already been decided on by the Government, no difficulty, it is presumed, would arise on that account.

These proposed wharves can also be connected with the greatest facility by railway with the Grand Trunk or other railways running along the harbour front.

It is proposed, in the next place, to enclose the navigable water on the south side of the above-mentioned proposed wharves, and along the front of the Windmill Point wharf, by the long pier C, extending from the proposed Lumber basin on the Point St. Charles shoal, to the branch or arm of deep water marked I, which runs southwards towards the "Normand shoal." By this means an extensive area of comparatively still, navigable water would be secured (marked D,) into which the upper and lower outlet locks of the Lachine Canal would discharge; but the tail race water of the mills and factories on Basin No. 2, which would otherwise be a serious drawback on the utility of this dock (D,) will be turned into the lumber basin at the head of the same, and thus be the means of supplying that large area with water. Note 1.

Note. If the proposed great Hydraulic Docks, had been built. it was intended by the engineer, to run the tail water of an extensive range of mills fed by said Hydraulic Dock into this dock D, on the south side of the same, which would have created a current of greater velocity than St. Mary's

current at Ile Ronde, and rendered this most valuable part of the harbour useless.

As we have already remarked, we propose to convert the Point St. Charles shoal into a Lumber Basin, marked E, as shewn on the Plan, by turning the tail water of the mills into the same, so as to give a depth of water therein of about ten feet. This basin would communicate with basin No. 2 of the Lachine Canal by double locks: with dock D, by a single lock, and with the navigable water of the North Normand channel, by another single lock, with breakwater enclosures outside 1500 feet in length, which will give ample space for making up and starting towage lines of lumber barges, without coming in contact with other branches of the harbour trade.

We propose to run a railway from Point St. Charles across the Mill street end of this basin, on piers,(with a swing bridge for the passage of steamers into the same, to connect with the long enclosing pier C, which forms the southern boundary of our proposed still water harbour, but the piers of this bridge at the west end would be sufficiently high to admit of the passage of loaded barges underneath.

The large shoal marked J, which extends from the front of the basin just described, to the north bank of the navigable channel on the north side of the Normand shoal, and which has an average depth of water at summer level of about three feet, could be enclosed in a similar manner, to the proposed Lumber Basin, as shewn by the dotted lines, and be supplied from the same source, so as to leave the same depth of water as the enlarged public canals. These basins would have most convenient access to the navigable waters of the Port and to the Lachine Canal. They could be made depots for the enormous produce trade of the West, which is gradually centering in Montreal. Steam tugs would take produce craft from these basins alongside sea-going vessels in any part of the harbour in a few minutes, and it must be remembered that these immense areas, although *in* the river, can scarcely be said to form part of it; and the small body of water which runs over them will add so little to the current of the actual river, as not to be worth taking account of; but the outside enclosures of these basins must be protected with sloping rip-rap walls, to resist the ice-shoves of winter.

We have, also, at the suggestion of a prominent merchant who has for many years taken great interest in harbour improvements, shown an extension in deep water, of the Albert Pier (marked M). This extension has a superficies

of 1150x150 square feet, and will be an important addition to the wharf accommodation of this Port.

We have thus far shown how the western parts of the harbour—say from Victoria pier upwards—can be enlarged to several times its present capacity and in such manner as to meet the requirements of the vast trade of the West, and also be made free from the currents now detrimental to the same, without altering the natural level of the river. We now propose to show, how the strong currents of the harbour outside these limits may be so mitigated as to render every part of the harbour accessible for all classes of vessels from Point St. Charles to Hochelaga Bay.

THE CURRENTS OF MONTREAL HARBOUR.

We have shown on the plan submitted, the position of the principal currents (tinted blue) in the harbour, which injuriously affect the same, and beg to submit some observations on the best means of removing or so diminishing the velocity of these currents, that a vessel may, unaided, sail up the current St. Mary to the still water of the western part of the harbour. It will be necessary, however, in view of the extraordinary notions entertained by parties, otherwise well-informed, respecting rivers and running streams, to give some general data about the currents of this part of the river St. Lawrence, deduced from personal observations extending over some thirty years and corroborated by personal examination of the Missouri, Mississippi, Ohio, and Richelieu rivers, in America, and the Lower Rhine and other rivers, in Europe.

It has been asserted by some modern writers on hydraulics, and generally accepted without question by engineers, that any contraction of the sectional area of a river channel, will cause a rise of its water surface, proportionate to the amount of the contraction and the velocity of the current, and conversely; any enlargement or deepening of a river channel, or the diversion of part of its water into a separate channel, will cause a depression or lowering of its water surface in a similar proportion. Neville, an eminent writer, says in his Hydraulic Tables and Formulæ, page 75:—"When the banks of a river whose bed has a uniform inclination, approach each other, and contract the width of the channel in any way, the water will rise at the contracted portion until the increased velocity of discharge compensates for the reduced cross section;" and Molesworth in his Formulæ for engineers, gives (without any qualification whatever), Formulæ and Tables shewing the amount of

rise in the water surfaces of rivers for contractions of the channels from one to nine-tenths of their whole water section, and for velocities of the currents from one to six feet per second. Now, the facts and phenomena presented by rivers of any magnitude, entirely contradict the assertions of these writers. The river St. Lawrence abounds with such contradictions, and one of the most notable of these is the current St. Mary at Ile Ronde. This current at Ile Ronde conveys *six sevenths* of the whole water of the St. Lawrence, and yet there is no rise whatever, of its water surface, although it has a current velocity of more than eight miles an hour. Whereas, according to these modern writers, there ought to be a rise of the river surface at this point, of more than sixty feet perpendicular—conversely also, if all that portion of Ile Ronde which projects outside the line of the north side of St. Helen's Island were removed down to the depth of the deepest part of the north channel, it would be quite impossible for any lowering of the river surface to take place, but there would be this remarkable difference, viz: the velocity of the current St. Mary would be *reduced nearly one third;* this statement (which is susceptible of ample proof) points at once to the means which may be adopted for reducing the velocity of this current and thus almost entirely remove or reduce to a minimum this formidable obstacle to the safe and commodious navigation of the port. Note 2.

We propose, however, instead of removing this part of Ile Ronde, to widen and deepen the shallow channel between Ile Ronde and St. Helens Island, marked L, sufficiently for the passage of vessels of say, eighteen feet draught, and by dredging a channel from thence down to a narrow arm or reach of deep water, which extends up the river for about 1,590 feet above Longueuil wharf. By this means a new channel of approach could be made to the harbour, as indicated by the red lines on the plan, or the channel could for the present, only be continued round into Hochelaga Bay, as shown on the same. We should thus obtain a channel suitable for all vessels up to second class, in which the current would only be between four and five miles an hour, and moreover, the construction of such a channel would have the direct effect of reducing the velocity of the current St. Mary by about two and a half miles an hour. It is almost impossible to estimate the advantages which would accrue to Montreal if these proposed improvements in the approaches and access to the port were carried into effect.

We also propose to open a channel for steamboats of light

draught on the south side of St. Helen's Island, as shewn by the red lines on the Plan, and in order to turn a greater body of water down this channel, (which, by the way, would reduce still further the velocity of the current St. Mary), we propose to construct a catch-water pier from the head of St. Helens, to the Ile des Fraises, and to remove entirely back to Moffatt's Island the old Champlain railway wharf, beyond which, said wharf ought never to have been built, as it has been the means of turning the strongest current above the harbour more directly down into the same. It may be well to add respecting this channel on the south side of St. Helen's that it affords almost the only means for reducing the velocity of the two strongest currents in the harbour, viz: the deep water current I, and the south Norman channel, H. The latter being about ten miles an hour. If the immense hydraulic power of the Lachine rapids should be utilized and mills and factories become established there, a large business must necessarily arise by way of the river, from the foot of the rapids to the harbour of Montreal; and owing to the great velocity of the south Norman current, above mentioned, it would be very desirable to open the North Norman channel for this business, as the current is much slower than that of the south channel. The principal obstructions in this channel is a shoal near the bridge and a few boulders, and as the height from the under side of the bridge to the water is about fifty feet, there is plenty of room for the passage of vessels.

We have, at the risk of being tedious, described the currents and natural facilities of the Harbour of Montreal, because in all the projects hitherto submitted for increasing the shipping accommodation of the same, these currents and natural facilities have been altogether ignored, while enormous artificial works have been projected, the cost of which (unless borne by the whole Dominion) would become too great a burden for the shipping interest of the port to bear, and might thus be the means of neutralizing the unrivalled advantages it now possesses, and of driving its trade to other less favoured ports, where the burdens on shipping would be much less oppressive than at Montreal.

ON RAILWAY CONNECTION WITH THE HARBOUR OF MONTREAL.

The question of communicating with the business parts of the city by railway is rapidly assuming vast dimensions, and must necessarily form an important feature in any scheme for the improvement of the port of Montreal. An extensive connection by railway such as the exigencies of the principal seaport of the Dominion demand, is from the

topography of the city and its intermittent navigation, a complicated and somewhat difficult matter. In the first place the ground on which the city is built consists of long narrow banks or terraces situated parallel with the river, on the first of which the principal business part of the city is located, Notre Dame street being on its crest. This bank commences in Griffintown, and gradually rises as it extends towards the east end of the city, until, in the Quebec suburbs, it attains an elevation of nearly ninety feet above the river. The descent, for instance, from Notre Dame street to Craig, is about ten feet at McGill street, while, in the vicinty of Viger square, the descent ranges from forty to fifty-five feet. From this Craig street valley, the ground ascends in terraces in the direction of Sherbrooke street to a height of about one hundred and fifty feet above the river, and the city having been built in conformity with these natural features of the site, it must be evident that railway communication across the city to the harbour would be so costly as to be out of the question; whereas these same banks and terraces offer great facilities for the entrance of railroads into the city from its extreme eastern and western ends, and from thence to run along the entire harbour front, and in lines parallel thereto, if necessary. By this means the Northern Colonization, the North Shore, and the Grand Trunk railways, could have continuous lines of railway along the entire harbour front, both at the wharves' level and along Common, Commissioners and Water streets. The site of the Quebec Barracks would also make an excellent Union Station for passengers and general merchandise for all those railroads at both levels, and a Grand Eastern hotel constructed over this station, fronting on and at the level of Dalhousie square, would supply the want of hotel accommodation which has been so long felt at the East end of the city.

It may be well to state, in the next place, that the natural facilities for reaching the wharves are much greater at the east and western portions of the harbour than in any other; at Hochelaga Bay, for instance, the public highway is only some thirty feet above the river, (or about the same height as Notre Dame street at the intersection of McGill street), and the country as far back as Cote a Barron, is pretty level. These advantages in connection with its magnificent harbour accommodation, point to Hochelaga as the most fitting locality for railway connection with the harbour at the East end, while at the west end, all the most important streets are almost level. If we take McGill street as an illustration, we have level communication by this street with Common,

Youville, Foundling, St. Paul, Lemoine, Recollet, Notre Dame, St. James and Craig street, on one side, and with the whole of St. Ann's Suburbs, with its mills and factories. The Lachine Canal and the Grand Trunk Railway: in fact, the entire outlet to the West on the other side. As we proceed eastwards along Notre Dame street, these advantages soon disappear. The cross streets from the river to Craig street are steep and unsuitable for heavy traffic. Notre Dame street, at Jacques Cartier square, is twice the height above the river that it is at McGill street; and, while the descent to Craig street at this latter point is scarcely perceptible, at Jacques Cartier square, said descent is about forty feet. Again, Dalhousie square is about sixty-five feet above the river. Viger Garden, in rear of the same, is only twenty feet above, while some parts of the Quebec suburbs are more than eighty feet above the level of the river, and are so precipitous as to be almost inaccessible from the same. We have given these approximate heights and levels to show that the introduction of railroads to the city east of McGill street, or west of Hochelaga, would be attended with great inconvenience, damage and expense; and, because such railroads would have no facilities for communicating with the harbour; along the front of which most of the railway traffic of the city may be carried on to the best advantage.

For the distribution of railway lines along the harbour front, we beg to refer to the Plan, on which said lines are shewn in red ink, and also the connections of the same with the proposed new wharves at Hochelaga and the western end of the harbour, and it only remains to say on this part of the subject: that if the Northern Colonization, or Trunk line of the Ottawa Valley, becomes part of a railway from the Pacific Ocean, it will be necessary, in that event, to have further connection with the great cities of the United States seaboard by means of another bridge across the St. Lawrence, and the location of such bridge must necessarily influence the entrance of this railroad into the city, and, inasmuch as the whole city is to be taxed to the extent of a million dollars for the construction of this road, it is evident that the interests of the city, as a whole, must be considered in its location. To secure this it may be found necessary to have this road for the reasons already given, divide into two branches when it reaches the Island of Montreal, so as to enter at the east and western extremities of the city, and have their junction at the Quebec Barracks Station, on the harbour front. By this means railway traffic to the United States could pass on to its destination by the branch having the Bridge, while the other branch would connect directly with the Port and city of Montreal.

All the improvements here suggested for rendering the Harbour of Montreal fully equal to present and future requirements, are almost entirely confined to operations for improving the natural advantages of the same, because they furnish for this purpose, by far the most efficient and economical means; can be better adapted to the local circumstances of the port and the peculiarities of the climate, and in consequence, less likely to derange its established trade. Our object is to convert this harbour of Montreal into a *dock, arranged especially to suit its trade and navigation.* Our circumstances render elevated artificial docks for sea-going vessels inexpedient, and our sheltered harbour and the high land surrounding it, obviate many of the necessities which exist at Liverpool for docks, but imposes obstacles to their construction here which do not exist at the latter port, and we venture to assert that notwithstanding the greater necessity for docks at Liverpool than at Montreal, if the water surface of such docks had to be raised twenty-five feet above high river level, as would be the case here, and that such docks had to be supplied with water by artificial means, the enormous cost of such works and the risks and expense of locking up and down sea-going vessels to and from such docks, would be found very unprofitable in a port open all the year round, and positively ruinous in the case of a port open for business only seven months out of the twelve.

To return. The south side of the large "Island shoal" wharf would be well adapted for landing coal, and steamships could also take in coal from the opposite side of the same, while cartage to the city from this point, could be done as already stated, without crossing the canal. The provision made for the lumber trade on Point St. Charles shoal, will render the large space in the vicinity of Wellington bridge available for the western produce trade, in addition to the docks and warehouses about being provided by the government in that neighbourhood. Note 3. We also propose to fill up with earth excavated from these docks, the large space between the south end of the proposed lumber basin and the Victoria Bridge, marked F, for piling ground or wharfage, and thus remove the risk of fire from shipping being surrounded by piles of lumber.

In our description of the means to be adopted for reducing the velocity of the Current St. Mary, we deferred for the sake of clearness, making mention of a plan proposed by us some fifteen years ago in the Montreal *Gazette*, for making a channel through this current, which would have a velocity of only some three miles an hour and thus enable

vessels and craft to sail up to Montreal, or to be towed up with the greatest ease.

We have shewn this slow current channel on the plan now submitted; it consists of three or more piers extending from just above the lower end of the enclosing pier C, down to Hochelaga Bay, forming a channel next the Montreal shore of about 350 feet in width. These piers are arranged with their ends passing each other as shown on the plan. We thus cut off the initial velocity from the upper end of this channel, and the spaces between the piers form inlets or outlets, between the same and the river outside, but the velocity of the latter cannot be communicated to the enclosed channel which will in consequence only have the velocity derived from its inclination alone, say about three miles an hour, or about one third the velocity of the river outside. But it may be asked, will not this enclosed channel increase the velocity of the river channel outside? Unquestionably it will, but to a very limited extent, for it must be observed that this enclosed channel, although separated from the river as far as its velocity is concerned, still forms part of the river channel and the only increase it can make to the velocity of said channel, is the displacement caused by the enclosing pier and the reduction of the current in the enclosed channel from nine to three miles an hour, or an addition to the velocity of the river outside of about one and a half miles an hour. We should thus have an almost slack-water channel from Hochelaga Bay to the Lachine Canal, and by the construction of the proposed channel between Ile Ronde and St. Helen's, we should effect a reduction in the velocity of the Current St. Mary of nearly three miles an hour. As to the order in which these works should be executed it is only necessary to remark here that by constructing the channel between Ile Ronde and St Helens, first—we should *reduce* the velocity of St. Mary's Current at the same time. If on the other hand, the slow current channel on the Montreal side were made first, we should thereby *increase* the velocity of the said current as already stated.

Before proceeding to make any comparison between these proposed improvements of the natural advantages of the harbour and the elaborate and extensive plan of a new harbour, canal and docks, prepared by Messrs. Trudeau and Sippell, for the Dominion Government (a copy of which through the influence of Hon. Thomas Ryan and others, has been obtained for the inspection of the public.) It is necessary to describe as well as our limited information will permit, the magnificent works shewn on said plan. The

changes contemplated by this plan are of the most extensive and radical character, as besides the large basins and warehouses adjoining basin No. 2 of the Lachine Canal, which we have already noticed, it is proposed in the first place to enclose the entire upper part of the harbour with a water tight pier extending from point St. Charles down parallel with Mill street as far as Victoria pier. The large area of water thus enclosed, is to be raised by this means to the level of Basin No 1, of the Lachine Canal, or about 13 feet above the present level of the harbour, and double locks are provided outside Victoria Pier for locking vessels up or down between the harbour and river levels. In the second place, from the lower end of this elevated dock on the land side, it is proposed to construct a ship canal down to Hochelaga, at the same elevated level as the harbour above. This ship canal at Hochelaga Bay curves inwards and forms the upper entrance to the proposed Hochelaga Docks, a magnificent structure about two miles in length, situated in rear of the town and arranged to be surrounded with warehouses. These docks form the third division of the project. They would be at the same level as the enclosed harbour and canal, and would communicate by double locks with the river at their Eastern extremity.

This project certainly indicates that the Dominion Government is not only fully alive to the importance of improving the principal port of the country, but entertains ideas respecting the same, far in advance of the most extensive projects yet devised for that purpose. It would, however, be premature in the absence of any descriptive report of this project, to comment on the important advantages to be gained by the execution of these works. The engineers are gentlemen of high standing and large experience, and are no doubt fully prepared to give satisfactory reasons for the arrangement and construction of every part of their design, but with our present information, the project seems to be open to the following objections, viz:—

1. The entire wharfage of the harbour from Victoria pier to the Lachine Canal, would have to be reconstructed and raised to a level some thirteen feet higher than at present.

2. That the tail water of all the mills and factories on canal basin No. 2, will pass outside this dock and cause such a strong current as to render the outside entrance of the Lachine Canal useless.

3. That a head or pressure of about thirteen feet, will be put on the outflow of the large sewer in front of the Custom House, which in consequence would be turned back

throughout all its entire circuit of several miles and flood the basements of the buildings which drain into it.

4. That the bed of the river on which the long enclosing pier of this dock would be constructed, being composed of solid rock, clay, boulders, sand and quicksand, with a depth of water over the same of from ten to forty feet, would render the construction of such a water tight pier a most difficult undertaking, and even supposing this were effected, the exposure of this pier to ice shoves twice a year, in a locality more exposed to them than any other part of the harbour, must render any chance of its remaining water tight very slender indeed, and as it would be impossible to empty this dock except by pumping, the locality of any leakage below the river line would be very difficult to find. Note 4.

5. The great risk to the navigation resulting from the inter-dependence of the several parts of this long range of artificial works (extending from upper Lachine to Longue Pointe) upon the integrity and security of the whole. If for example: this dock received serious injury from an ice shove in Spring so as to run down the water to the river level, it might take a month even to discover the locality and extent of the damage, and another month or more to repair it; in the mean time the spring fleet would have arrived, and the dock in which the most important part of it were to discharge and load would be useless, because, if a large vessel were to enter this dock and run the risk of stranding in the shallower parts thereof, such vessel could neither discharge nor load in consequence of the enormous height the wharves would be above the water; for similar reasons the water connections with the Lachine Canal, the mills, the factories, basins and warehouses would be severed, unless special means were provided against such a contingency. The supply of water would also be cut off from the Ship Canal and Hochelaga Docks, and these costly structures would have their depth of water gradually reduced from twenty-five feet to twelve feet, to the great danger and detention of every vessel that might happen to be therein. And if such an accident as we have supposed were to occur towards the close of the season the consequences might be more disastrous than at any other period.

6. The trouble and delay which would be caused by locking up and down of every vessel using this dock, and the strong current which would be caused at the foot of the locks, would compel the enormous business which is now done in this vicinity to move lower down. All the river steamboats and river craft land their passengers here, and

discharge and load, besides a number of ocean steamers and ships: and the whole of this annually increasing trade would be cut off from the city by the proposed ship canal, which would have to be crossed by a swing bridge or two, whereas, except for the purpose of avoiding the St. Mary's current, it is difficult to see what useful object can be served by this costly canal, which would at all compensate for the many sacrifices that would have to be made for its accommodations: it would occupy a most valuable space urgently required for wharfage and railway tracks; it would intercept all drainage of the city from this point downwards, including the two large cross tunnels which have been built by the corporation at an enormous expense; and it would be exposed all along its south side to damage from the ice shoves in the Spring and Fall. Note 5.

7. Unless we fill up Hochelaga Bay and thus destroy that splendid harbourage of deep water; and unless we so increase the velocity of St. Mary's current as to prevent steamers ascending it. It is very difficult to see what object beyond spending an enormous sum of money uselessly, can be attained by constructing the proposed large deep water docks and warehouses in rear of the town of Hochelaga. There is no business present or prospective, that can arise or be brought to this locality; there is nothing either that the proposed railways can bring to it that cannot better, quicker, and more satisfactorily be done at Hochelaga Bay, than would be possible at these proposed docks. All that is wanted here is more wharfage in the position shown on our Plan, where there is little current, and a fine depth of water. (The Harbour Commissioners are extending the present Hochelaga wharf upwards, from the same point, but in a much stronger current, and much less eligible connection with the shore than at Hochelaga Bay.)

And generally, considering the shortness of our navigable season, the entire abandonment of the whole harbour during a five months' winter, and the constant exposure and liability to damage to which these costly artificial works would be peculiarly subjected: we think there can scarcely be a question as to the vastly greater safety, security and economy which may be obtained by adopting, and gradually carrying into effect, some comprehensive plan for taking advantage of and improving the great natural facilities possessed by the Harbour of Montreal; facilities which, it should be remembered, will afford twice the amount of accommodation provided by any project of artificial harbour works, hitherto made known; and we beg respectfully to

submit that the plan we lay before you to-day is such an one. Note 6.

JAMES H. SPRINGLE,
CHAS. F. H. FORBES,
Civil Engineers.

MONTREAL, August 25, 1873.

NOTE 1.—In turning the tail water of the Mills into the proposed Lumber Basin, we of course contemplate making the head or fall of water used by these Mills about thirteen feet, or about the same height as is obtained during the winter months. In a word—The head or fall would be the same all the year round. If the Government would allow the use of the water from the proposed new basins, adjoining basin No. 2, the Hodges property which forms the north side of the Lumber Basin could be laid out for mills and factories, which would discharge their tail water into the proposed Lumber Basin. A large amount of industrial wealth would be added to that already in existence, and manufactured products could be shipped directly from these mills into barges or steamers, and taken round in a few minutes alongside sea-going vessels, lying in any part of the harbour below. If the Government would not allow water for such purpose from the Canal, it might be induced to grant it, if a similar quantity of water were supplied to the same from the proposed canal of the St. Louis Hydraulic Company's works.

NOTE 2.—There are many persons for instance, who think that if a canal were made from Montreal Harbour, down to some point below the ice jam, which causes the rising of the river and flooding the lower parts of the city. That such canal would if made large enough, carry off the rising water and prevent any flood from taking place. It may surprise such persons to learn, that if it were possible to construct a canal as large as the north channel at Ile Rond, so as to convey the same quantity of water, said canal would not have the slightest effect in lowering the flood. The water in it would rise to the same level as the river itself, both in time of flood and at low water. The only effect of such a canal would be to lessen the velocity of the current St. Mary nearly one half.

NOTE 3.—These proposed new basins are to be eighteen feet deep, and as the Government are going to deepen the present canal basins to a similar depth, the long disputed question as to whether it would be more advantageous for the sea-going vessel to ascend to the level of Basin No. 2, and load at the warehouse or mill; or for barges or other craft to load at said warehouse or mill, and then descend to the vessel lying in the harbour below, may to a limited extent at least, be tested.

NOTE 4.—We have already adverted to the impossibility of emptying the elevated docks below the river level, in the event of damages and repairs, but it is clear that the same objection applies to the ship canal and the Hochelaga Docks, or any Dry Docks which may connect with them. None of these works could be emptied below the river level except by pumping, a fatal objection we fear, to such of the works as would be exposed to damage from ice shoves.

NOTE 5.—The three large tunnels which form the river outlets for the great part of the city sewerage, would not only be stopped by the proposed works, but in addition, the entire sewerage of the city from its extreme western boundary, down to below the outlet looks of the Hochelaga Docks, a distance of more than five miles; would be cut off from all connection with the river. This would necessitate an entire re-arrangement of the city sewerage, which would have to be carried in one large tunnel down below the eastern extremity of the proposed docks at Hochelago, before it could enter the river. It is very likely that such a system of sewerage as these proposed harbour works would render necessary, would possess many and great advantages over the present system, but the change would require an enormous outlay, and could scarcely fail to add a heavy burden of taxation to the City and Port of Montreal.

NOTE 6.—The limited season of navigation common to Canada and the Northern States, compels us to make the most of the time as one of the essential means of successfully competing with other Ports open all the year round, and if the Port of Montreal were as well lighted as some of the streets of Paris, during the season of navigation, we might by relays of labour, make each of our working days *eighteen hours in length*, and thus our seven months of navigation (the choice months of the year) might be made fully equal to the twelve months of other seaports.

MEMO.—The additional outlet lock of the Lachine Canal shown on our plan (parallel with the present outlet lock) is not laid down on the plan of Messrs. Sippell and Trudeau as it would not be required if the elevated dock proposed fly them were carried into effect, but it is comprised in the works contemplated by the Government, of making another canal outlet and basin adjoining Basin No. 1. This additional outlet from the canal to the harbour, which can be made double if required, is proposed on our plan to be made in the south side of the new Windmill Point wharf, at the part where said wharf has been left unfinished. By this arrangement, and by closing the present outlet lock, direct and unimpeded connection between the city and the extensive wharves on the "Island Shoal" is secured.

J. H. S.,
C. F. H. F.

The Plan can be seen at the Corn Exchange