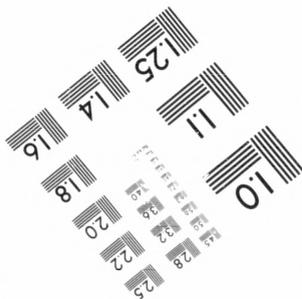
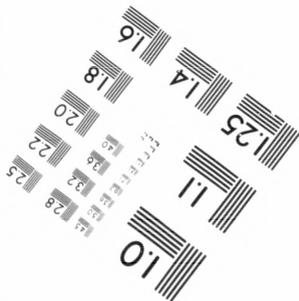
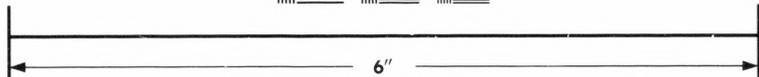
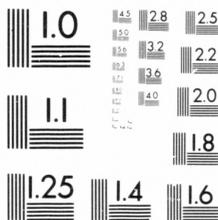


**IMAGE EVALUATION
TEST TARGET (MT-3)**



Photographic
Sciences
Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

Can

13
14
15
16
17
18
19
20
21
22
23
24
25

**CIHM/ICMH
Microfiche
Series.**

**CIHM/ICMH
Collection de
microfiches.**

11
12
13
14
15
16
17
18
19
20
21
22
23
24
25



Canadian Institute for Historical Microreproductions

Institut canadien de microreproductions historiques

1980

Technical and Bibliographic Notes/Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- Coloured covers/
Couverture de couleur
- Covers damaged/
Couverture endommagée
- Covers restored and/or laminated/
Couverture restaurée et/ou pelliculée
- Cover title missing/
Le titre de couverture manque
- Coloured maps/
Cartes géographiques en couleur
- Coloured ink (i.e. other than blue or black)/
Encre de couleur (i.e. autre que bleue ou noire)
- Coloured plates and/or illustrations/
Planches et/ou illustrations en couleur
- Bound with other material/
Relié avec d'autres documents
- Tight binding may cause shadows or distortion along interior margin/
La reliure serrée peut causer de l'ombre ou de la distortion le long de la marge intérieure
- Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/
Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- Additional comments:/
Commentaires supplémentaires:

- Coloured pages/
Pages de couleur
- Pages damaged/
Pages endommagées
- Pages restored and/or laminated/
Pages restaurées et/ou pelliculées
- Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées
- Pages detached/
Pages détachées
- Showthrough/
Transparence
- Quality of print varies/
Qualité inégale de l'impression
- Includes supplementary material/
Comprend du matériel supplémentaire
- Only edition available/
Seule édition disponible
- Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/
Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
				✓							

The co
to the

The im
possib
of the
filming

Origin
beginn
the las
sion, c
other
first p
sion, a
or illus

The la
shall c
TINUE
which

Maps,
differe
entirel
beginn
right a
require
metho

The copy filmed here has been reproduced thanks to the generosity of:

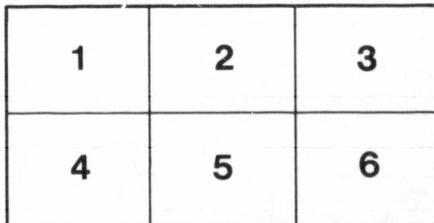
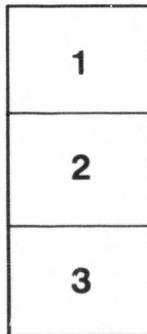
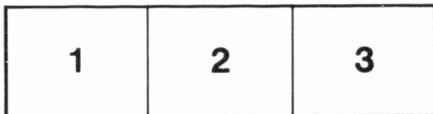
Thomas Fisher Rare Book Library,
University of Toronto Library

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol \rightarrow (meaning "CONTINUED"), or the symbol ∇ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:



L'exemplaire filmé fut reproduit grâce à la générosité de:

Thomas Fisher Rare Book Library,
University of Toronto Library

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole \rightarrow signifie "A SUIVRE", le symbole ∇ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.

aire
détails
ues du
modifier
ger une
filmage

ées

aire

oy errata
ed to

ont
ine pelure,
açon à

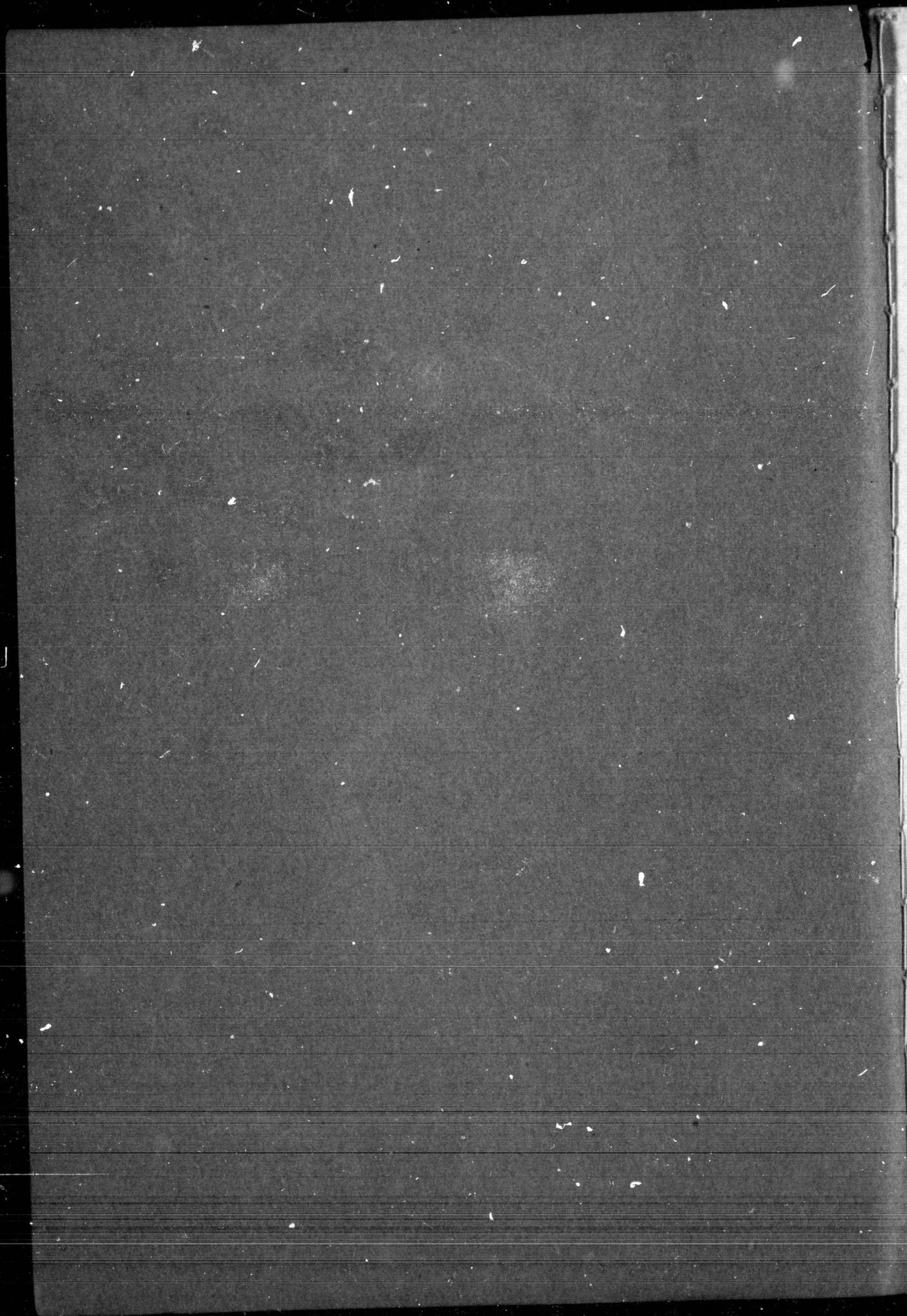


Pamph
TEH
B

Charles P. Florent
REPORT OF M^r BAILLAIRGE,
" "
ENGINEER OF
THE NEW QUEBEC AQUEDUCT
ON THE
COMPLETION
OF THE
BEEMER CONTRACT.

30th Oct. 1885.





O

n
t
b

l
i

c
i

h
r
c

REPORT

Of Mr. Baillargé, engineer of the new aqueduct, on the termination of works under the Beemer contract for the laying of the new 30 inch main and of its accessories between Quebec and Lorette, a distance of 40,800 feet ($7\frac{3}{4}$ miles) under a head of 463 feet.

Following out the contract, item by item, the first requirement is that the quantity of water to be supplied, be (10,000,000) ten million imperial gallons, inclusive of the $2\frac{1}{2}$ million gallons by the old 8 inch pipe.

The additional supply was therefore to have been $7\frac{1}{2}$ million gallons, while according to the most reliable formulæ it is in reality $9\frac{1}{2}$ millions.

This difference of 2 million gallons surplus is what in my calculations of 1881, I allowed for diminution to be caused by incrustation, sediment etc. within the next 10 or 20 years.

It is the history of all aqueducts and hence now-a-days it has become the rule to compute any conduit of the kind now under consideration for a supply some 20 to 30 per cent in excess of the required supply.

Clause 2 of contract relates to the thickness to be given the pipe which is stipulated to be of strength sufficient to stand a pressure of 430 lbs. to the square inch, equivalent to that of a column of water 1000 feet high.

Each length of pipe, that is each separate pipe was in reality subjected in England to the required test as certified to by Mr. Reynolds, whom the contractors employed to superintend the operation, the same person who was employed for a similar purpose by the cities of Montreal, Ottawa and Toronto.

My desire was that the thickness of pipe on the lower levels be $1\frac{3}{8}$ inches instead of $1\frac{1}{4}$ inches as set forth in my said report of 1881, so that the conduit might more thoroughly resist water hammer, oxidation, &c.; but of the two tenders submitted by Mr. Beemer \$455,000 for the $1\frac{1}{4}$ pipe, and \$545,000 for the $1\frac{3}{8}$ pipe, the City Council adopted that most in keeping with the pecuniary requirements of the City, notwithstanding that MM. Shanly and Parent, twice in their report on the respective tenders sent in, declare or words to that effect, that the conduit as proposed by the undersigned leaves nothing to be desired on the score of thickness, permanence and durability.

In view of that portion of clause 2 which sets forth that the undersigned is constituted the judge of the thickness to be given to the pipe, it has been argued that it only rested with me to cause the pipe to be made of such thickness as he thought proper; but when this clause is taken as it must be in conjunction with the latter part of clause 1 with regard to the 430 lbs. pressure and considering that Mr. Beemer's tenders for the thickness of conduit required by me was some \$70,000 more than for a $1\frac{1}{4}$ inch pipe, it became evident that I could not after the City Council adopting the lower tender of \$455,000, call on the contractor to execute the conditions of the higher tender of \$545,000; the total difference being \$90,000 of which allowing \$20,000 as per Shanly and Parent's report, for the enlarged bore of the pipe at the Lorette end, left as above stated \$70,000 as representing the cost of the increased thickness of metal; or which at Bee-

mer's tender of \$10,000 for the increased diameter, would still have left \$50,000 for the increased thickness.

That the thickness arrived at to withstand the required pressure of 430 lbs, is ample, is proved as already stated, by the fact of each pipe having been tested thereto, all defective pipes unable to stand the test having remained on the maker's hands to be broken up and recast.

That some 20 and odd pipes should have given way out of 4000 (about $\frac{1}{2}$ per cent of the whole) is not to be wondered at since some 200 or more of them were more or less broken and cracked in transportation from Europe. The cracked portions were cut off, but likely some of them were insufficiently curtailed and even a microscopic fracture invisible to the naked eye would be such as, under the great pressure (some 200 lbs. to the inch on the lower levels) to cause a rupture.

Some 2 or 3 pipes gave way from their settling down on bowlders or due to defective laying; two or three were showed defects, in the metal which could not be detected by inspection before breakage, while another had to be removed due to a leak at the joint, having thinned it out to less than $\frac{1}{4}$ inch, and the last fractured pipe was had in the very staving of a defective joint.

Again I say there was nothing strange in these failures, and Mr Corrigan, our old foreman of over 30 years standing, and who was in the employ of the City when the first aqueduct was laid, states that as in the present case more than 200 of comparatively stronger 18 pipes of the old main were broken on their way out from Scotland, and that in John St. alone he laid quite a number of 14 inch pipes which had been curtailed more or less to eliminate the broken or cracked portions thereof; while after being laid and the pressure turned on, no less than nine of the 18 pipes burst on the very first day and

that gangs of men were employed the whole of the first season in repairing burst pipes and leaky joints.

The new main is strong enough to resist the pressure stipulated in the contract, and with due care can not be subjected to heavy water hammer so long as the supply maintains itself on the heights, and that the gates have not to be used for turning up the water daily to the upper wards of the city as heretofore, and even this can be avoided by the introduction of hydrometers which though they may cause the revenue to fall off, will stop the wastage to such an extent that the water cannot go below the required level.

The importance of avoiding water hammer, by being very slow and careful with the gates may be inferred when it is remembered that water ($62\frac{1}{2}$ lbs to the cubic foot) is as heavy as oak and that, too suddenly to arrest a column or beam of that material, some $7\frac{3}{4}$ miles long and weighing not less than $12\frac{1}{2}$ millions of pounds, travelling at the rate of 3.58 feet per second or 215 feet a minute, is sure to cause a rupture somewhere along the line. The public should therefore be cautious never to hurry the fire-men in their manipulation of the gates, but, on the contrary, to caution them continually against any undue hurry in performing the operations.

Clause 3 of contract relates to the intake of water at Lorette. This was to have been affected, at the contractors option, either by a separate well or by setting the new pipe side by side with the old conduit. The committee on advice of the engineer, considered it more prudent to have an altogether independent supply for the new main, so that in case of failure of

the one, or of repairs required to the gate house, or so called Château d'Eau, the supply to the City could be maintained by the one pipe while the other was under repair.

A supplementary contract was entered into with Mr Beemer to build the second gate house for the price of \$11,040 and the

works thereof are terminated and were so some 15 days ago when I visited the place, with the exception of the drainage; but this in no way affects the payment of the 25% drawback, the provisions of which do not extend to the supplementary contract.

Clauses 4 and 5 of contract relate that the pipe shall be laid from Lorette to Mount Pleasant at the junction of De Salaberry street; that it shall be parallel to the old main and sufficiently remote therefrom to allow of repairs; that it shall be connected at Mount Pleasant with the present system of pipes by St. John and De Salaberry streets that the contractor shall put in all stop and air gates, the whole as described in my report of 1881 and as required by the undersigned.

All this has been done in full inclusive of wells, pockets, scours, &c., at rivers St. Charles and Des Mères; all that remains to be done being the restoration of such of the joints in the masonry as have given way to frost, and which must be done ere a final settlement can be had with the contractor.

Clause 7 concerns the steel and iron bridges over the St. Charles and Des Mères rivers. That over the St. Charles was to have been built below and alongside of the old aqueduct bridge.

As already set forth in my report of 1883, our legal adviser counseled that as we had already had a suit law with the MM. Bell who claimed \$40,000 damages on account of our having erected one bridge over the river, it would never do to erect a second, and that as the first had a certain headway under it, it would not be prudent to have a lesser height between the water and the underside of the other.

This rendered it necessary to build the new bridge on the very site of the old one. I solved the problem by increasing the span from 120 to 160 feet so as to bring and build the new piers or abutments in rear of the old ones which were partly cut

away from the rear to allow of the new construction. At the same time the new iron tube was built around the old pipe so as in no way to affect the new supply of water to the city.

Another supplementary contract was entered into with Mr. Beemer for this bridge as modified, making it at the same time with such a curvature as would give the same headway at centre as obtained with the old structure.

The new contract was for \$11,400 and all but covered by the \$10,000 which were thus saved to the city in not having to pay for a new or additional right of way and the cost of altering the old main to the new bridge so as to allow of demolishing the old bridge when the new one were finished.

Clause 8 relates that within the outer skin of the new bridge, there shall be an inner one of sheet iron. Upon second and more mature consideration your engineer recommended and there was built, in lieu of the proposed iron lining an inner tube of two thicknesses of wood which in case of leakage within the bridge under the there pressure of 200 lbs. to the square inch, would not be liable to rust as would have been the sheet iron, thus leading to its speedy destruction.

I had also previously recommended dispensing with the saw dust filling, at first proposed between the inner and outer tubes which, in case of leaks would have become wet and swollen and have bulged in the inner lining under the effect of frost as was the case with the inner lining of the old wooden tube. Moreover the air space, it was considered, would act equally as a non conductor and allow of getting between the tubes to repaint the iron work when required, thus preventing its oxydation and prolonging its duration.

The stipulations of clause 9 have been carried out, the pipes having been cast vertically and coated inside and out with Smith's patent varnish.

Clauses 10 and 11 relate to the laying of the pipe, its depth in the ground and the amount of filling over it. The 7 feet of material over the pipe are in no way necessary as a protection against frost and were only founded on the fact that the old main was supposed to be at that depth in the ground as inferred from the section of record in the office, and as clause 4 states that the pipe is to be laid parallel with the old conduit supposed to be at a depth of seven feet, the figure 7 was therefore introduced.

Now, on the contrary the old pipe was found at many places to be not over 4 to 5 ft. deep, to wit between the main road and the indian village, where the depth of ground over the old pipe proved to be but 4 to 4½ feet.

Mr McKay's reports show that of the 135 points at which it was possible to ascertain the depth of the old pipe, there are 95 on ¾ of the whole distance where it is at less than the supposed depth of 7 ft.. At 49 places, the depth is less than 6 ft. on over one third of the line. At 21 places, or one sixth of the distance the old main is at a less depth than 5 feet, and at 14 places it is at depths varying from 4 feet 7 inches to 4 feet 1 inch.

Again, I say, clause 4 required the new pipe to run parallel with the other to avoid syphons. Therefore the axes of the two pipes to satisfy this condition must be parallel with the bottom of the new conduit its bottom 6 inches below and its top six inches above the old one and this has been carried out except where the nature of the soil, due to land springs, made it dangerous to the safety of the old main to go below it, or where the rock bottom would not allow the blasting in the immediate vicinity of the pipe without perilling its existence.

The contractor was therefore in presence of two clauses of the contract which were not known to be incompatible with or contradictory of each other until it was found that the old pipe was far from being at the depth indicated on the section of record in our archives.

Now while the mean depth of the old main for some $\frac{3}{4}$ of its course is but 6 feet, that of the new main is 5 feet., partly due as already stated to its bottom being level with that of the old main and in some cases a few inches above it, and partly from the fact of its diameter being a foot more than that of the old conduit, which of necessity made the depth of filling a foot less.

But half the difference between the 5 and the 7 ft required by the contract is made good by the embankment above the surface composed of the material displaced by the 30 inch main, while along the remaining $\frac{1}{4}$ of its length both pipes are at depth varying from 7 to 14 feet at points, where to avoid syphons, a depth had to be reached which other circumstances would not have rendered necessary.

Therefore the depth of filling over the new main is but one foot less than required by the contract and that along only little more than half the distance between Quebec and Lorette and a detailed calculation of the deficient earthwork makes it but 8000 cubic yards which at 20 cents a yard, getting the material along the line would only amount to some \$1600 and I doubt whether, in view of the clause which requires the new main to be laid parallel to the old or at an equal depth, any deduction can be claimed by the city under this head ; but this is a question to be dealt with by the City Council and its legal advisers.

Clause 12 of contract relates to the jointing of the pipes and if some of them have been found leaky, the defects have been remedied, no leak existing except that from the scouring gate at river St. Charles, to replace which a new gate has been supplied by the contractor, but which it was considered unadvisable to put yet so as not again to leave the city without water, while the operation was being performed, and that the contractor has still more than 6 months before him wherein to do the work or that on his failure so to do, the corporation can have it done and charge the cost thereof against the amount still due.

On the other hand, the leakage from the scouring gate is

too small to affect the supply to the city especially when it is considered that the supply by the new main is fully 9 millions of gallons instead of the $7\frac{1}{2}$ millions required by the contract.

Under clause 13 Mr. Beemer is bound to settle all damages which proprietors and tenants along the line might be subjected to outside of the right of way, 33 feet in width english measure or 31 feet french measure, and Mr. Hoare his managing engineer in chief assures me he has settled all claims along the line with the exception of one of about \$150 of J. Bédard which he has left to be settled by the court on account of the exorbitant nature of the demand.

This Mr. Bédard at River des Mères should be the less exacting in the premises seeing that the south west corner of his barn encroaches several feet on the right of way and that should the Corporation inherit the suit, it can bring Bédard to terms by causing him to remove the barn.

As to accidents to pipes and damages resulting therefrom, the contractor has up to date settled all claims, repaired all breakages as he will also have to do of all others which may occur until the expiry of his contract in May 1886, as required by said contract.

I have no doubt of the correctness of what Mr. Hoare has told me with regard to the settling by the contractor of all claims for damages. All those along the line whom I have been able to see have admitted to me that such is the case.

One or two of the claimants have complained that they were made to sign documents which they did not understand and that they should have got something more. I was lead to believe said one of them, that I was being paid for damages to grain outside the right of way, while the paper signed by me turns out to be a discharge on account of damages to fences, ditches, &c., and the same party complained that instead of bu-

rying the loose stones in the trench, they had been left upon the surface.

I mention these details of little importance that the City Council may judge to what extent if, any, the City might hereafter be called on to settle unassessed claims, by parties along the line of aqueduct.

To be certain that after the expiry of the contract in May next, the City may not be called on to settle further damages, may be it would be well for our notary or some one else to call upon each and every the proprietors and tenants along the line and make inquiry in relation thereto ; or may be it would be sufficient to advertise the matter in the official organs of the Corporation, or cause notices to that effect to be placarded on the church doors of the different parishes gone through, at St. Sauveur. Ste. Angèle, Charlesbourg, St. Ambroise and the Indian Village, &c., or have the matter advertised from the pulpit or both.

This would at any rate be advisable to engage or force proprietors along the line to put in gates (barrières) as thereunto required by their respective acts of cession to the City. Many of them have already done so, but there are still some 27 wanting between Lorette and the " Green Road, " and 7 more from there to the St. Clair road.

While on this question of right of way I may be allowed to suggest the advisability of keeping a roadway open along the line of aqueduct. Such a mode of communication would be of great benefit in the more prompt repairing of fractures and leaks, which yearly occur along the line and can not but be of more frequent occurrence with two pipes than with one.

Two miles in the distance would thus be saved and the steep acclivity of the St. Clair road, which has to be ascended, immediately to descend again by the Bonaventure incline to the level of River des Mères.

It will be remembered that on the occasion of the breakage at River des Mères on the 2nd of November last, the claim for transporting the engine and pumps was not less than \$300 which would not have come to one half the amount had it been possible to follow along the right of way where less than half the number of horses employed on the occasion would have been more than ample for the task.

We require an engine and pump of our own which two horses can manage along the right of way and it would hardly cost more than \$1000 to make the road fit for carts and heavy vehicles, by fascining the swamps and bridging over the ditches.

Practically speaking we have no right of way at Griffiths whose stables are built over the conduit; nor at Judge Stuart's, or through the grounds of the St. Mathews holding; but on account of the intersecting streets, these premises are of easy access in case of necessity.

But from the North end of "Aqueduct street," so called to the river St. Charles, the right of way is illegally obstructed by buildings which the proprietors prefer having with the risk of their being demolished or cut through when required. Still the disadvantage to the city on this account, and while having no damages to pay to squatters might be very great as may be inferred, if the delay be allowed for in reaching a leak or break to repair it, when a store full of heavy goods, or a shed or hangar full of coals or firewood had to be got through and under for the purpose.

The 14 inch pipe from Aqueduct street to Crown street, a distance of 1400 feet has with all the required connections been put in complete.

So also have all the connections, gates and wells been put in at Mount Pleasant at the interception of St. John, De Salaberry and Aqueduct streets, the whole conformably to the requirements of my report of 1881 on which the whole scheme

is based and it is now possible to make any desired combination of the two supplies by the old and new mains as stipulated in the contract.

Thus the Arago street pipe, connected as it is with both the new and old mains allows of supplying the lower levels of the City from the one or from the other or both so that in case of accident to the one the other is at hand to do duty in the interval; and in the same way, the combinations at Mount Pleasant allow of supplying all the upper portions of the city from the St. John street main or from the De Salaberry street main, or both.

The wisdom of not eliminating or doing away with the old main up Aqueduct Hill as Mr. Baldwin had intended to do, has been twenty times demonstrated when on each occasion of a break in the new main, the water could be turned up to the summits through the old main and the whole City supplied as heretofore.

It may also be remarked that the supply from the old conduit at its lower level of delivery is now some three quarters of a million gallons in excess of its former delivery of $2\frac{1}{2}$ million gallons at Mount Pleasant; so that the total supply to the city is rather 13 millions of gallons than the lesser figure alluded to under the head of clause 1 of the contract.

Clause 15 relates to the raising of the dam at Lorotte and scouring out of the subsiding reservoir, and first with regard to the removal of sediment from the dam, the work has been performed in a satisfactory manner, some 600 cubic yards of material having been dredged out by means of a scoop from the end of a 40 feet jib derrick with a 70 feet out-rigger attached to reach the outer most limits of the deposit.

I again sounded the reservoir lately and where the bottom of it was clear after the dredging, a new deposit of some 4 feet summit height is to be found, which bears me out in my con-

clusions that as the borders of the river became denuded of their trees and brushwood and therefore unprotected, sand becomes detached from them and comes down the river in constantly increasing quantities and must ultimately invade the whole system of our water works and reduce and destroy their efficiency to an alarming extent, unless my suggestion and recommendation of more than a year ago to the City Council be carried out of erecting a sand arrester, with suitable wire netting onto to prevent fishes, frogs, insects, leaves; branches, mosses and other organic matter from passing into the city circulation.

This bar to the passage of sand and sediment should have been erected at the outset of the works in 1853 and the consequence of its omission is that even in localities the most remote from the fountain head as at the extremity of the main at Cap Blanc, not less than half a cart load of coarse sand was removed from the 4 inch pipe in that ward, after the lighter sediment had been running off with the water for some 20 minutes previously.

Now, with regard to the other stipulation of clause 15 : the raising of the dam at Lorette, it is optional with the Corporation whether this be done or not, the contract providing that if not done the cost thereof shall be deducted from the contract amount. This I have estimated at some \$3500.

The Water Works committee as yet, has arrived at no conclusion in the premises, and it is therefore no omission of the contractor's if the work has not yet been done, nor can it affect the payment to the contractor of the first half of the 50 *per cent* drawback. At any rate, it is now too late to think of it at this season, and the work, if to be done, must be left over till slack water of July and August next.

Clause 16 of contract has it that the supply must be continuous throughout the city, the maximum pressure except upon the height to be 75 lbs, the maximum 90 lbs. The supply is

continuous ; not, however, because so stipulated, but because it could not be otherwise, and will be so long as the ever increasing wastage shall not have caused the water to fall off from the summit levels ; nor did I in my report of 1881 hold out any such promise of its continuity for all time to come.

As to the 90 lbs maximum pressure, the proposed automatic valve in Arago st. could no doubt have solved the problem but not with the other proviso of a minimum pressure of 75 lbs, for as it is, the fire pressure at the extremities is not sufficient to more than command a two story house, and had the value been put in and the present maximum pressure of 120 lbs, been then reduced to 90, the consequence would be that no dynamic pressure at all would have obtained at the city limits, due to the small size of the mains in those localities and to the fact that the flow as at Cap Blanc and the Marine Hospital is through loss by friction reduced to a minimum.

What I here advance with regard to minimising the pressure is fully borne out by the fact that not less than three regulating valves were, many years ago and before my time, introduced : the one in Augustin st. at the head of the cliff, another similarly situated in St. Clair st. and a third in Rampart street to command the supply to the lower, wards of the city. Each of the three proved to be absolutely useless and may still be seen with their respective lever arms securely fastened to the summit of the surrounding masonry after an expenditure of several thousand dollars to put them in.

But the pressure can easily and economically be reduced as required in every household, in every building, by the insertion of a regulator at a cost, in each case, of some \$2 to \$3, either at the expense of the proprietor or tenant or at that of the city.

By clause 17 of contract, the works were to have been completed by the 1st of December 1884. This result did not obtain

nor could it, due to the delay in getting the right of way at Mount Pleasant.

The last clause of the contract bearing a No (18) is to the effect that at no time during the prosecution of the works shall the city be without at least its present supply of water, that by the old pipe and in this respect Mr Beemer did not fail.

With regard to the present broken or apparently unfinished state of the approaches to the bridges over the rivers St. Charles and Des Mères, it is to be remembered that these works have already been completed and were only broken and partially destroyed by the leakages which since occurred. They cannot be repaired at this season, nor can the joints be drawn again where they have fallen away during the frosts of last winter, nor until the forth-coming spring ; and neither can they be charged to that portion of the contract which deals with the payment to the contractor of the first half of the drawback, since they were all completed previously and now, it is evident that the making good of the approaches, etc., etc., can only be charged to " maintenance " and comes under the clause relating to the year's delay and payment of the second portion or remainder of the drawback.

Mr. Beemer with his staff of engineers, managers, &c has fulfilled his contract under most arduous engineering and pecuniary difficulties : a rainy season and an unprecedented drawback of 50 0/0, the whole under the able guidance of his chief engineer E. A. Hoare esq. M. I. C. E., quite a young man to whom it has been this given to acquire much valuable experience in hydraulic engineering, in the carrying out of this one contract of nearly half a million of dollars, where every description of work is to be met with in iron, steel, stone and wood, including the new gate house at Lorette, the several air, stop and scouring gates and wells, galleries etc : structures of which the least important are not the steel and iron tubular bridges over the Des Mères and St. Charles rivers resting on

massive piers of the heaviest cut stone masonry, while the carrying on of the designs prepared by the undersigned for the span over the St. Charles with its novel feature of a reversed curve in the vertical plane at each abutment reflects much credit not only on the contractor and his engineer, M. M. Beemer and Hoare but also on the bridge building company which carried out the design.

CHS. BAILLAIRGÉ,
Engineer New A., W. W.

Quebec, 30th Oct. 1885.

CITY HALL.

Quebec, July 13th 1886.

C. DUQUET, esq.,
Chairman W. W. Committee.

Sir,

In obedience to the resolution of the W. W. Committee requesting me to report on Mr. Beemer's demand to be now relieved of further responsibility with regard to the new aqueduct; I have the honor to state that all works not terminated at the date of my report of Oct. 30th 1885, have since been completed in a satisfactory manner and that the new main is now and already for some time past has been in complete working order.

Now as to the question of the day and date from which should be reckoned the year's delay to be undergone by the contractor to entitle him to the payment of the second half of his drawback, I would observe that the water was first on the city for a few hours on Jany. 30th 1885 when certain pipes gave

way, some of them under pressure and others from being improperly set.

Again on the 28th Feb. following the water was on the city by the new main for some 10 hours.

On the 27th of March the water was on during 24 hours consecutively.

On April 9th the supply maintained itself for some 48 hours and finally about the 11th May 1885 nearly all the breakages had occurred and been repaired and the water may be considered as having been permanently on the city since that time.

Fourteen months have now gone by since that date, and consequently in computing therefrom, that is from the most recent of the aforesaid dates, the year's delay has more than expired through which the contractor was to have waited to entitle him to receive the balance of his drawback, and a fortiori if the delay be computed from January 1885 when the water was for the first time on the city.

The committee can therefore in my opinion recommend that the balance due Mr. Beemer be paid him reserving for future settlement the respective claims of the contracting parties.

C. BAILLAIRGÉ,

Engr. New Q. W. W.

P. S.—It must be understood that the work here referred to is not work forming part of that to be completed within the first period mentioned in the contract, but is simply repairs to works destroyed by breakage in the pipe line and which had once been fully completed, and therefore form part of the works to be maintained during the last term of the contract for which

the 25 o/o drawback was retained. All of which is evident from the report of Oct. 30th 1885.

C. B.

REPORT OF THE WATER WORKS COMMITTEE.

—
CITY HALL.

Quebec, Aug. 3rd 1885.

Present :

His Worship The MAYOR,
Councillor DUQUET, *in the chair*,
Alderman HEARN,
Councillors BOUCHARD,
PEACHY,
TESSIER.

Your Committee has the honor to recommend to the Council that Mr. Beemer be now relieved of all responsibility with regard to the New Water Works pipe and that the Corporation do now take over and accept the new main, leaving the respective claims of the contracting parties to be settled hereafter,

Humbly submitted

(Signed) CYR. DUQUET,
Chairman.

RESOLUTION.

CITY HALL

QUEBEC, 30 AUGUST 1886

At a special meeting of the council of the City of Quebec held on the 27th day of August 1886 :

Read, the 429th report of the Water Works Committee (To take over the new aqueduct from Mr. Beemer), which, being put to the vote ; Alderman Chouinard, seconded by Honorable Alderman Hearn, moved, and it was .

Resolved,—That the said report be continued until the opinion of the legal adviser be obtained regarding the acceptance of the new water works by the Corporation, and that, meanwhile, Mr. Baillairge's reports relating to the completion and acceptance of the new water works, namely, the reports of the 30th October, 1885, of the 18th July and 3rd August, 1886, and letter of the 13rd July, 1886 be translated and printed for the use of this Council.

CONTRACT

BETWEEN

THE CORPORATION OF THE CITY OF QUEBEC

AND

HORACE JANSON BEEMER, ESQ.,

In the presence of the undersigned, Notary Public for the

Province of Quebec, in the Dominion of Canada, residing in the City of Quebec.

Personally came and appeared His Worship, François Langelier, Mayor of the City of Quebec, and therein residing, acting to these presents for and in the name of the Corporation of the City of Quebec, and duly authorized to the effect of these presents by and in virtue of a resolution passed at a special meeting of the Council of the said City, held on the twenty second day of June last, of the one part ;

And Horace Janson Beemer, of the City of Montreal, Esq , Contractor, of the other part.

Which said parties have agreed and contracted together, as follows to wit :—

10. The said Horace Janson Beemer, promises to supply the said City of Québec, with ten millions of gallons of water, imperial measure, per twenty-four hours including the present supply of about two and a half millions of gallons to be taken from the dam at Lorette, whence the present supply is obtained, to Mount Pleasant, by means of a thirty inch, inside diameter conduit, the same to be of a sufficient thickness and strength to stand the pressure due to a head of one thousand feet of water.

20. Each length of pipe and each special casting shall be tested by and at the expense of the said Contractor to the aforesaid head of one thousand feet or pressure equal thereto, and the City Engineer shall decide as to the thickness and strength of these pipes and special castings.

30. The Contractor shall at Lorette, in the vicinity of the Château d'Eau, cause to be made an ingress well of ten feet inside diameter and of a depth of ten feet below the surface of the water in the subsiding reservoir and the said well shall be connected with the said reservoir by a proper tunnel or conduit

of sufficient dimensions and strength, the whole, to be constructed of hydraulic masonry and the said well shall be fitted with stop-gates, strainers, and all the necessary appliances for shutting off, turning on and measuring the flow of water to the City as may be required, and he, the said contractor, shall over the said well erect a stone structure of proper shape and dimensions to protect the same and suit the above mentioned requirements. It shall be optional for the contractor instead of building the above mentioned well to connect the new pipe, with the well in the present Château d'Eau, the whole as fully described in the City Engineer's report of the tenth of June, eighteen hundred and eighty one, and with the addition only of some mode of dividing the two supplies to admit of the separate measurement thereof, the whole to the satisfaction of the City Engineer.

40 The said conduit shall be laid from the said well to Mount Pleasant as aforesaid (at the junction of St. John and De Salaberry streets) parallel to the present main, at a sufficient distance for clearances and repairs.

50. The said conduit shall be connected at Mount Pleasant with the present system of distribution through St. John and De Salaberry streets.

60. The said Contractor shall provide on the line of the said pipe, eleven wells, ten air valves, five stop valves, a scouring reservoir, and scouring gates, the whole at such places, and in such a manner as shall be directed by the City Engineer.

70. The said Contractor shall carry the said conduit across the rivers des Mères and St. Charles on iron tubular bridges of a single span, on abutments or piers of heavy coursed rock-faced stone masonry in hydraulic cement on properly filled foundations or the masonry itself of the piers extending down to a solid and unyielding foundation.

80. The said tubular bridges shall have an inner skin of

iron, the space between the inner and outer to be filled with some protecting material against the action of frost and the inside space through which the new tube shall run shall be of such size as to afford space for hereafter placing side by side with it, the present main with sufficient space between the two and on all sides of both pipes for all necessary repairs or alterations at any future time.

9o. All pipes shall be cast vertically and after being thoroughly cleaned both inside and out and while still hot from the mould, shall be coated inside and out with Doctor Smith's Patent coal tar varnish.

10o. The said Contractor shall make all excavations in earth, shale, rock, &c., and after the pipes are laid, fill in, under, around and over the same with proper earthy materials, the same to be properly rammed down and consolidated.

11o. Where laid in embankment the same shall be seven feet thick over the pipes on all sides with side slopes of at least one and a half to one, and where laid in excavation the depth of ground over the pipe will also be of seven feet.

12o. The pipes shall all be thoroughly laid to proper grades and directions on an unyielding foundation and all joints thoroughly filled with gasket and lead, the same to be thoroughly staved to withstand the pressure and prevent any blowing off the joints and that the whole may be absolutely free from leaks of even the minutest discription throughout the whole extent of the conduit.

13o. The contractor shall execute all the works necessary to carry out the present contract, all of which shall be of the very best class of workmanship and will likewise furnish all materials of the best quality as also all labor, cartage, plant, and every other item of expenditure whatsoever required in the carrying out of the contract and necessary for the full completion thereof whith the sole exception of the right of way, being

only thirty feet in width, the contractor shall confine himself thereto and will be held responsible for all damages arising from all encroachments beyond the same or otherwise including all damages which might arise to the present main during the execution of the present contract.

140. The said contractor shall from the foot of aqueduct hill at the intersection of Arago street or the prolongation thereof westward lay a fourteen inch conduit or from the present main or both as may be hereafter decided by said City Council through Arago street to or near the head of Crown street, and said connections as well as those at Mount Pleasant shall be supplied with stop gates to allow of any possible combination or distribution of supply from both mains to either the lower or upper wards of the said City.

150. The present dam at Lorette shall be raised by the said contractor to the extent of two feet more or less as may be decided by the said City Council, but in case the latter should not decide on having the alteration made, a deduction will be made from the price hereafter stipulated of the present contract in proportion to the amount of work deducted but in all cases the present dam shall be thoroughly repaired and the subsiding reservoir cleaned out by the said contractor as part of the present contract.

160. The said supply of ten millions of gallons of water to be furnished by the said contractor as aforesaid shall be constant and continuous that is that all the pipes in the City even at the highest levels shall be constantly full of water at a minimum pressure of seventy-five pounds to the square inch with the exception only of the summit level at Grande Allée where such pressure cannot be had with the present head of water and the maximum pressure shall no where and at no time exceed ninety pounds to the square inch, and the said contractor shall provide in that respect such self acting or weighted valve as in the opinion of the City Engineer shall be considered necessary

to prevent the said maximum pressure from being exceeded.

17o. The said contractor shall commence the said works in one month from this day or sooner and shall continue the same without unnecessary interruptions and with a sufficient number of hands to secure the completion thereof on or before the first day of December of next year.

18o. The said Contractor shall carry on the said works in such a manner that at no time the said City shall be without at least its present supply of water.

19o. The present contract is made for and in consideration of the sum of four hundred and fifty-five thousand, five hundred dollars, which the said François Langelier acting as aforesaid promises to pay to the said Horace Janson Beemer or order, monthly, on the certificates of the City Engineer, approved of by the City Council, the said certificates to be based on the progress estimates of works done and materials delivered, and accepted as hereinafter provided, the same to be prepared by the said City Engineer and shall be pro rata of the total contract price. The said contractor shall be paid fifty per cent only of the amount of such certificates, the balance to remain in the hands of the said Corporation as a guarantee for the carrying out of the present contract and the fulfilment of all each and every one of its clauses. Upon the completion and acceptance of the said works and after the said City shall be supplied with water as aforesaid, the said contractor shall be paid one half of the said drawback and the balance or twenty-five per cent of the contract amount will be paid over to the said contractor, one year after the completion and acceptance of the said works by the said Corporation, provided that, at that latter date, the whole work be found satisfactory, in every particular and the said water supply and pressure be as agreed upon by the present contract and interest at six per cent shall be allowed to the said Contractor on the drawback of each certificate from the date of the same until final payment of the said drawback.

des
be
del
wa
and

tra
de
ne
am
Co

Ci
ca
th
all

th
ri
sh
sa

se
ac
tl
o
ti
o
v
v
n
v

It is agreed between the said parties, that all materials destined to the construction of the works shall be considered to be the property of the Corporation, so soon as the same shall be delivered on the works, that is on and along the said right of way or on any other property belonging to the said Corporation, and shall have been accepted by the said City Engineer.

It is hereby agreed that the deposit made by the said Contractor, now in the hands of the City Treasurer shall remain a deposit until such time as the aggregate amount of City Engineer's approved estimates as aforesaid, shall have reached the amount of twenty five thousand dollars, at which time the said Contractor will be refunded said deposit.

The said Contractor shall have to comply with all Police, City and municipal laws and by-laws, with respect to the carrying out of the present Contract, to the entire discharge of the said Corporation, he hereby holding himself responsible for all damages arising out of a non complying therewith.

The surplus ground or materials from the excavations along the line of said Conduit, shall be equally spread over the said right of way by and at the expense of the said Contractor, who shall likewise remove all remaining materials if any to the satisfaction of the said Corporation.

It is expressly agreed and understood by and between the said parties, that all the works to be done concerning the said aqueduct shall be considered as made and executed in virtue of the present contract and for, and in consideration of the price, or sum of money herein above stipulated and that the said contractor shall have no right to claim or demand any indemnity or remuneration whatever for works done and executed by him with respect to the present contract under pretext that such work or works do not form part of the present contract, were not in contemplation and are extras or under any other pretext whatsoever unless he receives from the said City Council an

order in writing clearly specifying the extra work or works to be done for a certain price to be mentioned in the resolution to be passed by the said Council to that effect and not otherwise.

It is also agreed between the said parties, that, in case of any difficulties or differences of opinion arising between them as to the meaning, interpretation or signification to be given to the present contract, that then, the said parties will respectively appoint an arbitrator, each to decide the matter and should they the said arbitrators disagree that then they will appoint an umpire to pronounce judgement which judgement will then be final and without appeal.

And at the same time personally came and appeared Alphonse Charlebois, of the town of St-Henri-des-Tanneries. Esquire, contractor and Louis Zenophile Malette of the parish of Vaudreuil, in the county of Vaudreuil, Esquire, contractor, who after having taken full communication and reading of the present contract hereby agree to become joint securities of the said Horace Janson Beemer, in favor of the said "The Corporation of the City of Quebec" jointly and severally, and have and do hereby bind themselves as aforesaid to the entire execution of the present contract and of all, each and every one of its clauses and conditions, each of them the said contractor and said securities making of the whole his own and proper affair, as if he were the only contractor and principal *obligé*.

And in order further to secure the execution of the present contract and give more value to the said security, the said Alphonse Charlebois, one of the said securities doth hereby especially mortgage and hypothecate to the amount of four hundred and fifty-five thousand five hundred dollars, the following immoveable property viz :—

A piece of land situated in the said town of St. Henri-des-Tanneries, in the County of Hochelaga, bounded in front to the north by St. Antoine street, in rear to the south by the heirs of

the
Hu;
stre
tan
mor
and
nur

tie
the
Ho
de

H:
hu
si:
G
si

the late Samuel, on one side to the East by the heirs of the late Hugh McKay, and on the other side, to the West by Bethune street, with a brick and stone castle thereon erected, circumstances and dependencies. The immoveable property presently mortgaged is now known and designated on the cadastral plan and book of reference thereto, for the said town, under the number (1617) one thousand six hundred and seventeen.

The contractor shall pay the cost of the present contract,

And for the execution of the present contract, the said parties and securities have made election of domiciles, His Worship the Mayor, at the City Hall, the said contractor, at the St. Louis Hotel, Quebec, and the said securities at their respective residences.

Done and passed at the said City of Quebec, at the City Hall, of the said City, this tenth day of July, one thousand eight hundred and eighty-three, under the number two thousand six hundred and fifty-four of the minutes of Mtre. Adolphe G Tourangeau, the undersigned notary and the said parties have signed with us said notary after due reading of these presents.

(Signed)	" F. LANGELIER, Mayor of Quebec,
"	" H. J. BEEMER,"
"	" A. CHARLEBOIS,"
"	" L. Z. MALLETTE,"
"	" AD. G. TOURANGEAU, N.P."

There is a true copy of this in my office.

CONTENTS.

	Page
Report of Mr Baillairgé.....	1
Report of Mr Baillairgé.....	16
Report of Water Works Comitee.....	18
Council Resolution.....	19
Contract between the Corporation of the city of Quebec and H. J. Beemer.....	19

