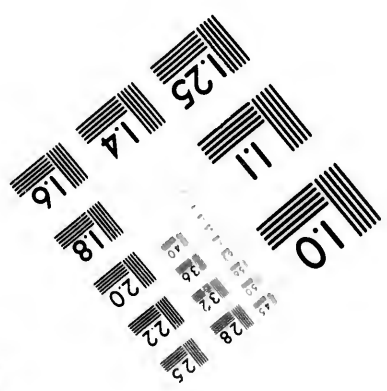
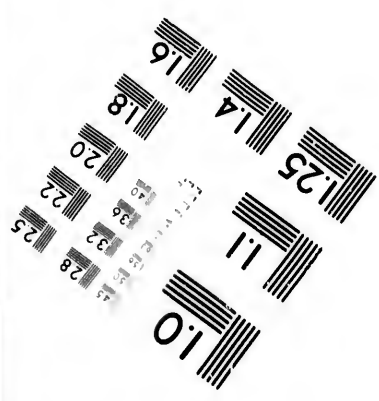
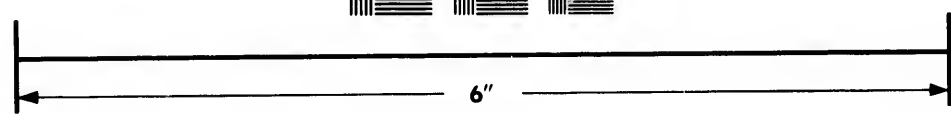
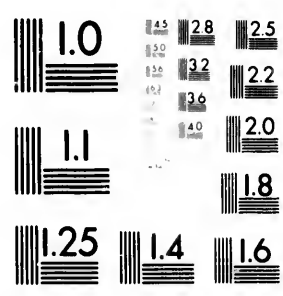


**IMAGE EVALUATION  
TEST TARGET (MT-3)**



**Photographic  
Sciences  
Corporation**

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



**CIHM/ICMH  
Microfiche  
Series.**

**CIHM/ICMH  
Collection de  
microfiches.**



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	14X	16X	22X	26X	30X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12X	16X	20X	24X	28X	32X

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

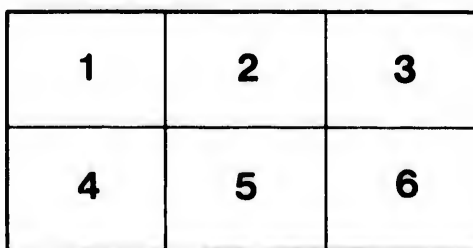
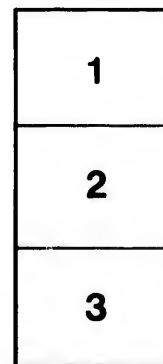
National Library of Canada

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  $\nabla$  (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:

Bibliothèque nationale du Canada

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  $\nabla$  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.

REPORT  
ON  
WATER POWER

AT  
ST. JEROME, P. Q.

---

BY  
WILLIAM MALSBERG,  
*Civil Engineer.*

*T. Pymelo*

Montreal :  
PRINTED BY JOHN LOVELL, 23 ST. NICHOLAS STREET.

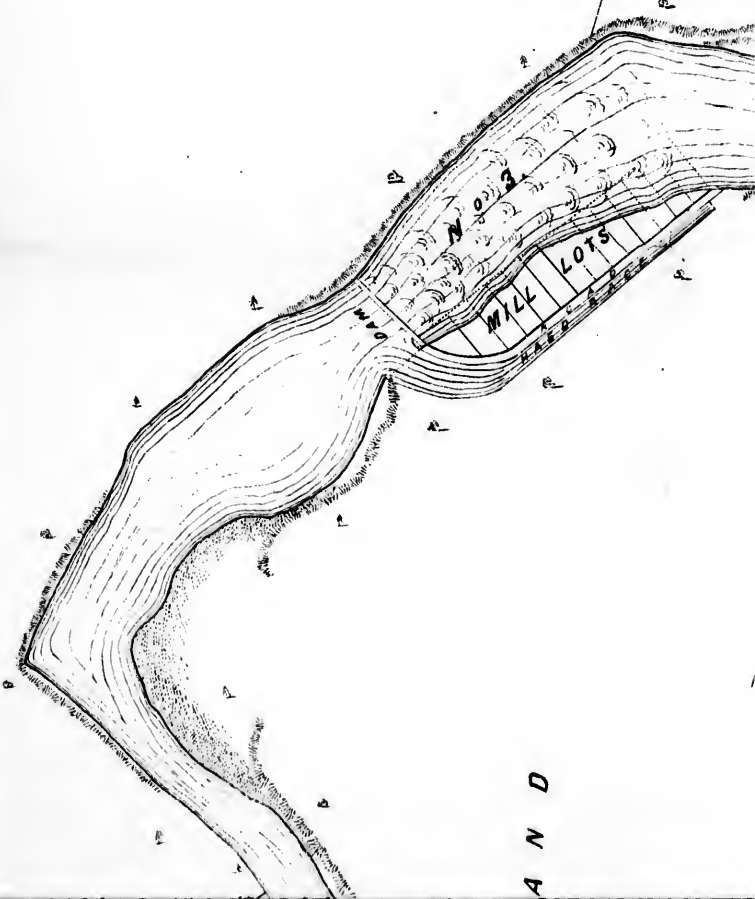
1870.











P. LABELLE.

LAUT

A N D

LAUZON.

I. PARQUIN.

A.

ST. FRANCOIS.

P. LABELLE.



A.

A. ST. AUBIN

CHARLIE.

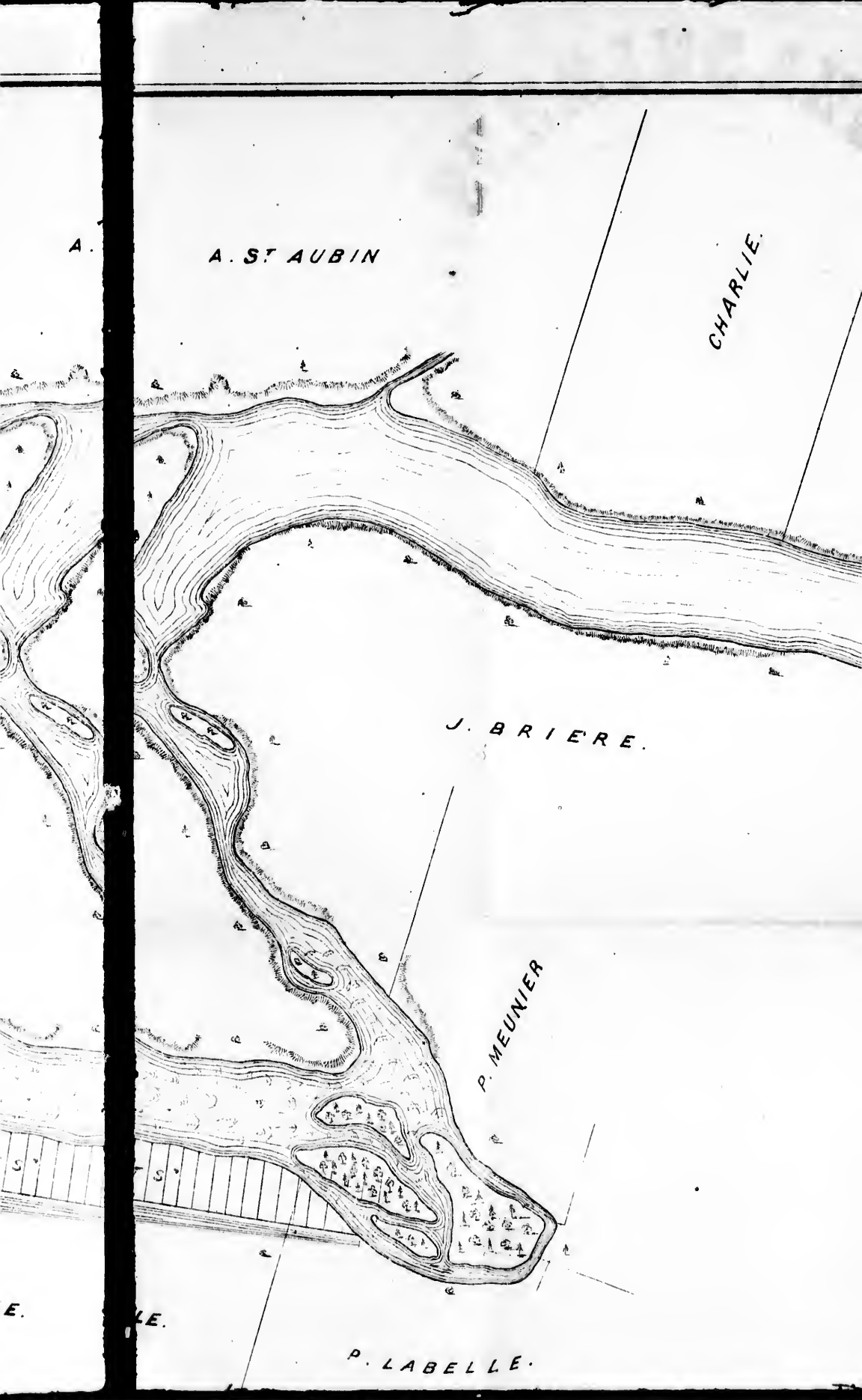
J. BRIERE.

P. MEUNIER

P. LABELLE.

E.

LE.



LAPORTE.

LAPORTE.

C. ALARIE.

T. RHEAUME.

CAREY.

A. LECAVALIER

P. VAILLANCOURS.

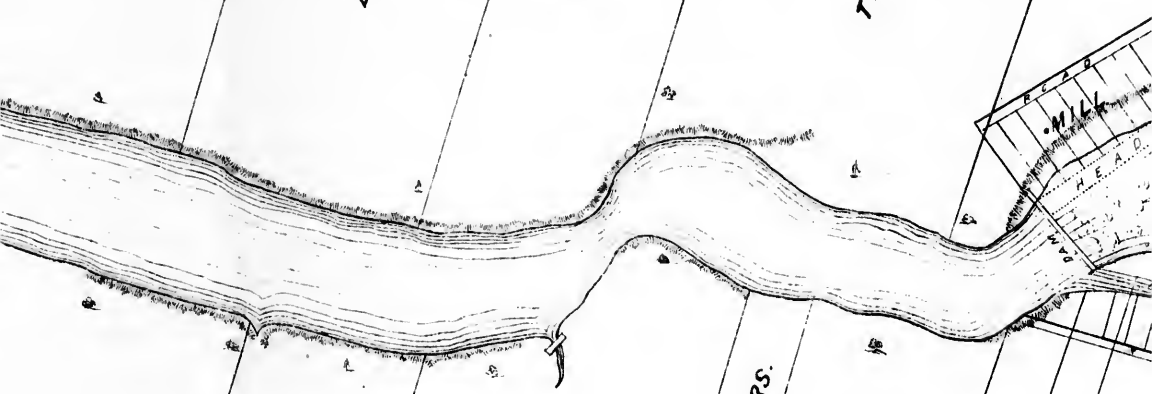
H. MAINVILLE.

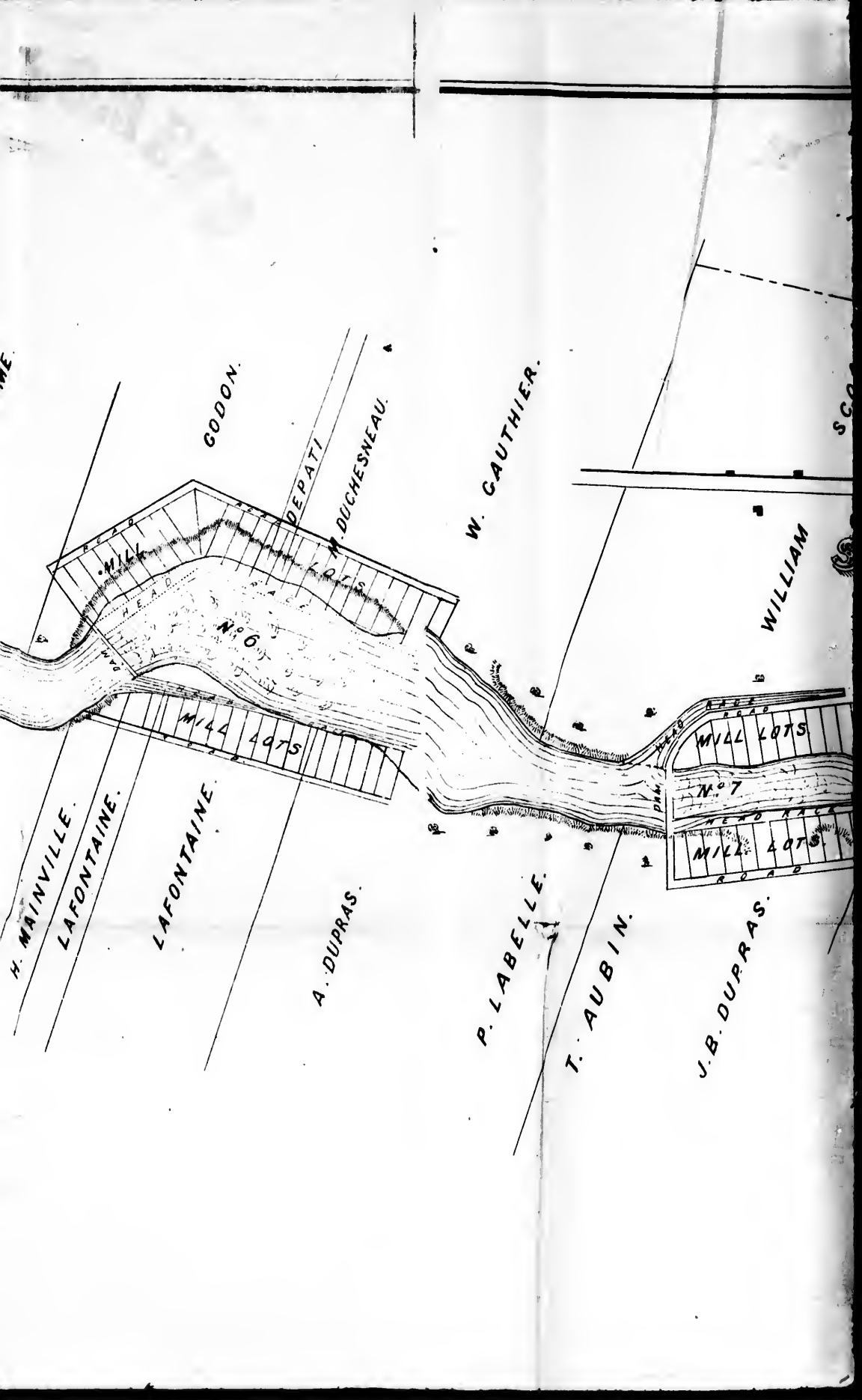
P. LAUZON.

H. MAINVILLE.

LAFONTAINE.

LAFON





GODON.

DEPATI

DUCHESNEAU.

W. GAUTHIER.

WILLIAM

H. MAINVILLE.  
LAFONTAINE.

LAFONTAINE.

A. DUPRAS.

P. LABELLE.

T. AUBIN.

J.B. DUPRAS.

MILL

N° 6

MILL LOTS

MILL LOTS

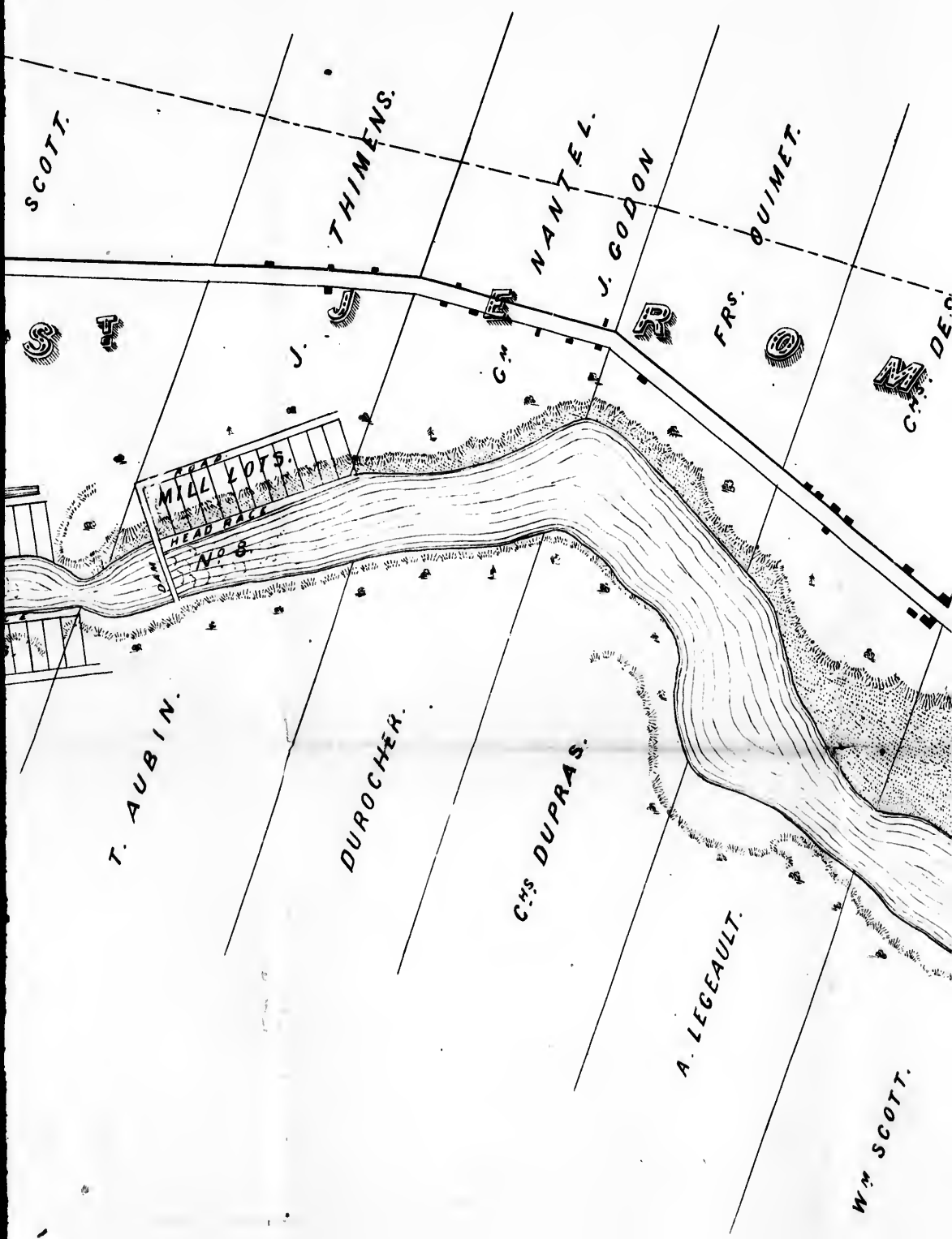
N° 7

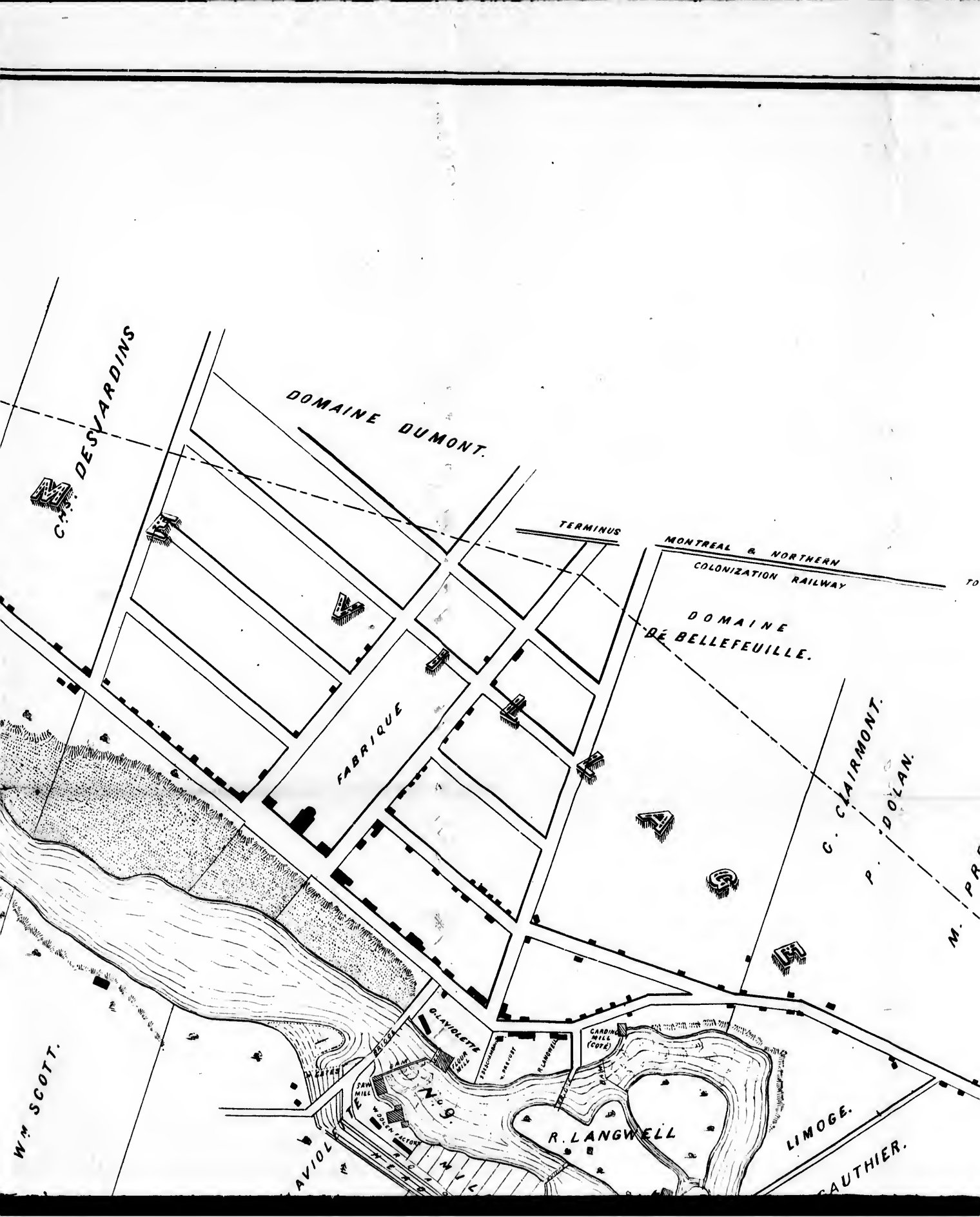
MILL LOTS

ROAD

DRAIN

SC





DES VARDINS

DOMAINE DUMONT.

TERMINUS

MONTREAL & NORTHERN  
COLONIZATION RAILWAY

DOMAINE  
DE BELLEFEUILLE.

FABRIQUE

G. CLAIRMONT.

P. DOLAN.

M. PR...

W.M. SCOTT.

AVIOL...

GLANVOLETTE

CARBON MILE (COTE)

R. LANGWELL

LIMOGE.

SAUTHIER.

SAND MILL


WOODEN FACTORY

STATION

PARK DRIVE

BLANKWELL

N. 9.

TO MONTREAL. 

DOLAN.

M. PREVOST.

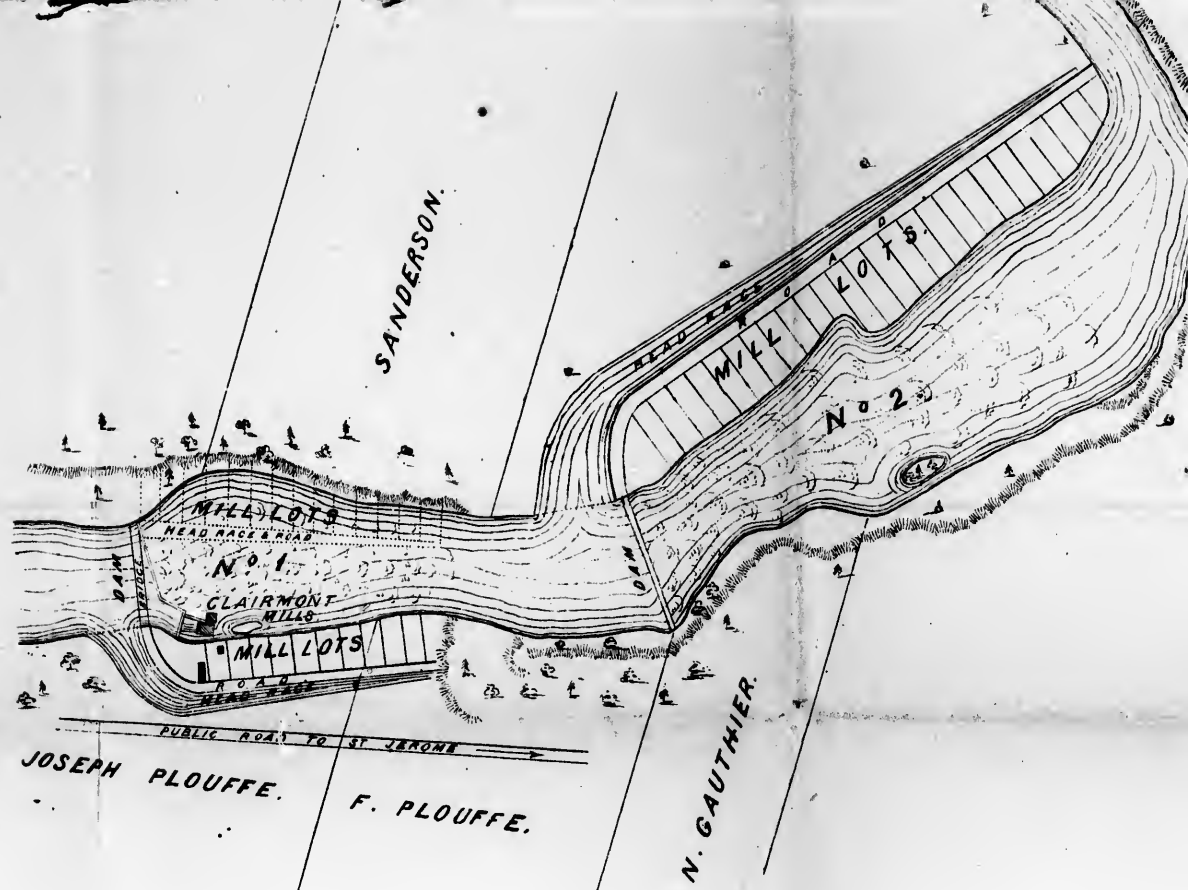
LA JEUNESSE.

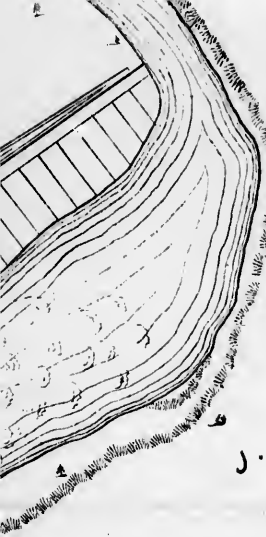
R.

TO MONTREAL. 









J. B.

C H A R T R A N



**PLAN**  
**SHewing THE DIFFERENT WA**

**OF THE**  
**RIVIERE DU NOI**

**AT AND NEAR**

**THE VILLAGE OF ST**

**COUNTY OF**  
**TERREBONN**

**DISTANCE FROM MONTREAL 30 M**

*Scale 360 Feet to One Inch*

*Montreal 1<sup>st</sup> February 1870.*

**WATER POWERS**

**NORD**

**ST. JEROME**

**BONNE. P. Q.**

**REAL 30 MILES.**

*One Inch*

*William Malburg  
Civil Engineer*

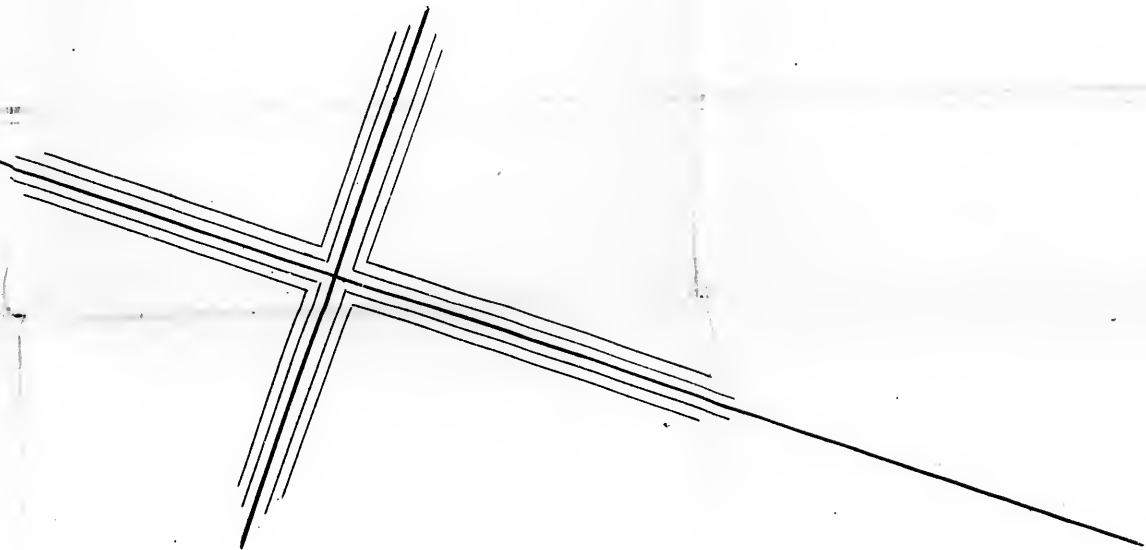
G. LAVIOL

LONGPRE

W. M.



MAC MORTON



G. LAVIOL

GAUTHIER

LONGPRE

BRIERE

LANGWELL

GUERIN

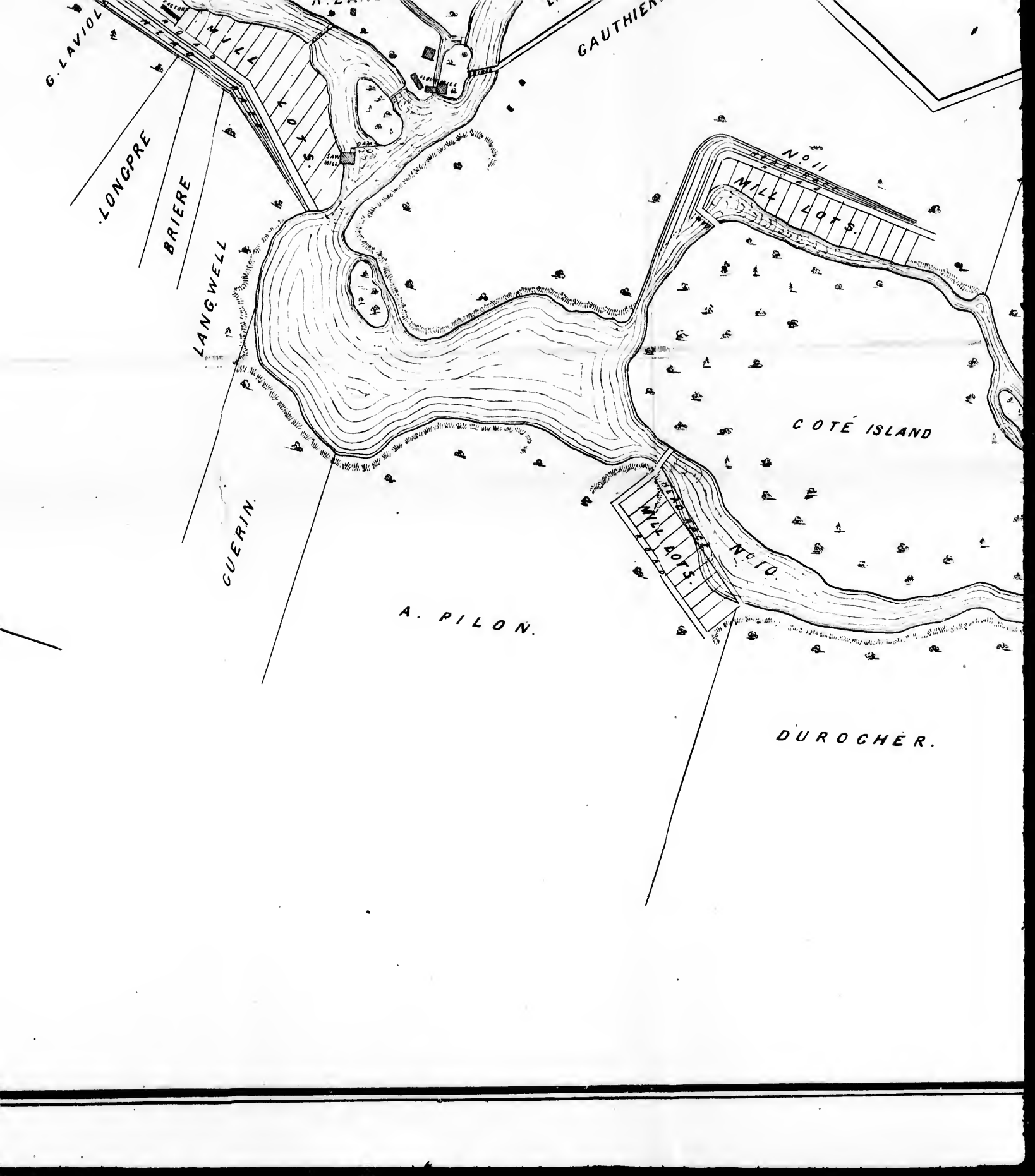
A. PILON

DUROCHER

NO 10

NO 11  
MILL  
LOTS

COTE ISLAND



TO MONTREAL.

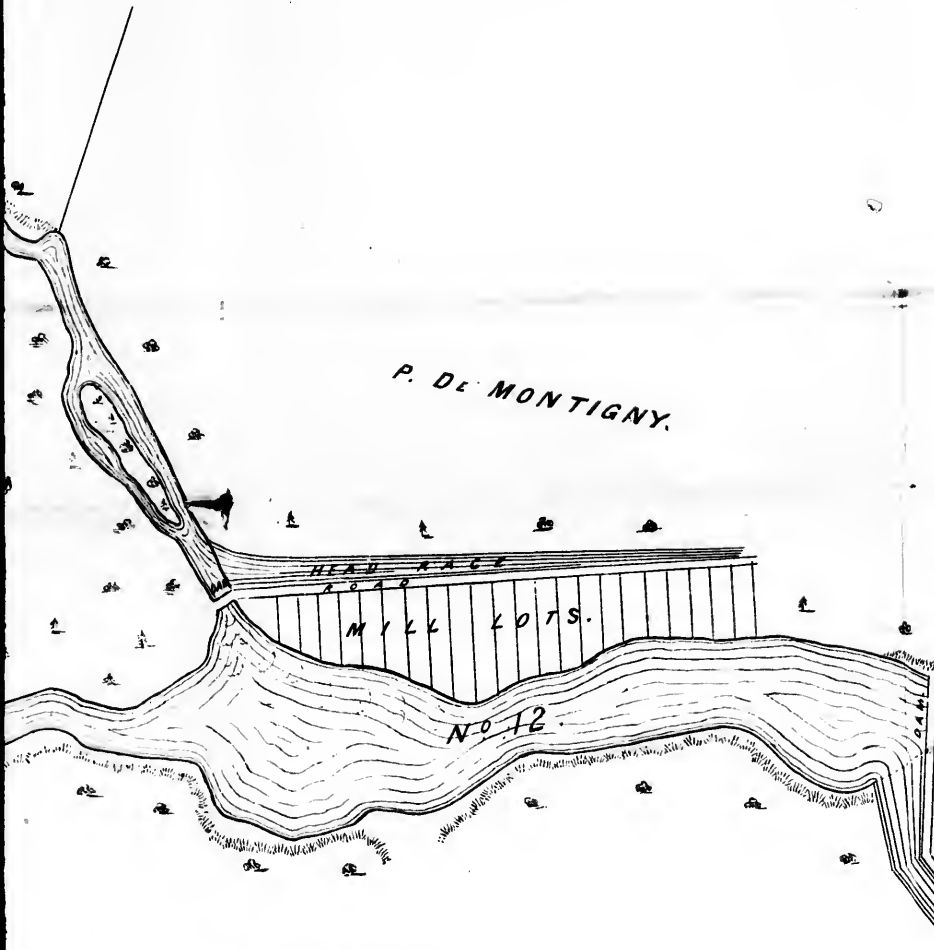
P. DE MONTIGNY.

HEAD RACE

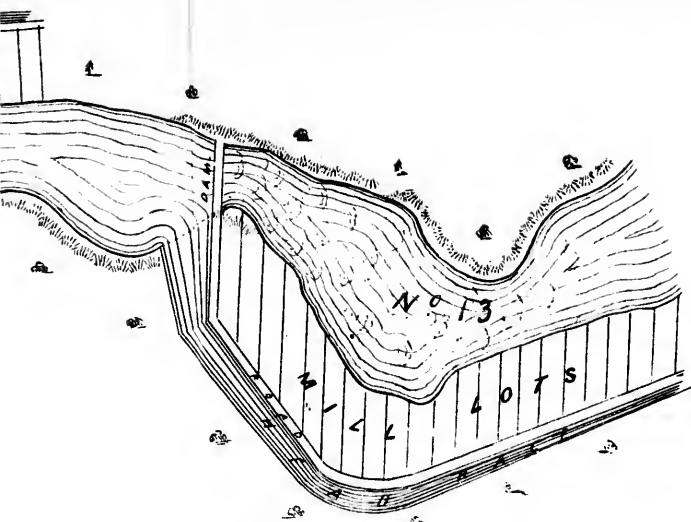
MILL LOTS.

NO. 12

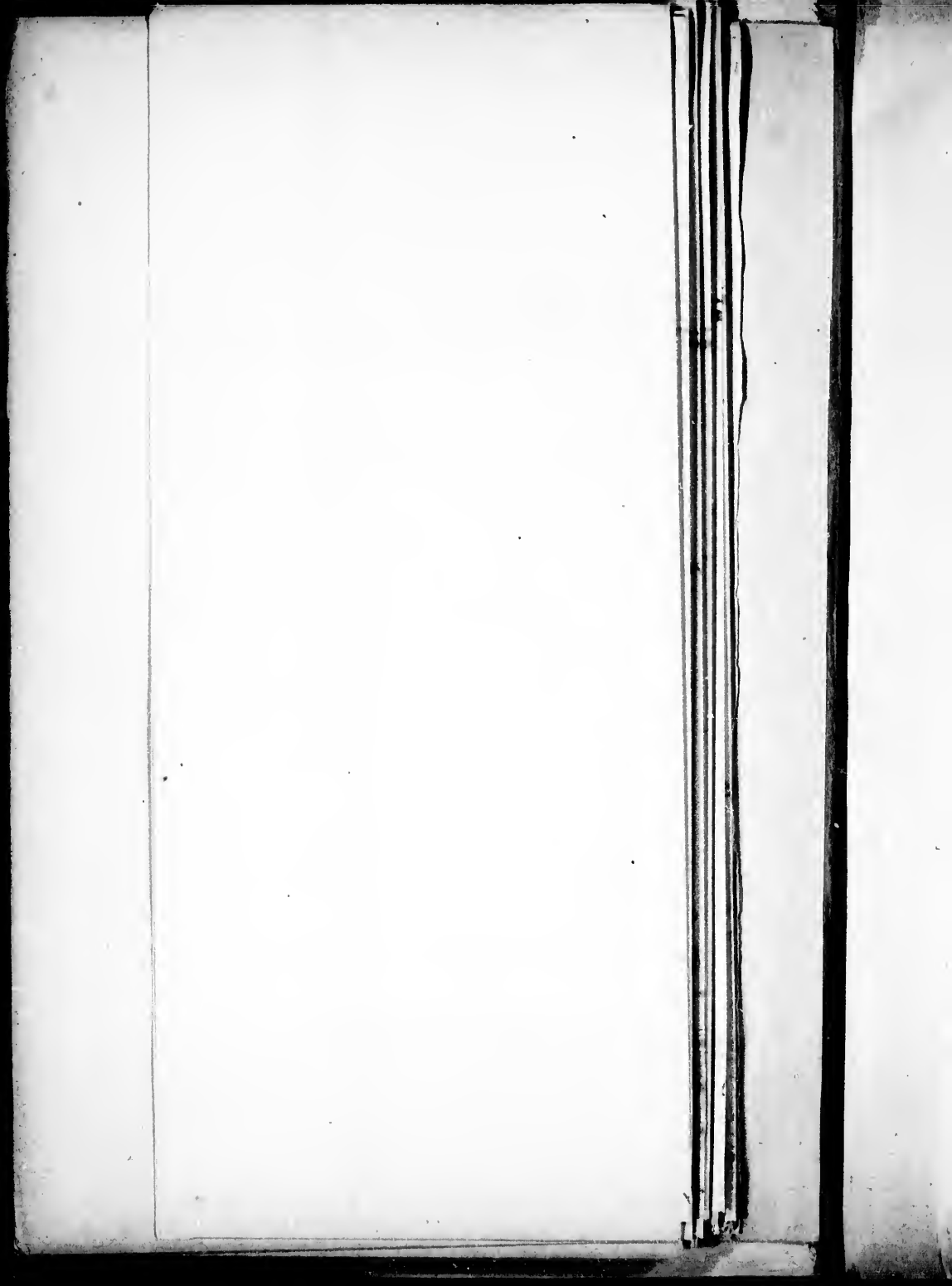
S<sup>T</sup>. MARTIN.







TRUDEL.



REPORT  
ON  
WATER POWER

AT  
**ST. JEROME, P. Q.**

---

BY  
WILLIAM MALSBURG,  
*Civil Engineer.*

---

Montreal :  
PRINTED BY JOHN LOVELL, 23 ST. NICHOLAS STREET.  
1870.

TC 427

N6

M34

\*\*\*

MONTREAL, 1st February, 1870.

To G. LAVIOLETTE, Esq.,

*Mayor,*

St. Jérôme, P. Q.

SIR,—At the request of the gentlemen interested in the development of the water power on the Rivière du Nord (North River), at and near the Village of St. Jérôme, County Terrebonne, Province of Quebec.

I proceeded to that place with the view of making such examinations as would enable me to arrive at the knowledge of the amount of power which could be brought into use. Being also advised that what was most particularly required for the present was a preliminary survey with plan and report, giving such results as would sufficiently warrant the carrying out of the proposed improvements.

In view of the extent of the work determined on for the present, I first made myself generally acquainted with the character and regimen of the river for a number of miles above and below the village, and examined the different points advocated by various parties as suitable sites for mill dams and mill lots. These different points are shewn on the annexed lithographic plan, from No. 1 to 13 inclusive, as also the different rapids, mills and mill dams.

The village of St. Jérôme and proposed termini of Montreal and Northern Colonization Railway. Reference will be made to the above plan from time to time, in present report, when required for demonstration.

Before proceeding with the report, I beg to call your attention to the following abstract, taken from C. Legge's, Esq., C.E., report on Montreal and Northern Colonization Railway :—

“ A few remarks on the water power of St. Jérôme may not be out of place, in consequence of the intimate relation which exists between its profitable employment and the construction of the railway.

“ The North River, which furnishes the power in question, takes its rise in several large lakes in the interior of the country, draining a large extent of territory, and flowing in a southerly direction to St. Jérôme, where it turns suddenly and runs in a south-westerly direction, discharging into the Ottawa river, near the Village of St. Andrew's.

“ At the Village of St. Jérôme, and for the distance of six miles, there is a fall of 305 feet, divided over that space by a succession of cascades or currents, developing a power of 120,000 horse-power, at the lowest stage of the water in a dry season, or about twelve times as much power as exists at the City of Lowell in the United States.

“ In all my experience as an hydraulic engineer, I never saw a more favorable locality for employing the water by a succession of dams at different points along the river, thus causing it to repeat its useful effect at least a dozen times within the distance of six miles.

The bed of the river in many places is of rock with adjoining banks admirably adopted for the efficient distribution of the power for useful purposes in mills and factories. Passing along the beautiful banks of this river, and stopping from time to time to examine points which would give joy to the hydraulicians heart, and which, by the expenditure of a few hundred dollars, could be converted into splendid mill sites.

With the rich undulating agricultural country stretching off to the south, east and west, and flanked on the north by the Laurentian Mountains, with their undeveloped mineral wealth, the spectator would be deeply impressed with the facilities given by Providence for turning the riches of this region into a means of support for the teeming population yet destined to occupy this favorite country. The writer himself could well sympathize with the

enthusiasm of the Rev. Mr. A. Labelle, the esteemed curé of the parish, who is now devoting his entire energy to the development and useful employment of this great motive power for the good of his fellow countrymen. Who will not wish success to his efforts and at the same time extend the aid necessary for the purpose, simply in the construction of the Montreal and Northern Colonization Railway from Hochelaga to St. Jérôme. More especially by doing so the city of Montreal and intervening parishes will reap so great a reward in this as well as in other respects already alluded to.

An elaborate survey of the river at this point is now in progress, and when completed the entire plan of water power will be arranged and reported on. The report, accompanied by lithographic plans, will be widely distributed through Canada, Great Britain and the United States, with the view of drawing the attention of manufacturers and capitalists to the great advantages offered for the investment and employment of capital.

The success of this enterprise depends in a great measure on the construction and carrying out of the railway scheme as a preliminary. Without it no outlet can be had or adequate market obtained for the products of the power utilized.

At the present time a fractional amount of the power is usefully employed at St. Jérôme, but its results are confined principally to the locality. There are now in operation two grist mills of ten run of stones, two saw mills, one shingle machine, one carding mill, and a cloth factory turning out 200 yards of tweed per day. If brought within two hours of the Montreal markets by a cheap rail connection how soon all this would be augmented, Montreal becoming the Boston and St. Jérôme the Lowell of the Dominion.

The village is situated on the north side of the river, and from the picturesque and beautiful scenery by which it is surrounded would become, during the summer months, the resort of tourists and pleasure seekers.

The population amounts to 1400 inhabitants as given in the Assessors Roll for 1869. It may be well to remark that since that period the material increase in the population, together with that derived from emigration, will have considerably augmented the figure.

After reading the above elaborate abstract we shall proceed with the following brief references to the different mill sites. I may mention that on deciding on the position which offers the greatest amount of advantages, we must consider : 1st. The point adapted for laying out mill sites, with head and tail races on either side of the river on which power is to be distributed. 2d. The one which will overflow the least amount of land. 3. The point which will, give a mill pond capable of acting as a reservoir during low water. 4th. The point best adapted for a dam to serve as a permanent bridge to unite the two shores. 5th. The site where the water power would be utilized to the greatest extent.

In directing my attention to the different sites which have been advocated as suitable for dams you pointed out the leading places on the river, which for convenience sake I have numbered from 1 to 13, inclusive, as before mentioned.

Before describing the mill sites, and estimating the horse-power developed by the different falls in the River du Nord, we must first ascertain the number of cubic feet of water passing down the river.

At a suitable point between dams Nos. 8 and 9, three accurate cross-sections of the river were obtained, and the surface velocity of the current carefully measured in three places.

From this we ascertain the average sectional area of the points to be 2118 square feet, with an average velocity of 1.63 feet per second. Multiplying the sectional area 2118 square feet, by the average velocity 1.63 feet we find a total quantity of 3452 cubic feet of water per second, passing down the river at its present stage of low water.

If we now assume, for the purpose of estimating the power which may be developed at the different points, supposing all other conditions of the mill dams satisfied, that the sites are located from Nos. 1 to 13, and we take the above figures to calculate the nominal horse-power at each dam, that is to say multiply the number of cubic feet of water which flows in a second by the height through which it falls, and the product by the weight of a cubic foot, the result is then divided by 550 if the time is in seconds, or 33000 if in minutes.

Applying this rule to dam No. 1, with fall of 9 feet, the following result will then be obtained :



3452 cubic feet x 9 feet, by 62½ lbs.

550 lbs.

Equal, 3531 nominal horse-power.

The above rule will apply to the different dams to estimate the nominal horse-power of each.

Dam No. 1	with	9	foot	head.	=equal	3531	h.p.	nominal.
"	2	"	12	"	"	4707	"	"
"	3	"	7	"	"	2746	"	"
"	4	"	7	"	"	2746	"	"
"	5	"	10	"	"	3923	"	"
"	6	"	10	"	"	3923	"	"
"	7	"	12	"	"	4707	"	"
"	8	"	8	"	"	3120	"	"
"	9	"	12	"	"	4707	"	"
"	10	"	6	"	"	2353	"	"
"	11	"	6	"	"	2353	"	"
"	12	"	7	"	"	2746	"	"
"	13	"	12	"	"	4707	"	"

Total amount to be utilized as per above would be 46,269 h. p. nominal still leaving a balance of 73,374 h. p.—for future use.

We shall now proceed and describe the different mill sites.

SITE No. 1.—By referring to the annexed plan you will perceive that there are 14 lots of 50 feet in width by an average depth of 100 feet each, situate on Mr. Plouffe's property on the south side of the river. These lots are alimented by means of a head race running inland. These lots to have tail races to convey waste water to the river.

The land being comparatively level this site is admirably adapted for mill lots fronting on the public road to the village. The north side of the river presents high and steep embankments, but not to lose the great amount of power there, it would be advisable to connect the two shores by means of a permanent bridge over the dam, thus giving access and egress to the 13 lots of this site. The head race to supply these lots will be constructed in the river, covered over with timber and planking so as to serve as a roadway to the different mills. The waste water from the mills, etc., will be discharged into the river by means of tail races passing under the head race.

The average horse-power for the lots on both sides would be about 130 horse-power nominal.

SITE No. 2.—These lots are situated on the property of Mr. Sanderson on the north side of the river and number 27. Supplied by a head race running inland, these lots to have necessary tail races to carry off surplus water. The average horse-power for each lot will be about 174 horse-power nominal.

SITE No. 3.—No. 3 is situated on the south side of the river on the property of Mr. J. Bte Chartrand, and contains 14 lots of 50 feet in width by about 100 feet in depth, supplied by means of a head race running inland. The waste water to be disposed as before mentioned by means of tail races.

The average power of each lot will be about 196 horse-power nominal.

SITE No. 4.—There are 13 lots of 50 feet in width by about 100 feet in depth, in this site situate on the property of Mr. J. Paquin on the north side of the river as shewn on plan. The motive power is supplied to these lots by means of a head race running inland, the waste water to be disposed of as before stated. The average power for each lot will be about 211 horse-power nominal.

SITE No. 5.—This site will be situated on the properties of Messrs. St. Francois and P. Labelle on the south side of the river, and will contain 32 lots of 50 feet in width by about 100 feet in depth, supplied by a head race running inland, the waste water of which will be discharged into the river by means of tail-races, &c.; the average power for each will be about 122 horse-power nominal.

SITE No. 6.—The site will consist of 19 lots on the south side of the river, and 25 lots on the north side, these lots to be supplied by means of a head race running inland and another constructed in the river as shewn on plan and to have tail races as before stated in such cases. The lots on the south side are situated on the properties of Messrs. Lafontaine and Dupras, which is well adapted for the purpose. The lots on the north shore are situate on the property of Messrs. Godon, Depati, Dechesneau and Gauthier. The average power for each lot will be about 90 horse-power.

SITE No. 7.—Site No. 7 consists of power on both sides of the river.

On the north side there are 11 lots on the property of William Scott, Esq; supplied by a head race running inland, the waste water to be disposed of by means of tail-races from each lot. This spot is most admirably adapted for construction of mills, factories &c., the shore and property inland for a considerable distance presenting nearly a level surface.

The south side of river contains 12 lots situate on the property of Mr. Dupras, supplied by means of a head race constructed on the river; these lots can have access and egress to the public road on which they butt; the waste water will be carried of by means of tail races passing under head race, average power for each lot will be about 204 horse power nominal.

SITE No 8.—This site is situate on the property of J. Thimens, and consists of 12 lots supplied by head race constructed in river, with necessary tail race built underneath to carry off surplus water. These are laid out on plan at 50 feet in width by about 100 feet in depth, the average power for each lot will be about 260 horse-power nominal.

SITE No. 9.—These lots are situate on the properties of Messrs. Godfroi, Laviolette, Longprée, Brière and Langwell, and No. 17, By referring to the plan you will perceive that the situation is one remarkably well adapted for magnitude of power and facilities for construction. The present dam could be used as it is or raised to a height of 12 feet, in which case the power for each lot would be about 260 horse-power nominal. These lots would be supplied by a head race, built inland, with all necessary tail races for the discharge of waste water.

SITE No. 10.—This site could either be located on the property of Mr Pilon, on the south side of the river, or on the island belonging to Mr. Coté, in which case the head race could be made to run inland while on the other hand it must be constructed on the river. There are 12 lots at this dam, with an average power of 210 horse-power nominal each.

SITE No. 11.—This is situate on the property of Mr. Coté, and consists of 15 lots starting from the old dam, formerly used by Godfroy Laviolette, Esq., and supplied by a head race running inland with all necessary tail races, &c., &c., the average power for each lot will be about 156 horse-power nominal.

**SITE No. 12**, as shown on plan, is located on Mr. P. deMontigny's property and consists of 23 lots supplied by head race running inland, these lots to have tail races, &c., to carry off surplus water. The land at this point is nearly level, and can have direct communication with St. Jérôme by means of a road to join the Queen's Highway fronting the above property. Power for each lot about 119 horse power nominal.

**SITE No. 12**, consists of 21 lots situate on the property of Mr. Trudel, on the south side of the river. These lots are 50 feet in width by 100 feet in depth, supplied by a head race running inland, and having all necessary tail races, &c., &c. The number of these lots could be augmented by extending further south; the average power of each lot will be about 224 horse-power nominal.

After describing the different mill sites it would not be amiss to compare the difference of cost between steam and water power. Suppose we take in one case a steam engine of 25 horse-power nominal and in the other case a water wheel of the same power, and estimating 300 working days per annum the following will be the result:

Engines of the above construction with fixed boilers and the necessary connections complete will cost \$2400.00.

\$2400.00, a 7% .....	168.00
Depreciation if working 24 hours continuously will be 20% per annum .....	480.00
Engine man .....	600.00
Tallow oil and waste .....	81.00
Coal at the rate of 4 lbs per indicated horse-power per hour is 321 tons \$6.00 .....	1926.00
	<hr/>
	\$3255.00

If we now assume that the first outlay for water power will cost \$37 per horse-power 25 .....	\$925 at 7%	\$65.00
To this add depreciation of flumes which will last fifteen years, say .....	\$400 at 7%	28.00
Tyler wheel 25 horse-power under 10 feet head extra shaft 20 feet long .....		25.00
Depreciation and attendance .....	10%	40.00
		<hr/>
Annual cost of water power .....		158.00

Or \$6.32 per horse-power for the 24 hours' work, which is really the correct method of computing the results, as the water power would otherwise be running to waste during the night, the comparison will, therefore, stand as follows :

Cost of steam power per indicated horse-power per annum. \$130.00

Cost of water power per nominal horse-power, per annum. \$6.32

If the comparison is for 12 hours per day the result will

be per annum steam power per indicated horse-power. \$72.84

Water power per nominal horse-power..... 5.12

From the above results it would appear that to obtain for the 24 hours an equal amount of steam power to that yielded by the dam it would require an annual outlay of \$5982.60, or if steam power is employed for 12 hours per day the annual expenditure will be \$3352.09.

These conclusions are sufficient to show the vast difference of using steam as a motive power, and should not be entertained as long as the Rivière du Nord flows before your doors with fine facilities for its employment.

In conclusion I would say to every capitalist or proprietor of real estate in your section of the country, take stock in the Montreal and Northern Colonization Railway, and have it in operation at once. Then by publishing throughout Canada, England and the United States the peculiar advantages of the locality, and the liberal inducements you offer to parties requiring power, and my word for it your water powers will all be taken up from Site No. 1 to 13 in a very short space of time.

Will you kindly convey my thanks to C. Legge, Esq., for the assistance and data rendered me in the above, and also to Mr. J. H. Leclair, and others during survey.

Finally accept for yourself and colleagues my thanks for the polite attention bestowed on me when at St. Jérôme.

I have the honor to be,

Sir,

Your humble servant,

**WILLIAM MALSBERG,**

*Civil Engineer.*

