In the Privy Council.

No. 70 of 1936.

VOL. 6

ON APPEAL

FROM THE SUPREME COURT OF CANADA

BETWEEN

HIS MAJESTY THE KING on the information of the Attorney-General of Canada (*Plaintiff*) - - - - *Appellant*

AND

SOUTHERN CANADA POWER COMPANY LIMITED (*Defendant*) - - - - - - - - - - *Respondent*

AND BETWEEN

SOUTHERN CANADA POWER COMPANY LIMITED (*Defendant*) - - - - - - - - - - *Appellant*

AND

HIS MAJESTY THE KING on the information of the Attorney-General of Canada (*Plaintiff*) - - - - *Respondent*

(*Consolidated Appeals*).

RECORD OF PROCEEDINGS.

VOLUME 6.—PLAINTIFF'S EXHIBITS (CONTINUED); DEFENDANT'S EXHIBITS AND JUDGMENT OF THE EXCHEQUER COURT.

CHARLES RUSSELL & CO.,
37, Norfolk Street,
Strand, W.C.2.
For the Appellant and Cross-Respondent.

BLAKE & REDDEN,
17, Victoria Street,
S.W.1.
For the Respondent and Cross-Appellant

DANS LA COUR SUPRÊME DU CANADA

En appel de la Cour d'Echiquier du Canada

Southern Canada Power Co, Ltd,

Défenderesse-appelante,

— vs —

Sa Majesté le Roi,

Demandeur-intimé.

INDEX

PREMIERE PARTIE

PROCEDURES

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LA PREUVE

PREUVE DU DEMANDEUR

PREUVE DE LA DEFENDERESSE:

CONTRE-PREUVE DU DEMANDEUR:

TROISIEME PARTIE

LES EXHIBITS

EXHIBITS DU DEMANDEUR:

Exhibit No.		Date	Page
1.	Proclamation bringing into force Act confirming agreement G.T. Ry. Co. for extension of I. C. R. to Montreal	Sept. 30th 1899	976 Vol. 5
2.	Contract between Drummond County Ry. Co. and The King	Nov. 7th 1899	977 Vol. 5
3.	Order in Council for authority to purchase railway from Drummond County Railway	Nov. 4th 1899	984 Vol. 5
4.	Order in Council amalgamating different lines of railway	Jan. 20th 1923	986 Vol. 5
5.	Locomotive data card		Not printed
6.	Photo		" "
7.	"		" "
8.	"		" "
9.	"		" "
10.	Plan		" "
11.	Photo		" "
12.	"		" "
13.	"		" "
14.	"		" "
15.	"		" "
16.	Photo		" "
17.	Profile of plans St. Francis River		" "
18.	Plan		" "
19.	Plan		" "

EXHIBITS DE LA DEFENSE

QUATRIEME PARTIE

JUGEMENTS, ORDONNANCES, AVIS, ETC.

HEMMINGS FALLS PLANT

Data re Gate Manipulation and Discharge on certain Dates.

Time	Elevation	Spillway	Gate No 1	Gate No 2	Gate No 3		Gate No 4	Regulating Gate	Turbines	Total
Mar. 14,	1927									
1 A.M.	316.2	7750	Closed	Closed	2'	2100	Closed	Closed	1200	3300
2	316.2	7750	"	"	"	2100	"	"	1200	3300
3	316.1	7250	"	"	"	2100	"	"	1200	3300
4	316.1	7250	"	"	"	2100	"	"	1200	3300
5	316.1	7250	"	"	"	2100	"	"	1400	3500
6	316.1	7250	"	"	"	2100	"	"	1400	3500
7	315.8	5750	"	"	4'	4700	"	"	3000	7700
8	315.2	3100	"	"	7'	8000	"	"	3100	11100
9	314.6	1100	"	"	9'	9500	"	"	3100	12600
10	313.9	—	"	"	"	9500	"	"	3300	12800
11	313.7	—	"	"	2'	2100	"	"	3400	5500
12	313.7	—	"	"	"	2100	"	"	2500	4600
1 P.M.	313.7	—	"	"	"	2100	"	"	2800	4900
2	313.7	—	"	"	"	2100	"	"	3000	5100
3	313.2	—	"	"	"	2100	"	"	3100	5200
4	313.7	—	"	"	"	2100	"	"	3300	5400
5	313.7	—	"	"	"	2100	"	"	3200	5500
6	313.8	—	"	"	"	2100	"	"	3200	5300
7	313.9	—	"	"	"	2100	"	"	3200	5300
8	314.0	—	"	"	3'	3300	'	"	2800	6100
9	313.8	—	"	"	5'	5500	"	"	2800	8300
10	313.8	—	"	"	"	5500	"	"	2500	8000
11	313.8	—	"	"	"	5500	"	"	2600	8100
12	313.8	—	"	"	"	5500	"	"	2500	8000

HEMMINGS FALLS PLANT (Continued)

Time		Elevation	Spillway	Gate No 1	Gate No 2	Gate No 3		Gate No 4	Regulating Gate	Turbines	Total
Mar. 15											
1	A.M.	313.8	—	Closed	Closed	"	5500	Closed	Closed	2600	8100
2		313.8	—	"	"	"	5500	"	"	2600	8100
3		313.8	—	"	"	"	5500	"	"	2600	8100
4		313.9	—	"	"	"	5500	"	"	2600	8100
5		314.0	—	"	"	6	6200	"	"	2900	9100
6		314.1	100	"	"	"	6200	"	"	3100	9300
7		314.0	—	"	"	8'	7800	"	"	3300	11100
8		313.8	—	"	"	"	7800	"	"	3700	11500
9		313.7	—	"	"	"	7800	"	"	4000	11800
10		313.7	—	"	"	6'	6200	"	"	4000	10200
11		313.8	—	"	"	"	6200	"	"	4000	10200
12		314.0	—	"	"	8'	7800	"	"	3500	11300
1	P.M.	314.0	—	"	"	10'	9200	"	"	3400	12600
2		314.1	100	"	"	"	"	"	"	3900	13100
3		314.1	100	"	"	"	"	"	"	4300	13500
4		314.2	250	"	"	"	"	"	"	4300	13500
5		314.4	600	"	"	"	"	"	"	3700	12900
6		314.6	1100	"	"	"	"	"	"	3600	12800
7		314.8	1750	"	"	"	"	"	"	3500	12700
8		315.7	2750	"	"	"	"	"	"	3500	12700
9		315.4	3900	"	"	"	"	"	"	3500	12700
10		315.6	4750	"	"	"	"	"	"	3500	12700
11		315.8	5750	"	"	"	"	"	"	2900	12100
12		316.0	6750	"	"	"	"	"	"	2800	12000

HEMMINGS FALLS PLANT (Continued)

Time	Elevation	Spillway	Gate No 1	Gate No 2	Gate No 3		Gate No 4	Regulating Gate	Turbines	Total
Mar. 16										
1 A.M.	316.0	6750	Closed	Closed	5'	5800	Closed	Closed	3000	8800
2	316.0	6750	"	"	"	5800	"	"	2800	8600
3	316.1	7250	"	"	"	5800	"	"	2700	8500
4	316.1	7250	"	"	"	"	"	"	2700	8500
5	316.2	7750	"	"	"	"	"	"	2800	8600
6	316.2	7750	"	"	"	"	"	"	2800	8600
7	316.1	7250	"	"	"	"	"	"	3200	9000
8	316.0	6750	"	"	"	"	"	"	3500	9300
9	315.9	6250	"	"	"	"	"	"	3700	9500
10	315.8	5750	"	"	"	"	"	"	4200	10000
11	315.8	5750	"	"	"	"	"	"	3800	9600
12	315.8	5750	"	"	"	"	"	"	3400	9400
1 P.M.	316.2	7750	"	"	5'	5300	"	"	3100	16200
2	316.6	10000	"	"	"	5400	"	"	3200	18600
3	316.7	10750	"	"	"	5400	"	"	3200	19400
4	316.9	12000	"	"	"	5400	"	"	3500	20900
5	317.1	13250	"	"	"	5450	"	"	3500	22200
6	317.3	14750	"	"	"	5450	"	"	3300	23500
7	317.5	16500	"	"	"	5500	"	"	3400	25400
8	317.7	17750	"	"	"	5500	"	"	3400	26600
9	317.9	19000	"	"	"	5600	"	"	3400	28000
10	318.8	25750	"	"	"	5700	"	"	3100	34500
11	318.3	21750	"	"	"	5650	"	"	2900	30300
12	318.3	21750	"	"	"	5650	"	"	2700	30100

HEMMINGS FALLS PLANT (*Continued*)

Time	Elevation	Spillway	Gate No 1	Gate No 2	Gate No 3	Gate No 4	Regulating Gate	Turbines	Total
Apr. 8, 32									
1 A.M.	317.00	12750	Closed	9' 9100	Closed	Closed	Closed	2800	24600
2	316.9	12000		11, 10700			—	2800	25500
3	316.9	12000		" 10700			—	2800	25500
4	317.0	12750		" 10700			—	2900	26400
5	317.0	12750		" 10700			—	2900	26400
6	317.0	12750		" 10700			—	2500	26000
7	316.9	12000		13' 12000			—	2600	26600
8	316.9	12000		" 12000			—	3000	27000
9	316.9	12000		" 12000			—	3200	27200
10	316.9	12000		" 12000			—	3200	27200
11	317.0	12750		13.5' 12400		2 2200	—	3300	30600
12	316.8	11500		" 12300		" 2200	—	2800	28800
1 P.M.	316.7	10500	13' 12000	Cl		" 2200	—	2800	27500
2	316.7	10500	" 12000	" —		" 2200	—	3300	28000
3	316.7	10500	" 12000	" —		" 2200	—	3000	27700
4	316.8	11500	" 12000	" —		" "	—	3000	28700
5	316.7	10500	" 12000	" —		3 3300	—	3000	28800
6	316.8	11500	" "	" —		" "	—	3000	28800
7	316.7	10500	" "	" —		5' 5200	—	3300	31000
8	316.6	10000	" "	" —		6' 6300	—	3600	31800
9	316.6	10000	" "	" —		" "	—	3500	30800
10	316.6	10000	" "	" —		8' 8100	—	3500	30800
11	316.7	10500	" "	" —		" "	—	3500	33000
12	316.7	10500	" "	" —		12 11300	—	3500	37200

HEMMINGS FALLS PLANT (Continued)

Time	Elevation	Spillway	Gate No 1	Gate No 2	Gate No 3	Gate No 4	Regulating Gate	Turbines	Total
Apr. 9									
1 A.M.	316.6	10000	“ “	“ —		“ “	—	2900	36100
2	316.4	8900	“ 11800	“ —		“ 11200	—	2600	34500
3	316.4	8900	“ “	“ —		11’ 10300	—	2600	33600
4	316.5	9500	“ “	“ —		“ “	—	2600	24200
5	316.5	9500	“ “	“ —		“ “	—	2600	24200
6	316.9	12000	“ 12000	2’ 2200		“ 10600	—	2500	39300
7	316.6	10000	“ 11900	“ “		13’ 11900	—	3000	39000
8	316.5	9500	“ 11800	4’ 4300		“ “	—	3100	40600
9	316.5	9500	“ 11800	“ “		“ “	—	3300	40800
10	316.5	9500	“ 11800	“ “		“ “	—	3400	40900
11	316.4	8900	“ 11800	“ “		“ 11800	—	3400	40200
12	316.4	8900	“ 11800	“ “		“ “	—	3100	39900
1 P.M.	316.5	9500	“ “	“ “		“ “	—	3000	39800
2	316.5	9500	“ “	“ “		“ “	—	3100	39900
3	316.6	10000	“ 11900	“ “		“ 11900	—	3000	41100
4	316.6	10000	“	“ 5300		“ “	—	2900	42000
5	316.6	10000	“	“ “		“ “	—	2900	42000
6	316.7	10500	“ 12000	6’ 6300		“ “	—	2900	43600
7	316.6	10000	“ 11900	“ “		“ “	—	3600	43700
8	316.4	8900	“ 11800	“ “		“ 11800	—	3600	42400
9	316.1	7250	“ 11500	4’ 4300		“ 11400	—	3600	38100
10 P.M.	316.1	7250	13’ 11500	4’ 4300		13’ 11500	—	3500	38100
11	316.2	7750	“ 11550	“ 4300		“ 11550	—	2500	37600
12	316.3	8250	“ 11600	“ 4350		“ 11600	—	2400	38200

HEMMINGS FALLS PLANT (*Continued*)

Time	Elevation	Spillway	Gate No 1	Gate No 2	Gate No 3	Gate No 4	Gate Regulating	Turbines	Total
April 10									
1 A.M.	316.5	8900	" 11600	5' 5300		" 11600	—	3000	40300
2	316.5	9500	" 11650	" 5350		" 11650	—	3000	41100
3	316.5	9500	" 11650	" 6300		" 11650	—	3000	42100
4	316.4	8900	" 11600	" 6250		" 11600	—	3000	42300
5	316.4	8900	" 11600	" 6250		" 11600	—	3000	41400
6	316.5	9500	" 11650	" 6300		" 11650	—	2600	41700
7	316.4	8900	" 11600	7' 7150		" 11600	—	2500	41800
8	316.4	8900	" 11600	" 7150		" 11600	—	2600	41900
9	316.3	8250	" 11600	" 7100		" 11600	—	2600	41200
10	316.3	8250	" 11600	" 7100		" 11600	—	2700	41300
11	316.3	8250	" 11600	" 7100		" 11600	—	3000	41600
12	316.3	8250	" 11600	" 7100		" 11600	—	3000	41600
1 P.M.	316.3	8250	" 11600	" 7100		" 11600	—	3000	41600
2	316.4	8900	" 11600	" 7100		" 11600	—	1100	40300
3	316.5	9500	" 11650	" 7150		" 11650	—	2000	42000
4	316.6	10000	" 11700	8' 8000		" 11700	—	200	41600
5	316.3	8250	" 11600	" 7900		" 11600	—	2400	41800
6	316.5	9500	" 11650	" 8000		" 11650	—	2900	43700
7	316.5	9500	" 11650	10' 9400		" 11650	—	3300	45500
8	316.2	7750	" 11400	9' 8800		" 11400	—	3100	42500
9	315.8	5750	" 11200	6' 6200		" 11200	—	3100	37500
10	315.7	5250	" 11200	4' 4300		" 11200	—	2900	34900
11	315.9	6250	" 11300	Closed		" 11300	—	2500	31400
12	316.2	7750	" 11400	—		" 11400	—	1900	38500

MONTREAL, Quebec

NOVEMBER, 1919

ϕ=45° 32′ N. λ=73° 35′ W. Height above Sea, 187 feet

Hours of Observation, Time of the 75th Meridian: I. 7.40 a.m. II. 3.00 p.m. III. 7.50 p.m.

Day	Pressure at 32° 29 Inches+			Temperature					Relative Humidity			Direction and Velocity Wind			Cloudiness (Overcast = 10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	0.52	0.50	0.56	41	51	42	51	38	97	80	70	W 17	W 11	N 9	10	8	10	0.15	...	
2	0.62	0.74	0.83	35	36	32	40	31	70	58	61	NW 9	NW 10	NW 12	9	10	8	....	...	
3	1.01	0.95	0.94	30	35	32	35	29	62	58	64	NE 8	NE 10	NE 14	10	10	10	....	...	
4	0.86	0.72	0.65	33	41	39	41	31	97	75	78	SE 14	SE 14	SE 21	10	10	10	0.13	1.7	
5	0.62	0.65	0.73	33	32	33	38	32	98	98	98	NE 16	NE 20	NE 21	10	8	10	0.42	2.7	
6	1.00	1.07	1.10	34	35	34	36	32	87	80	84	NE 20	NE 18	NE 15	10	10	10	T	...	
7	1.16	1.15	1.20	34	37	36	39	32	89	76	79	NE 14	NE 13	NE 18	10	10	10	....	...	
8	1.30	1.28	1.31	35	40	37	40	34	88	69	76	N 11	N 6	N 12	10	10	10	....	...	
9	1.34	1.30	1.29	29	35	29	36	28	79	75	90	N 6	NE 2	E 7	0	8	0	....	...	
10	1.26	1.14	1.03	27	33	33	44	26	99	89	90	NE 6	NE 10	E 12	10	4	0	....	...	
11	0.90	0.88	1.03	41	50	46	52	34	93	88	79	S 14	S 12	W 21	10	6	0	0.17	...	Aurora IV.
12	1.07	0.79	0.73	36	45	53	53	35	98	98	93	SE 11	SE 10	S 20	10	10	7	0.15	...	Fog
13	0.93	0.86	0.87	33	35	33	51	32	69	52	67	W 25	W 13	W 13	0	10	8	T	...	
14	0.89	0.73	0.67	27	33	34	35	25	88	75	73	SW 14	S 10	SW 18	7	10	10	T	...	
15	1.06	1.12	1.14	17	22	21	27	16	74	60	65	W 22	SW 16	W 10	0	0	0	....	...	
16	1.03	0.92	0.90	29	40	38	40	20	73	60	65	S 18	S 10	S 16	4	7	8	....	...	
17	0.85	0.74	0.64	40	45	43	46	37	91	74	76	SW 12	S 10	S 18	10	8	10	0.01	...	
18	0.38	0.40	0.39	47	42	40	47	38	83	92	95	W 20	SW 8	W 6	10	9	10	0.19	...	
19	0.39	0.56	0.70	30	26	24	38	21	95	92	67		NW 16	N 19	10	10	9	....	1.4	
20	1.06	1.17	1.25	19	24	21	24	18	67	59	75	W 18	NW 19	W 19	8	4	0	....	...	
21	1.14	0.96	0.90	29	41	42	43	24	81	79	58	SW 16	SW 26	SW 24	10	10	10	....	...	
22	0.68	0.46	0.34	41	40	40	43	38	74	97	98	SW 14	S 14	S 15	10	10	10	0.41	...	
23	0.13	0.17	0.24	38	39	34	39	33	91	71	88	SW 12	W 18	SW 16	10	8	0	0.06	...	
24	0.52	0.53	0.59	30	34	31	34	21	74	69	84	W 12	S 5	W 16	8	10	4	....	0.3	
25	0.93	0.85	0.87	20	22	22	22	20	78	94	96	W 2	NE 13	NE 17	10	10	10	....	4.1	
26	1.10	1.03	1.07	21	23	23	24	20	83	82	82	NE 18	NE 22	NE 29	10	10	10	....	...	
27	1.13	1.16	1.20	19	24	20	24	19	83	80	81	N 9	NW 4	SW 15	10	10	10	....	...	
28	1.39	1.30	1.23	13	17	16	17	12	82	68	61	NE 7	E 4	E 13	7	8	10	....	...	
29	0.87	0.53	0.26	21	38	41	47	17	97	94	97	S 5	S 20	S 30	10	10	10	0.16	0.5	
30	0.02	0.18	0.37	43	32	31	50	27	73	60	66	SW 38	SW 31	SW 36	10	7	7	0.08	...	Wind 45 miles S.W.
31	....	....	....	..	..	..	..	..	..	..	..	....	....	....	..	..	.	....	...	Trace of Snow on ground
Mean	0.87	0.83	0.83	31	35	33	38	27	84	77	78	14	14	17	8	8	7	1.93	10.7	

MONTREAL, Quebec

DECEMBER, 1919

$\phi = 45° \; 32' \; N.$ $\lambda = 73° \; 35' \; W.$ Height above Sea, 187 feet

Hours of Observation
Time of the 75th Meridian

I. 7.40 a.m.
II. 3.00 p.m.
III. 7.50 p.m.

Day	Pressure at 32° 29 Inches+			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (Overcast = 10			Precipi-tation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	0.16	11.2	
1	0.89	1.04	1.11	22	26	22	26	21	66	52	54	SW 36	SW 22	SW 18	0	4	0	....	...	
2	1.06	1.01	1.14	16	14	11	20	11	88	90	74	E 10	NE 14	W 17	10	10	10	....	2.7	
3	1.33	1.26	1.21	—2	7	6	10	—2	73	77	79	W 6	SW 11	SW 16	2	8	0	....	...	
4	1.16	1.19	1.06	17	26	24	26	10	91	70	75	SW 16	SW 10	SW 16	10	8	10	....	T	
5	0.78	0.72	0.86	22	27	26	29	21	72	97	72	S 14	SW 16	W 24	10	10	10	....	0.9	
6	1.09	0.89	0.71	10	15	16	18	8	78	70	83	W 3	E 5	E 14	8	10	10	....	0.5	
7	0.27	0.22	0.46	21	24	25	25	18	98	96	93	NE 14	N 11	W 20	10	10	10	....	3.6	
8	0.92	1.06	1.11	20	34	34	36	18	95	73	84	SW 14	SW 7	W 12	8	6	10	....	...	
9	1.04	0.79	0.70	26	32	36	36	24	95	97	97	E 12	NE 10	S 14	10	10	10	0.10	...	
10	0.70	1.09	1.24	29	11	6	41	6	57	51	58	W 38	W 27	W 27	3	3	0	....	...	
11	1.44	1.42	1.32	6	13	14	19	6	62	52	63	W 16	W 10	S 8	0	6	8	....	...	
12	0.83	0.69	0.66	26	35	36	36	18	54	73	84	S 16	S 15	S 16	10	10	10	....	...	
13	0.50	0.54	0.62	41	41	37	46	34	96	74	77	SW 21	W 20	W 17	10	10	10	0.06	...	Fog
14	0.65	0.69	0.73	21	20	17	34	16	85	45	55	W 13	NW 22	W 9	10	0	0	....	0.5	
15	0.61	0.68	0.82	17	13	5	19	—2	73	40	43	S 9	N 24	W 30	10	0	0	....	T	
16	0.98	0.91	0.92	—6	0	—4	0	—7	63	54	55	NW 12	W 16	NW 11	10	5	0	....	...	
17	0.97	1.07	1.16	-13	—8	-11	—8	-14	77	59	57	N 9	W 8	NW 18	3	6	0	....	...	
18	1.17	1.12	1.13	-11	2	2	4	-12	70	50	70	SW 16	W 16	W 18	0	0	0	....	...	
19	1.12	1.05	1.05	3	15	10	15	2	86	65	78	W 13	W 9	W 14	0	0	0	....	...	
20	1.04	1.16	1.17	12	13	8	17	3	87	66	62	W 16	N 8	E 14	10	3	0	....	0.2	
21	1.34	1.26	1.21	0	9	8	10	—1	72	60	71	NE 9	NE 9	E 8	4	10	10	....	...	
22	1.10	1.00	0.96	14	28	26	29	10	84	80	86	S 10	S 8	S 11	10	10	10	....	...	
23	0.84	0.72	0.66	28	31	29	31	24	91	85	91	W 19	W 6	W 2	10	4	10	....	...	
24	0.59	0.71	0.87	27	22	17	28	12	95	68	56	N 22	N 23	N 25	10	10	10	....	0.5	
25	1.00	0.94	0.93	6	11	9	12	6	68	66	71	N 9	W 3	W 8	0	0	0	....	...	
26	0.62	0.40	0.31	10	14	22	32	6	87	84	89	S 18	S 4	S 11	10	10	10	0000	0.8	
27	0.39	0.31	0.29	28	34	33	34	28	66	91	95	W 14	W 10	W 14	10	10	10	....	0.5	
28	0.43	0.60	0.70	18	14	7	33	4	78	67	68	W 19	W 12	W 20	3	0	0	....	...	
29	0.72	0.66	0.56	2	12	14	16	1	62	65	76	W 13	W 7	S 12	0	2	10	....	...	
30	0.36	0.39	0.52	9	17	16	18	8	82	59	76	N 8	W 5	W 18	10	0	0	....	...	
31	0.82	0.74	0.68	0	6	5	10	1	68	68	66	N 3	E 6	NE 11	3	9	10	....	...	Snow on ground 3 inches
Mean	0.86	0.85	0.87	14	18	16	23	9	78	69	73	14	12	15	7	6	5	0.16	11.2	

MONTREAL, Quebec

JANUARY, 1920

ϕ=45° 32′ N. λ=73° 35′ W. Height above Sea, 187 feet

Hours of Observation
Time of the 75th Meridian

I. 7.40 a.m.
II. 3.00 p.m.
III. 7.50 p.m.

Day	Pressure at 32° 29 Inches+			Temperature					Relative Humidity			Wind Direction and Velocity						Cloudiness (Overcast = 10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I		II		III		I	II	III	Snow	Rain	
1	0.18	0.23	0.39	9	18	16	23	3	89	74	74	NE	20	SW	20	SW	20	10	2	0	....	1.5	
2	0.61	0.50	0.52	—2	4	0	11	-3	72	67	75	W	17	NE	4	SW	20	0	0	0	....	0.1	
3	0.73	0.76	0.85	-10	—4	—6	—4	—3	73	62	63	W	12	SW	26	W	30	6	0	0	....	...	
4	1.03	1.13	1.21	—7	0	—3	—0	—7	73	68	79	W	14	W	11	W	21	5	6	0	....	...	
5	1.28	1.17	1.12	—7	8	11	17	—7	68	64	66	SW	24	SW	16	SW	18	3	0	10	....	T	
6	1.04	1.04	1.08	16	23	24	25	12	89	87	85	SW	24	SW	16	SW	16	3	10	10	....	0.4	
7	1.01	0.86	0.82	24	30	28	32	22	81	72	94	S	14	S	8	S	15	10	10	10	....	0.9	
8	0.82	0.72	0.80	34	33	30	34	24	93	79	77	SW	19	SW	18	W	14	10	10	10	....	...	
9	0.91	0.81	0.82	11	6	8	24	5	69	64	66	N	20	N	17	N	22	10	10	5	....	...	
10	1.04	1.02	1.04	5	12	12	14	1	67	65	76	W	16	SW	13	SW	16	3	7	10	....	...	
11	0.79	0.62	0.54	25	29	27	30	14	90	81	76	SW	22	W	20	W	25	10	10	10	....	0.3	
12	0.65	0.82	0.85	13	6	0	23	0	65	58	65	NW	25	W	21	SW	22	8	0	0	....	...	
13	0.45	0.26	0.27	3	5	5	6	0	84	83	84	N	14	N	14	N	8	10	10	5	....	2.5	
14	0.35	0.46	0.56	4	6	1	8	—2	77	72	64	W	19	W	25	W	25	3	10	0	....	T	
15	0.66	0.70	0.81	—8	—7	-11	—2	-11	74	67	66	W	24	W	22	W	24	10	0	0	....	0.3	
16	0.96	0.93	0.84	-13	—6	—8	—3	-14	78	66	71	W	11	NE	12	NE	16	4	0	0	....	11.9	
17	0.34	0.19	0.25	—6	19	6	20	—3	90	92	86	NE	14	W	6	W	31	10	10	10	....	...	
18	0.24	0.47	0.67	—5	—5	-10	—2	-13	78	72	68	W	40	W	34	W	27	10	10	0	....	...	Wind 45 miles W.
19	0.88	0.83	0.95	-13	—3	—7	—2	-17	76	69	79	S	10	SW	4	W	10	8	10	0	....	T	
20	1.32	1.24	1.03	-13	—3	—3	—1	-14	75	68	84	W	13	E	10	NE	19	0	10	10	....	5.2	
21	0.93	1.15	1.29	6	8	3	10	—1	84	67	70	W	14	W	21	W	23	10	0	0	....	...	
22	1.46	1.42	1.37	—1	11	9	11	—2	85	64	71	SW	13	S	4	S	11	5	8	10	....	...	
23	1.28	1.21	1.26	5	16	14	16	4	80	59	86	NE	8	NE	7	NE	17	10	10	10	....	2.3	
24	1.39	1.37	1.37	—4	—4	—4	9	—6	78	74	80	NE	24	NE	28	N	25	8	10	10	....	0.7	
25	1.42	1.49	1.59	0	—6	—9	—3	-11	76	63	61	N	6	W	14	W	20	3	0	0	....	...	
26	1.64	1.39	1.15	-12	—1	1	1	-15	80	60	74	SE	10	NE	11	SE	15	10	10	10	....	...	Fog
27	0.88	0.97	1.11	26	29	16	31	1	91	71	60	SW	24	N	6	N	20	10	8	9	....	0.3	
28	1.16	1.22	1.29	1	9	2	10	1	70	63	67	N	13	W	11	W	22	4	0	0	....	...	
29	1.40	1.23	1.01	—3	7	10	10	—4	74	58	67	W	7	S	13	S	13	10	3	10	....	...	
30	0.74	0.98	1.22	23	9	—2	25	-14	84	41	45	N	22	NW	25	NW	26	10	1	0	....	3.0	
31	1.78	1.83	1.87	-22	-16	-17	-14	-23	51	46	55	N	11	W	18	W	18	0	0	0	....	...	Snow on ground 15 inches
Mean	0.95	0.94	0.97	2	8	5	12	—3	79	68	72		17		15		20	7	6	5	....	29.4	

MONTREAL, Quebec

FEBRUARY, 1920

ϕ=45° 30′ N. λ=73° 35′ W. Height above Sea, 187 feet

Hours of Observation
Time of the 75th Meridian

I. 7.40 a.m.
II. 3.00 p.m.
III. 7.50 p.m.

Day	Pressure at 32° 28 Inches+ I	II	III	Temperature I	II	III	Ma.	Mi.	Relative Humidity I	II	III	Wind Direction and Velocity I		II		III		Cloudiness (Overcast = 10) I	II	III	Precipitation Rain	Snow	REMARKS
1	2.78	2.51	2.41	-18	—5	—4	—4	-21	67	65	71	NE	14	N	14	NE	8	10	10	10	....	...	
2	2.23	2.06	2.06	7	26	23	34	—4	84	81	86	S	10	S	13	W	14	10	10	5	....	...	
3	2.40	2.50	2.58	16	18	15	34	13	66	46	51	N	19	N	5	NW	12	2	8	2	....	...	
4	2.70	2.65	2.64	5	12	8	13	4	67	59	55	NE	20	NE	8	NE	11	3	2	5	....	...	
5	2.46	2.28	2.16	7	19	20	20	6	69	67	77	NE	21	NE	16	NE	22	10	10	10	....	1.5	
6	1.67	1.46	1.41	21	29	27	29	18	95	84	86	NE	24	NE	22	N	8	10	10	0	....	2.5	
7	1.30	1.31	1.44	26	37	29	37	24	77	58	59	N	20	NW	12	NW	18	1	1	0	....	...	
8	1.67	1.70	1.76	21	27	24	29	19	68	61	60	NW	20	W	12	W	18	7	0	10	....	...	
9	1.93	1.96	1.93	20	21	16	26	16	78	73	80	N	4	W	9	SW	8	8	8	0	....	0.4	
10	1.60	1.39	1.44	18	25	27	28	10	80	96	95	SE	18	S	17	W	18	10	10	10	....	6.9	
11	1.57	1.63	1.72	20	24	21	27	18	80	69	74	W	20	W	19	SW	18	5	3	10	....	T	
12	1.78	1.71	1.69	22	26	23	26	16	80	88	90	S	10	E	11	E	12	10	10	0	....	T	
13	1.65	1.53	1.53	31	32	30	34	22	84	83	86	S	10	NE	8	NE	4	10	10	10	....	0.5	
14	1.74	1.68	1.62	26	31	30	33	25	83	70	93	SW	17	E	8	E	14	5	10	10	....	1.5	
15	1.22	0.93	0.87	32	18	15	35	13	90	94	91	SE	11	SW	30	SW	44	10	10	10	....	7.4	Wind 51 miles S.W.
16	1.23	1.42	1.51	4	2	1	16	0	85	71	71	SW	30	SW	30	SW	24	10	6	0	....	0.7	
17	1.33	1.26	1.32	9	19	22	22	1	78	90	92	S	20	S	13	SW	12	10	10	10	....	4.7	
18	1.51	1.57	1.62	18	19	17	22	16	90	78	82	S	6	SE	8	SE	8	10	10	7	....	1.0	
19	1.63	-.40	1.42	6	20	17	21	6	87	65	60	NE	8	NE	10	W	20	8	10	0	....	...	
20	1.78	1.85	1.98	6	21	18	21	4	73	68	81	W	20	W	15	N	22	5	3	4	....	...	
21	2.35	2.29	2.19	4	14	14	18	2	69	63	64	SW	4	S	7	E	4	2	5	8	....	...	
22	2.08	1.99	1.97	8	22	17	22	8	69	63	72	N	10	E	2	SW	12	0	0	0	....	...	
23	1.87	1.68	1.56	4	21	26	26	2	88	69	94	NW	14	NE	10	NE	16	1	10	10	....	0.8	
24	1.43	1.40	1.39	31	31	26	34	25	87	76	78	NE	16	SW	13	W	14	10	10	0	....	1.1	
25	1.26	1.00	1.13	17	27	19	27	16	78	58	60	NW	15	NW	17	NW	22	1	10	9	....	T	
26	1.27	1.30	1.42	2	7	2	19	0	66	58	62	NW	24	W	33	W	28	0	0	0	....	...	
27	1.67	1.76	1.89	—7	0	—3	2	—8	59	59	60	SW	30	SW	28	SW	25	4	0	0	....	...	
28	1.90	1.89	1.80	—2	9	9	10	—7	56	55	52	SW	14	SE	10	NE	12	0	2	0	....	0.3	Snow on ground 18 inches
29	1.74	1.69	1.66	5	18	16	20	1	82	71	62	NW	10	SW	18	SE	27	0	0	0	....	...	
30	....	....	....	..	..	..	..	..	..	..	..	..	...	...	....	...	....	..	..	..	....	...	
31	....	....	....	..	..	..	..	..	..	..	..	...	....	...	....	...	....	..	..	..	....	...	
Mean	1.79	1.72	1.73	12	20	17	23	9	77	70	74		16		14		16	6	6	5	....	29.3	

MONTREAL, Quebec

MARCH, 1920

$\phi=45° 30' N.$ $\lambda=73° 35' W.$ Height above Sea, 187 feet Hours of Observation Time of the 75th Meridian I. 7.40 a.m. II. 3.00 p.m. III. 7.50 p.m.

Day	Pressure at 32° 29 Inches+			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (Overcast = 10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	0.44	0.55	0.76	17	12	4	22	0	82	51	46	SE 30	NE 13	N 12	10	0	0	....	...	
2	1.04	1.31	1.32	—6	7	6	8	—7	50	52	60	N 12	NE 10	NE 12	0	10	10	....	...	
3	1.29	1.31	1.32	5	19	15	19	4	61	52	56	NW 15	NE 13	N 16	5	7	7	....	...	
4	1.24	0.95	0.90	11	40	36	40	10	74	57	68	NW 18	SE 10	SE 20	7	2	0	....	...	Aurora
5	0.54	0.37	0.45	40	40	27	41	26	80	90	95	S 15	S 15	W 27	9	10	10	0.17	5.0	
6	0.42	0.33	0.43	8	9	7	27	6	89	84	66	NW 18	W 27	W 32	10	10	10	....	8.5	
7	0.67	0.76	0.82	—1	6	7	7	—4	66	59	65	W 18	SW 23	W 12	0	0	8	....	...	
8	0.92	0.80	0.82	12	23	20	23	6	74	68	66	SW 22	SW 20	SW 22	0	10	4	....	T	
9	0.94	0.90	0.89	19	28	23	28	18	84	54	68	W 14	W 12	SW 16	7	4	0	....	0.2	
10	0.81	0.89	0.96	21	37	34	38	20	90	71	75	N 20	W 13	W 14	10	1	0	....	2.5	
11	0.91	0.82	0.81	34	39	38	40	32	84	78	92	SW 12	SW 15	SW 14	10	10	10	0.04	...	
12	0.44	0.13	0.04	39	39	39	40	37	94	96	96	SW 20	SW 22	SW 28	10	10	10	0.86	...	Wind 44 miles S.W.
13	0.40	0.21	0.04	27	24	23	45	22	78	83	95	W 10	NE 18	NE 32	10	10	10	....	8.1	
14	0.18	0.41	0.60	13	22	18	22	12	76	58	65	W 26	W 25	W 24	10	0	0	....	...	
15	0.97	0.94	0.82	19	28	29	29	12	55	52	58	W 14	S 10	SE 16	0	10	8	....	...	
16	0.49	0.32	0.24	34	41	40	42	27	80	77	81	S 15	S 21	SW 24	10	10	10	0.32	...	
17	0.43	0.55	0.66	35	35	32	44	32	67	74	80	W 34	W 26	W 19	7	10	5	....	0.2	
18	1.01	0.96	0.93	16	26	23	32	14	51	42	56	W 20	W 22	W 20	0	0	0	....	...	
19	0.78	0.56	0.47	25	33	31	34	20	71	44	53	W 20	SE 9	E 11	0	8	10	....	0.5	
20	0.30	0.32	0.47	29	32	30	32	28	95	84	89	NE 10	NE 24	NE 10	10	10	7	....	2.9	
21	0.72	0.72	0.78	30	36	33	37	26	51	54	69	W 8	SW 20	SW 25	2	6	3	....	...	
22	0.98	0.96	0.95	34	43	40	43	32	75	62	68	W 10	W 15	SW 24	7	7	0	....	...	Aurora IV.
23	0.90	0.87	0.94	41	53	46	53	38	65	53	62	SW 32	SW 21	SW 30	8	2	0	....	...	Aurora IV.
24	1.03	0.96	0.93	44	58	48	58	39	65	42	60	SW 17	SW 12	S 10	0	0	0	....	...	
25	0.88	0.78	0.72	45	57	47	58	40	56	47	61	SW 12	S 8	S 12	0	4	0	....	...	
26	0.55	0.35	0.29	47	55	50	60	42	59	64	65	S 17	S 14	S 22	7	8	8			
27	0.31	0.33	0.52	43	39	35	50	34	81	95	77	SW 18	SW 24	W 22	9	10	5	0.03	T	
28	0.83	0.81	0.71	31	42	40	44	27	61	48	61	W 12	W 6	SE 12	0	0	3	....	...	[to 6 a.m.
29	0.37	0.25	0.33	44	47	43	48	36	52	86	77	S 18	SW 27	SW 28	10	10	7	0.12	...	Thunderstorm: Hail 4.30
30	0.54	0.50	0.42	34	40	34	43	33	57	52	97	NW 24	NW 20	SW 7	0	2	10	....	T	[ground
31	0.73	0.08	0.86	33	38	35	39	29	81	58	70	W 7	NW 5	SW 8	8	4	2	....	...	Patches of Snow on
Mean	0.71	0.66	0.68	27	34	30	37	22	71	64	71	17	17	19	6	6	5	1.54	27.9	

MONTREAL, Quebec

APRIL, 1920

$\phi = 45°\ 32'$ N. $\lambda = 73°\ 35'$ W. Height above Sea, 187 feet

Hours of Observation, Time of the 75th Meridian: I. 7.40 a.m. II. 3.00 p.m. III. 7.50 p.m.

Day	Pressure at 32° 28 Inches+			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (Overcast = 10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	1.88	1.80	1.72	31	40	34	41	29	61	52	71	NE 12	NE 17	NE 16	8	0	0	....	...	Lunar halo
2	1.61	1.44	1.38	37	42	38	43	32	96	89	97	SE 12	SE 12	SE 16	10	10	10	0.52	...	
3	1.59	1.60	1.65	39	43	38	45	30	66	51	53	SW 14	SW 25	W 14	2	7	0	....	...	Wind 37 miles S.W.
4	1.85	1.71	1.60	27	34	33	34	24	55	52	60	NW 10	S 4	E 8	9	0	9	....	...	Solar halo
5	1.23	0.93	0.99	35	41	32	41	32	97	96	96	SE 12	SE 9	SW 32	10	10	10	0.36	2.0	Thunderstorm. Hail
6	1.14	1.29	1.40	24	31	29	32	23	63	48	45	W 31	W 33	W 19	8	7	0	....	...	
7	1.36	1.24	1.29	30	36	30	37	24	70	62	89	S 4	S 6	W 16	0	5	6	....	T	
8	1.33	1.38	1.49	27	32	28	34	23	63	52	73	W 14	W 20	W 14	5	6	10	....	T	
9	1.56	1.59	1.67	28	32	31	34	23	68	45	52	W 7	W 16	W 11	8	10	9	....	...	
10	1.74	1.66	1.69	33	44	40	45	26	67	51	61	W 12	W 11	SW 18	0	2	0	....	...	
11	1.72	1.72	1.75	34	43	37	47	31	78	51	74	SW 24	SW 16	W 17	7	10	10	....	...	
12	1.64	1.48	1.39	37	43	40	43	35	85	69	91	S 12	S 17	S 16	10	10	10	0.39	...	
13	1.11	1.20	1.35	45	33	36	46	33	96	94	84	S 12	W 29	W 13	10	10	7	0.70	5.0	
14	1.50	1.48	1.50	34	44	38	45	31	79	52	72	W 13	W 16	W 10	10	8	0	....	...	Aurora
15	1.55	1.43	1.41	40	49	43	50	34	73	62	79	W 14	SW 11	W 10	10	10	10	0.20	...	Solar halo
16	1.38	1.47	1.54	37	47	43	49	34	89	44	52	W 19	NW 22	W 13	10	4	10	0.09	...	
17	1.71	1.74	1.83	41	51	47	52	36	72	53	58	NE 8	NE 12	NE 11	0	2	10	....	...	Aurora
18	1.99	1.94	1.54	39	50	44	51	34	74	47	60	NE 12	NE 14	SW 7	5	0	0	....	...	Aurora
19	1.91	1.81	1.81	49	62	58	64	34	49	27	29	NW 16	NW 12	NW 12	0	0	0	....	...	
20	1.86	1.76	1.69	50	60	55	61	39	52	32	40	NE 8	SW 3	S 6	0	0	0	....	...	
21	1.53	1.34	1.37	43	61	52	62	40	44	57	89	NE 6	SE 8	SE 6	10	10	10	0.01	...	
22	1.60	1.66	1.66	42	53	49	54	40	62	48	52	NE 13	NE 7	NE 6	10	10	7	....	...	
23	1.34	1.22	1.27	46	61	52	62	40	47	46	76	S 14	SW 20	SW 12	10	7	10	0.42	...	
24	1.41	1.55	1.68	36	41	39	52	36	91	55	55	NW 22	NW 22	N 18	10	10	10	0.22	...	
25	1.86	1.82	1.88	41	53	47	54	35	61	39	46	NW 15	N 13	N 24	1	8	0	....	...	
26	2.00	1.89	1.82	43	54	50	56	36	50	36	42	N 10	S 6	S 12	0	0	10	....	...	
27	1.74	1.58	1.58	43	53	45	58	38	72	50	85	NE 11	S 10	S 18	10	10	10	0.02	...	
28	1.42	1.35	1.34	40	40	39	45	39	97	96	96	S 14	S 6	S 13	10	10	10	0.42	...	Fog
29	1.35	1.40	1.49	41	45	42	46	39	84	76	86	SW 18	SW 26	W 20	10	10	10	0.02	...	
30	1.65	1.63	1.63	42	47	46	51	39	82	60	63	SW 17	W 14	W 6	10	10	10	....	...	
31	...	...	...	..	..	..	..	..	..	..	..	....	....	....	..	..	..	....	...	
Mean	1.58	1.54	1.56	38	45	41	48	33	71	56	68	14	15	14	7	6	6	4.37	7.0	

SHERBROOKE, Quebec

NOVEMBER, 1919

φ=45° 30′ N. λ=72° 5′ W. Height above Sea, 620 feet

Hours of Observation, Time of the 75th Meridian: I. 8.00 a.m. II. 2.00 p.m. III. 8.00 p.m.

Day	Pressure at 32° 28 Inches+ I	II	III	Temperature I	II	III	Ma.	Mi.	Relative Humidity I	II	III	Wind Direction and Velocity I	II	III	Cloudiness (Overcast = 10) I	II	III	Precipitation Rain	Snow	REMARKS
1	1.10	1.10	1.13	48	52	43	52	41	97	78	88	W 6	W 8	NW 11	10	10	10	0.27	...	
2	1.18	1.27	1.42	33	34	32	35	29	86	71	74	NW 8	NW 11	NW 5	10	10	10	....	...	
3	1.59	1.53	1.53	29	36	32	37	25	75	59	80	E 4	N 2	SE 3	8	4	5	....	...	
4	1.54	1.43	1.35	31	38	39	39	28	100	73	75	E 9	SE 9	SE 15	10	10	8	....	1.5	
5	1.09	1.11	1.23	31	31	31	33	28	100	100	100	NE 17	NW 26	NW 19	10	10	10	....	10.8	
6	1.52	1.58	1.64	32	36	31	36	29	100	72	88	NW 11	N 14	NW 11	10	10	10	....	0.2	
7	1.73	1.70	1.76	34	39	32	30	30	88	74	90	N 2	N 11	NW 5	9	10	7	....	...	
8	1.84	1.83	1.85	32	35	33	36	28	91	80	96	NW 3	NW 11	NW 4	10	10	10	....	T	
9	1.89	1.86	1.88	31	34	25	34	25	89	81	100	NW 3	W 3	C 0	10	7	1	....	T	
10	1.87	1.77	1.70	19	41	33	44	16	100	63	85	E 2	E 2	SE 9	2	1	2	....	...	
11	1.56	1.54	1.64	44	44	40	46	30	44	77	97	S 9	SE 7	S 3	10	8	0	T	...	
12	1.71	1.50	1.42	32	43	51	51	30	100	92	88	E 2	SE 6	SE 11	10	10	10	0.04	...	Fog
13	1.50	1.46	1.45	36	34	31	36	30	87	69	72	SW 17	W 10	SW 6	9	7	8	0.26	...	
14	1.47	1.38	1.29	27	33	34	34	24	83	58	80	SW 14	SW 8	SE 15	3	8	10	....	...	
15	1.60	1.67	1.72	19	23	19	27	17	85	63	88	SW 17	SW 15	SW 7	10	1	0	....	T	
16	1.66	1.56	1.53	27	39	36	40	17	70	45	60	E 5	SW 7	E 4	8	9	9	....	...	
17	1.47	1.39	1.31	28	46	42	46	35	70	96	78	SW 2	SE 5	SE 3	10	10	10	T	...	
18	1.03	1.02	1.02	46	45	36	48	35	69	83	99	SW 14	SW 7	SE 1	10	4	0	0.06	...	
19	0.96	1.02	1.18	33	28	22	34	20	100	100	94	W 10	NW 17	NW 25	10	10	10	0.05	3.0	
20	1.56	1.65	1.78	19	22	19	26	16	89	72	78	NW 16	SW 22	W 16	10	10	0	....	0.5	
21	1.73	1.58	1.50	26	39	42	46	16	82	60	49	E 4	SE 4	S 7	10	9	10	....	...	
22	1.33	1.14	1.00	40	43	39	14	36	58	74	98	S 3	SW 17	SW 12	9	10	10	0.12	...	
23	0.79	0.78	0.86	36	36	31	39	32	95	92	90	SW 6	SW 18	S 6	9	10	3	0.21	...	
24	1.10	1.15	1.19	31	32	33	33	28	97	97	86	SW 5	W 6	S 6	10	1	2	....	2.0	
25	1.51	1.45	1.45	20	25	26	27	17	93	100	100	W 9	NE 3	C 0	7	10	10	....	2.8	
26	1.63	1.60	1.59	23	30	30	30	21	100	90	56	NW 7	N 6	NW 7	10	10	10	....	1.7	
27	1.63	1.69	1.77	24	22	20	25	17	93	90	96	NW 6	W 9	NW 6	10	10	10	....	0.3	
28	1.95	1.88	1.82	5	18	12	31	2	100	76	98	C 0	NE 2	E 1	5	2	10	....	...	Fog
29	1.53	1.30	1.01	31	37	40	50	10	90	85	95	SE 10	SE 12	SE 14	10	10	10	0.12	T	
30	0.66	0.78	0.95	45	36	31	45	29	87	90	63	S 8	SW 23	SW 36	10	10	8	0.13	T	Snow on ground 0.1 inch
31	...	...	...	..	..	..	..	..	..	..	..	....	....	....	..	..	..	....	...	
Mean	1.46	1.42	1.43	31	35	32	38	25	87	79	85	8	10	9	9	8	7	1.26	22.8	

SHERBROOKE, Quebec

DECEMBER, 1919

φ=45° 32′ N. λ=72° 5′ W. Height above Sea, 620 feet Hours of Observation Time of the 75th Meridian

I. 8.00 a.m.
II. 2.00 p.m.
III. 8.00 p.m.

Day	28 Inches+ Pressure at 32°			Temperature					Relative Humidity			Wind Direction and Velocity						Cloudiness (Overcast = 10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I		II		III		I	II	III	Rain	Snow	
1	1.46	1.57	1.68	21	27	21	27	20	79	61	79	W	16	SW	25	W	12	1	5	1	....	0.1	
2	1.64	1.49	1.58	15	18	14	18	7	98	100	91	NE	3	N	8	NW	9	10	10	1	....	1.0	
3	1.88	1.83	1.78	—5	7	3	19	—6	100	73	97	SE	7	W	11	E	5	0	1	5	....	0.1	
4	1.76	1.71	1.68	19	23	20	24	1	85	83	82	SE	6	S	5	SE	5	5	10	6	....	0.1	
5	1.43	1.33	1.40	22	26	27	27	15	72	74	90	SE	7	SW	10	W	5	9	10	10	....	0.9	
6	1.64	1.47	1.31	5	15	16	29	3	100	79	88	W	1	SE	3	E	4	0	7	10	....	T	
7	0.89	0.78	1.00	29	33	27	33	17	100	95	96	E	6	E	4	SW	14	10	10	10	....	4.1	
8	1.53	1.63	1.73	19	36	21	36	16	100	71	100	E	2	SW	4	SE	5	8	3	0	....	T	Fog
9	1.68	1.47	1.41	27	34	35	40	15	100	100	98	E	5	SE	4	SE	4	10	10	10	0.27	...	Hail
10	1.22	1.48	1.70	36	16	15	36	15	95	71	72	SW	32	SW	42	SW	19	10	2	0	0.12	T	
11	1.99	1.96	1.78	7	12	18	26	3	81	63	92	W	17	W	14	SE	2	0	5	10	....	...	
12	1.47	1.34	1.31	26	34	35	46	11	62	77	88	S	13	S	10	E	3	8	10	10	....	...	
13	1.14	1.11	1.22	43	46	38	47	34	93	97	77	SW	8	SW	3	W	13	10	10	10	0.11	...	
14	1.22	1.21	1.21	24	17	15	24	15	100	97	93	W	7	NW	12	NE	1	10	9	0	....	1.0	
15	1.24	1.17	1.37	14	16	6	18	4	96	86	61	S	6	W	23	SW	19	7	9	0	....	0.4	
16	1.52	1.46	1.47	—9	—3	—8	—3	—9	82	86	87	W	7	SW	12	N	2	0	0	0	....	...	
17	1.40	1.54	1.68	18	-12	-16	-12	-18	100	85	100	NW	5	NW	14	SW	4	0	4	0	....	...	
18	1.72	1.68	1.69	-13	—2	—4	—2	-16	100	68	93	SW	11	SW	4	SW	4	0	0	0	....	...	
19	1.70	1.65	1.62	—3	12	1	12	—6	100	73	100	E	3	SW	6	SE	4	0	0	0	....	...	
20	1.60	1.67	1.82	8	11	—2	12	—3	100	80	100	SE	1	NW	14	W	1	10	0	0	....	0.7	
21	1.91	1.83	1.80	—7	11	10	21	-11	100	72	92	E	3	E	1	SE	5	3	2	10	....	...	
22	1.69	1.62	1.58	21	29	28	29	10	88	77	87	SE	3	S	6	E	4	10	10	10	....	...	
23	1.45	1.34	1.28	16	34	27	34	16	100	90	66	SE	5	E	3	NW	1	0	0	0	....	...	
24	1.16	1.19	1.38	23	23	16	26	16	100	100	100	NW	4	NW	16	NW	17	10	10	10	....	1.2	
25	1.53	1.50	1.51	0	9	3	10	—1	97	83	97	N	8	NW	9	W	3	0	1	0	....	...	Fog
26	1.26	1.00	0.97	—2	19	25	34	—8	97	63	52	SE	3	SE	4	S	5	8	10	10	....	...	
27	1.00	0.94	0.95	32	34	34	36	15	55	62	63	SW	13	SE	3	S	7	10	10	10	....	2.0	
28	0.99	1.12	1.27	24	17	8	24	5	84	63	54	SW	20	SW	22	SW	6	10	7	0	....	0.7	
29	1.28	1.25	1.23	—2	11	4	13	-10	47	69	44	E	5	W	7	SE	6	0	0	5	....	...	
30	0.95	0.93	1.09	7	22	10	24	0	40	62	62	SE	3	W	5	W	8	10	10	10	....	...	
31	1.39	1.31	1.27	—5	17	7	23	-10	37	62	40	W	4	S	3	E	2	0	7	10	....	T	Snow on ground 4 inches
Mean	1.45	1.41	1.44	12	19	11	24	4	87	78	82		8		10		6	5	6	5	0.50	T	

SHERBROOKE, Quebec

JANUARY, 1920

$\phi=45°\ 32'$ N. $\lambda=72°\ 5'$ W. Height above Sea, 620 feet

Hours of Observation, Time of the 75th Meridian: I. 8.00 a.m. II. 2.00 p.m. III. 8.00 p.m.

Day	Pressure at 32° 28 Inches+			Temperature					Relative Humidity			Wind Direction and Velocity						Cloudiness (Overcast = 10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I		II		III		I	II	III	Rain	Snow	
1	0.84	0.78	1.04	24	31	17	31	3	69	65	60	E	6	SW	10	SW	27	10	10	10	....	3.0	
2	1.19	1.08	1.22	1	8	3	13	-14	40	62	63	SW	7	E	4	W	11	10	10	0	....	T	
3	1.27	1.28	1.43	—7	—6	—8	—3	-13	47	44	45	SW	10	W	7	SW	1	10	0	0	....	0.2	
4	1.60	1.68	1.75	—8	2	0	3	-18	67	47	49	E	2	S	3	SE	3	2	6	10	....	...	
5	1.82	1.76	1.92	-10	—8	2	2	-20	91	43	56	SW	8	SW	9	SW	4	0	0	0	....	...	
6	1.89	1.71	1.65	—3	20	13	23	—8	52	64	67	E	2	E	3	S	8	10	10	0	....	...	
7	1.53	1.49	1.44	10	34	27	36	7	63	63	79	S	7	SW	9	SW	16	10	10	10	....	0.4	
8	1.42	1.37	1.36	34	35	31	35	26	80	80	83	NW	7	NW	6	NW	7	10	10	10	....	0.2	
9	1.46	1.36	1.35	8	12	9	12	5	96	87	94	NW	3	SW	3	SE	4	7	9	10	....	...	
10	1.59	1.60	1.62	—5	14	5	22	—5	100	67	95	S	4	SW	7	S	11	0	4	0	....	...	
11	1.40	1.25	1.15	22	27	25	27	6	90	90	95	NW	5	W	3	E	5	10	10	10	....	1.0	
12	1.13	1.32	1.39	17	9	—3	17	—5	100	79	100	NW	17	SW	20	SW	7	10	6	0	....	2.1	
13	1.09	0.86	0.82	2	14	15	15	—6	100	93	98	E	3	E	2	C	0	10	9	10	....	1.2	
14	0.91	0.95	1.06	4	5	4	8	—1	100	95	63	C	0	W	19	SW	16	8	10	10	....	0.4	
15	1.15	1.21	1.35	—8	—1	-11	—5	-14	100	88	81	W	17	SW	15	C	0	4	6	0	....	T	
16	1.53	1.48	1.41	-21	—4	—4	14	-22	100	93	89	—	—	E	2	C	0	0	8	10	....	...	Fog
17	0.96	0.77	0.83	14	28	10	23	—5	100	100	83	—	—	NE	12	SW	17	10	10	10	....	7.1	
18	0.81	0.99	1.19	—5	—7	—7	—5	—8	93	92	80	SW	20	SW	24	SW	25	10	10	10	....	0.3	
19	1.45	1.38	1.49	-18	—1	—4	—1	-19	100	94	100	S	1	NE	3	NW	6	1	10	5	....	0.1	
20	1.88	1.85	1.64	-20	2	2	18	-24	100	72	100	SE	3	E	4	SE	3	0	10	10	....	2.6	
21	1.38	1.64	1.86	16	10	—1	17	—4	100	87	94	W	13	NW	8	W	1	10	8	0	....	3.7	
22	2.04	1.99	1.93	-18	9	8	11	-22	100	89	93	SE	5	SE	4	SE	3	0	8	10	....	...	
23	1.85	1.78	1.80	3	18	14	19	1	100	78	100	SE	1	SE	1	NW	7	8	10	10	....	0.3	
24	1.88	1.86	1.86	4	8	2	9	2	100	87	100	NW	4	N	4	NW	4	10	10	10	....	1.8	
25	1.92	1.99	2.16	-10	—5	-18	—5	-20	87	89	100	NW	10	NW	9	W	5	2	1	0	....	1.0	
26	2.22	2.03	1.78	-25	2	-15	31	-30	100	75	68	S	3	S	3	S	12	0	7	10	....	...	
27	1.46	1.46	1.65	31	30	9	33	7	91	89	94	S	6	NW	11	NW	8	10	10	0	....	2.4	
28	1.68	1.71	1.83	—2	8	—3	10	—3	100	85	100	W	2	NW	12	W	1	2	0	0	....	...	
29	1.96	1.81	1.69	-21	8	4	23	-21	100	71	87	SE	2	SW	5	SE	7	0	0	10	....	...	
30	1.25	1.43	1.74	23	9	—9	24	—9	95	63	69	W	18	NW	19	NW	21	10	0	0	....	5.2	
31	2.24	2.31	2.40	-27	-19	-28	-15	-28	61	52	100	W	8	NW	11	NW	1	0	0	0	....	...	
Mean	1.51	1.49	1.54	0	9	3	14	—3	85	77	83		6		8		8	6	7	6	....	33.0	

SHERBROOKE, Quebec

FEBRUARY, 1920

φ=45° 30′ N. λ=72° 5′ W. Height above Sea, 620 feet

Hours of Observation
Time of the 75th Meridian
I. 8.00 a.m.
II. 2.00 p.m.
III. 8.00 p.m.

Day	Pressure at 32° 28 Inches+			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (Overcast = 10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	2.35	2.13	2.00	-29	—4	11	21	-36	78	72	74	SE 2	E 3	S 12	10	9	10	....	...	Fog
2	1.82	1.68	1.64	21	33	37	39	9	88	73	77	SE 3	SE 5	SW 6	10	10	10	....	...	
3	1.96	2.01	2.13	14	18	5	18	5	94	62	93	NW 5	NW 9	W —	1	2	0	....	...	Fog
4	2.25	2.20	2.19	-12	14	5	15	-12	90	64	93	E —	NE 2	NE —	3	5	2	....	...	
5	2.03	1.86	1.74	9	24	22	24	0	85	73	94	NE 2	NW 5	NE 12	10	10	10	....	0.8	
6	1.20	0.99	0.94	20	26	24	26	17	93	82	79	N —	NE 14	NW 14	10	10	10	....	1.5	
7	0.81	0.80	0.97	25	33	28	34	23	88	66	72	NW 15	NW 23	W 16	10	2	0	....	...	
8	1.22	1.26	1.33	16	22	18	23	14	87	67	94	W 10	NW 12	W 1	8	10	5	....	T	
9	1.50	1.49	1.52	17	24	20	24	16	98	82	89	W 3	NW 6	W 2	10	9	2	....	0.7	
10	1.27	1.09	1.07	11	26	26	26	4	100	80	91	E 5	SE 7	S 5	10	10	10	....	3.8	
11	1.16	1.22	1.32	22	28	21	28	18	87	68	83	SW 8	SW 15	SW 3	4	5	10	....	0.5	
12	1.40	1.37	1.34	18	30	24	30	14	95	83	92	SE 1	SE 4	SE 3	5	10	0	....	0.1	
13	1.31	1.14	1.13	24	38	31	38	20	100	69	100	SE 3	E 3	NE 1	5	10	10	....	0.9	
14	1.35	1.33	1.27	29	36	32	36	25	76	64	85	SW 8	SE 4	E 3	9	10	10	....	2.0	
15	0.82	0.47	0.48	31	30	18	33	14	81	100	89	NE 12	NE 8	SW 16	10	10	10	....	4.2	
16	0.82	0.94	1.09	4	4	2	9	0	87	85	78	SW 19	SW 16	SW 21	10	10	0	....	0.3	
17	1.00	0.91	0.95	9	20	21	26	—8	63	72	81	SE 16	SE 22	SE 16	10	10	5	....	T	
18	1.08	1.15	1.19	20	23	22	23	17	100	89	100	NW 6	NW 1	N 2	10	10	10	....	4.3	
19	1.15	0.88	0.92	16	18	18	18	13	100	98	74	NW 11	NW 22	NW 20	10	10	0	....	1.9	
20	1.33	1.38	1.55	8	21	18	21	6	87	74	86	SW 15	SW 18	SW 15	9	9	6	....	...	
21	1.91	1.86	1.76	—2	17	14	18	—6	90	62	78	C 0	SE 6	C 0	2	1	8	....	...	
22	1.62	1.54	1.54	15	25	12	26	11	100	65	96	NE 1	NW 8	C 0	10	0	0	....	0.2	
23	1.47	1.32	1.21	—6	32	24	32	-10	100	58	97	SE 3	E 4	NE 8	0	10	10	....	0.3	
24	1.08	1.00	0.99	26	34	28	34	20	99	85	82	SE 2	SW 2	W 4	10	10	10	....	2.9	
25	0.79	0.63	0.62	20	23	21	24	17	100	85	96	NW 10	W 14	NW 20	10	10	10	....	0.8	
26	0.77	0.82	0.94	4	5	2	7	—2	87	73	80	NW 23	SW 17	SW 17	6	2	8	....	0.2	
27	1.18	1.25	1.46	—6	—2	—5	0	—8	89	71	89	W 16	SW 23	SW 17	2	3	0	....	...	
28	1.57	1.50	1.41	-19	9	4	10	-20	100	65	69	E 3	SW 7	SE 6	0	5	5	....	...	Fog
29	1.29	1.29	1.25	6	21	12	21	3	100	73	90	E —	SW 9	E 2	10	0	0	....	0.3	
30	....	....	....	..	..	..	..	..	...	...	...	....	....	....	..	..	..	....	...	
31	....	....	....	..	..	..	..	..	...	...	...	....	....	....	..	..	..	....	...	
Mean	1.36	1.29	1.31	11	22	18	24	6	91	74	86	7	10	8	7	7	6	....	25.7	

SHERBROOKE, Quebec

MARCH, 1920

ϕ=45° 30′ N. λ=72° 5′ W. Height above Sea, 620 feet

Hours of Observation
Time of the 75th Meridian

I. 8.00 a.m.
II. 2.00 p.m.
III. 8.00 p.m.

Day	Pressure at 32° 28 Inches+			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (Overcast = 10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	1.01	1.03	1.32	9	12	—2	21	—2	92	92	77	E 3	NW 23	NW 9	9	10	0	....	T	
2	1.60	1.60	1.62	-18	14	12	15	-22	100	66	67	SE 1	SW 3	C 0	0	5	8	....	...	
3	1.84	1.86	1.88	12	22	17	23	10	96	68	75	NW 2	NW 5	NW 2	8	4	10	....	0.1	
4	1.85	1.66	1.60	18	44	32	44	16	80	49	73	SE 4	S 11	S 5	5	4	3	....	...	Aurora
5	1.23	1.05	1.02	42	43	34	44	31	69	72	99	SE 21	SE 20	W 13	8	10	10	T	T	
6	0.89	0.78	0.87	7	4	4	8	3	100	97	97	W 18	NW 24	NW 28	10	10	10	....	11.0	
7	1.19	1.28	1.41	—1	4	1	11	—2	81	74	86	SW 21	SW 22	SW 2	3	2	5	....	T	
8	1.52	1.43	1.44	11	25	19	25	1	84	62	74	S 9	S 13	SW 6	5	2	5	....	T	
9	1.51	1.50	1.50	21	27	21	28	16	89	73	81	SW 6	SW 16	SW 4	8	7	0	....	0.6	
10	1.40	1.47	1.58	26	36	36	37	14	99	71	72	C 0	W 11	SW 9	10	5	10	....	1.0	
11	1.53	1.44	1.41	33	46	40	46	24	84	63	81	SE 2	SW 9	SE 3	9	9	10	....	...	
12	7.09	0.82	0.70	41	46	44	48	38	97	91	94	SE 4	SE 18	SE 11	10	10	10	0.33	...	Thunderstorm
13	0.99	0.80	0.47	30	29	24	32	24	87	98	100	SW 13	NW 9	NW 21	10	10	10	0.08	0.6	
14	0.71	0.94	1.32	14	14	10	16	12	87	84	70	W 17	SW 27	SW 19	8	8	0	....	1.0	
15	1.55	1.53	1.47	12	28	27	38	5	69	53	63	SW 6	SW 6	SE 4	0	1	10	....	...	
16	1.21	1.02	0.89	38	46	46	48	27	69	66	69	SE 9	SE 11	SE 19	10	10	5	0.13	...	
17	1.00	1.11	1.18	33	35	32	35	29	69	75	84	SW 27	SW 23	W 23	9	10	2	....	0.1	
18	1.50	1.50	1.47	12	22	20	22	11	62	50	69	W 23	NW 21	SW 8	0	0	0	....	...	
19	1.38	1.24	1.09	22	36	32	36	15	66	45	55	E 1	S 2	SE 4	0	7	5	....	...	
20	0.92	0.86	1.00	36	32	28	36	27	86	100	91	E 9	NW 12	N 10	10	10	10	....	3.7	
21	1.29	1.31	1.36	26	36	32	36	22	76	50	87	W 6	SW 19	SW 17	0	7	1	....	T	
22	1.57	1.57	1.56	29	43	41	47	26	89	51	72	SW 3	W 10	SW 2	0	0	0	....	...	Aurora
23	1.51	1.49	1.57	47	58	49	56	34	53	42	62	SW 10	SW 12	E 3	8	0	0	....	...	Aurora
24	1.67	1.58	1.58	40	63	42	64	31	73	60	69	SE 5	SW 5	SE 2	0	0	0	....	...	Aurora
25	1.53	1.42	1.37	35	64	42	64	25	81	26	88	E 3	SW 4	SE 4	0	3	0	....	...	
26	1.25	1.05	0.98	40	64	54	64	31	65	56	84	SE 6	S 11	SE 5	1	2	10	T	...	
27	0.96	0.92	1.03	46	43	36	48	36	87	88	96	W 4	SW 9	W 18	10	10	10	0.02	...	
28	1.40	1.40	1.34	28	41	34	46	24	67	56	78	NW 12	SW 1	E 6	0	0	3	T	0.1	
29	1.07	0.96	0.98	46	47	46	50	28	36	71	59	E 13	SE 14	SW 16	3	10	9	9.10	...	
30	1.08	1.12	1.06	32	36	32	37	32	69	59	99	SW 27	SW 22	W 1	10	7	10	....	0.7	
31	1.33	1.35	1.47	32	35	30	35	30	84	70	92	W 4	W 4	SW 2	10	3	2	....	2.0	
Mean	1.31	1.26	1.28	26	35	36	38	19	79	68	79	9	13	9	6	6	5	0.66	20.9	

SHERBROOKE, Quebec

APRIL, 1920

$\phi = 45° 30' N.$ $\lambda = 72° 5' W.$ Height above Sea, 620 feet

Hours of Observation, Time of the 75th Meridian: I. 8.00 a.m. II. 2.00 p.m. III. 8.00 p.m.

Day	Pressure at 32° 28 Inches+			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (Overcast = 10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	1.52	1.44	1.39	28	41	37	43	24	65	53	79	E 5	13	E 8	10	6	7	0.38	...	
2	1.31	1.18	0.99	26	38	35	42	31	91	83	89	SE 7	E 6	E 5	10	10	10	....	...	
3	1.23	1.18	1.25	42	45	40	47	31	53	40	48	SW 10	SE 6	W 15	4	8	5	0.01	...	
4	1.42	1.33	1.19	29	36	34	42	24	56	55	58	W 12	SW 28	NE 2	2	8	8	....	...	
5	0.93	0.62	0.61	42	40	37	45	30	75	93	89	E 7	W 2	W 12	10	10	10	0.57	...	Thunderstorm
6	0.71	0.82	0.97	25	27	28	31	24	68	74	60	SW 20	SE 19	SW 5	9	10	2	....	0.2	
7	0.98	0.83	0.86	31	37	31	37	22	60	86	69	E 3	SW 20	W 3	5	9	2	....	...	
8	0.91	0.93	1.03	29	31	27	32	24	65	53	79	SW 8	NW 2	SW 13	7	9	6	....	...	
9	1.14	1.16	1.23	27	29	29	33	19	77	64	55	W 8	W 22	W 11	3	9	7	....	0.7	
10	1.34	1.28	1.29	33	43	35	44	25	68	47	81	SW 10	W 17	C 0	8	5	0	....	...	
11	1.33	1.31	1.34	39	44	38	46	30	67	54	79	E 1	W 8	NW 6	5	10	5	....	...	
12	1.29	1.20	1.11	37	44	38	50	33	79	76	91	E 5	W 8	E 6	4	10	10	0.43	...	
13	0.86	0.77	0.98	44	42	34	52	32	82	78	98	E 19	S 12	W 1	10	10	10	0.87	0.7	
14	1.07	1.08	1.09	34	39	36	40	32	84	64	79	W 9	SE 12	W 6	9	10	0	....	0.5	
15	1.17	1.12	1.04	38	47	42	47	32	79	65	72	C 0	W 12	SE 6	4	5	10	T	...	
16	0.96	1.02	1.13	35	46	40	46	34	98	49	61	SW 6	SW 16	W 13	10	5	3	....	2.6	
17	1.30	1.30	1.42	38	50	40	51	32	81	42	80	NE 3	SW 24	N 4	3	5	1	....	...	
18	1.53	1.54	1.52	42	46	38	46	32	65	52	75	N 4	N 10	NE 4	9	8	0	....	...	
19	1.48	1.36	1.41	39	56	43	57	26	61	28	68	NW 9	NW 16	NW 4	2	1	0	....	...	Aurora
20	1.45	1.36	1.32	42	61	45	61	28	74	75	74	NE 2	NW 16	NW 2	0	0	1	....	...	Aurora
21	1.17	1.01	0.99	47	59	49	59	32	62	43	71	E 1	NW 11	SE 5	9	10	10	T	...	
22	1.19	1.23	1.26	47	59	56	59	39	47	88	90	NE 7	SE 12	SW 9	6	9	8	T	...	
23	1.04	0.94	0.93	46	47	43	52	40	95	87	93	SE 5	NE 6	E 5	10	10	7	0.61	...	
24	0.90	1.04	1.17	36	36	33	38	33	98	88	97.	NW 18	SE 8	NW 20	10	10	10	0.51	0.3	
25	1.37	1.40	1.46	38	42	38	44	33	67	57	61	NW 18	NW 21	NW 8	9	5	1	....	0.3	
26	1.53	1.49	1.46	37	50	43	52	37	60	43	70	C 0	C 0	N 2	0	0	2	....	...	
27	1.38	1.25	1.24	46	60	44	60	36	61	43	81	NE 5	S 5	S 11	6	9	10	....	...	
28	1.12	1.03	0.97	40	34	34	41	34	90	100	98	SE 6	NE 2	E 2	10	10	10	0.50	4.7	
29	0.99	1.02	1.13	41	45	40	47	33	86	76	85	S 6	SW 10	SW 10	9	10	10	0.24	...	
30	1.24	1.24	1.23	40	48	43	48	38	86	61	77	SW 15	W 15	W 4	10	7	10	0.03	...	
31	....	....	....	..	..	..	..	..	..	..	..	....	....	....	..	..	..	....	...	
Mean	1.19	1.15	1.17	..... 3rd.............					73	64	77			7	7	8	6	4.15	10.0	

MONTREAL, Quebec

NOVEMBER, 1927

$\phi = 45° 30' N.$ $\lambda = 73° 35' W.$ Height above Sea, 187 feet

Hours of Observation
Time of the 75th Meridian

I 7.40 a.m.
II. 3.00 p.m.
III. 7.50 p.m.

Day	Pressure at 32° 28 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity						Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I		II		III		I	II	III	Rain	Snow	
1	1.918	1.854	1.824	55.8	60.7	55.3	62.0	48.1	82	79	89	NW	10	SW	6	SW	6	6	10	2	....	....	
2	1.615	1.489	1.650	54.2	66.8	45.8	67.0	41.1	86	62	98	SW	14	SW	14	NW	10	8	10	10	0.50	....	Thunderstom
3	1.706	1.485	1.386	40.2	41.0	40.9	42.0	40.0	95	99	94	NE	12	NE	14	NW	12	10	10	10	1.49	....	
4	0.883	0.938	1.088	39.9	37.3	36.4	40.5	35.2	98	97	89	SW	10	SW	10	SW	8	10	10	10	0.52	....	
5	1.340	1.452	1.557	35.0	44.4	40.6	44.5	32.3	94	62	76	SW	8	SW	6	W	6	10	1	10	T	....	
6	1.535	1.472	1.463	35.4	37.8	33.5	41.4	32.5	90	92	96	NE	4	W	8	W	8	10	10	10	0.04	0.3	
7	1.695	1.846	1.950	31.0	32.8	31.1	36.0	30.5	68	62	64	NW	6	NW	8	SW	8	10	7	10	....	....	
8	2.122	2.109	2.096	28.0	30.7	27.0	31.3	26.0	62	58	65	NW	4	SW	6	NW	10	9	10	0	....	....	
9	2.104	2.126	2.194	25.5	29.2	28.7	29.9	24.5	89	77	77	NE	10	SW	6	SW	6	10	10	10	....	0.7	
10	2.227	2.153	2.095	33.0	34.0	33.0	34.3	29.0	86	90	93	SW	10	S	6	SW	6	10	10	10	0.06	1.2	
11	1.915	1.780	1.630	35.0	36.0	36.3	39.0	33.2	93	100	94	NE	10	NE	6	NE	8	10	10	10	0.43	0.3	
12	1.410	1.635	1.899	55.9	46.3	35.3	57.0	33.6	99	65	58	SW	10	SW	14	NW	24	9	1	0	T	....	
13	2.353	2.399	2.436	31.2	36.9	33.4	37.3	31.0	63	55	59	W	6	SW	10	SW	6	2	1	0	....	....	
14	2.252	2.139	2.106	33.4	46.1	45.4	47.1	32.3	76	66	72	SW	10	SW	6	SW	6	0	10	10	0.03	....	
15	2.048	1.952	1.883	39.9	40.1	37.5	42.9	36.0	98	99	97	NE	16	NE	12	NE	8	10	10	10	0.51	....	
16	1.747	1.719	1.667	50.0	56.8	55.8	57.0	36.2	98	98	96	SW	6	SW	8	SW	6	10	10	10	1.11	....	
17	1.613	1.473	1.318	45.0	42.9	38.4	55.6	38.4	100	97	98	SW	8	NE	10	NE	16	10	10	10	3.32	....	
18	1.528	1.642	1.753	31.0	28.5	27.3	40.1	26.3	90	78	77	SW	10	W	8	NW	8	10	10	10	0.04	T	
19	1.863	1.906	2.000	24.0	25.8	23.3	27.0	21.6	79	66	64	NW	6	SW	6	NW	6	10	9	10	....	0.4	
20	2.144	2.101	2.076	21.0	25.8	27.1	28.2	19.3	59	56	61	NW	4	SW	10	SW	6	10	1	10	....	....	
21	1.849	1.811	1.855	30.8	34.4	36.1	38.0	28.2	93	90	91	SW	8	SW	4	SW	4	10	10	10	0.07	1.6	
22	1.852	1.821	1.773	38.0	33.8	32.2	39.0	32.2	92	92	92	SW	6	NE	12	NE	12	10	10	10	1.17	....	
23	1.638	1.770	1.915	31.0	38.6	35.3	41.2	30.2	92	84	75	NE	8	NW	8	NW	8	10	8	10	0.07	....	
24	2.092	1.875	1.802	23.8	20.5	21.0	31.2	19.5	68	70	89	NE	20	NE	18	NE	14	10	10	10	....	2.1	
25	1.939	1.923	2.004	23.8	28.0	29.2	29.5	21.8	88	82	88	SW	8	SW	8	SW	6	10	10	10	....	T	
26	2.040	1.851	1.756	31.0	37.2	37.6	39.0	27.3	85	81	87	SE	14	SW	6	SW	6	10	10	10	0.15	....	
27	1.555	1.675	1.923	42.0	42.2	32.5	44.1	28.1	91	89	63	SW	8	NW	12	NE	12	10	10	0	0.12	....	
28	2.193	1.988	1.745	22.2	27.9	30.2	34.5	20.4	60	59	80	E	10	NE	8	NE	8	0	10	10	0.32	0.3	
29	1.300	1.577	1.686	47.9	44.2	37.1	48.0	34.5	77	68	87	SW	20	SW	10	SW	4	8	2	0	0.42	....	
30	1.449	1.374	1.255	44.0	46.0	39.4	48.7	33.5	98	100	97	SW	10	C	0	NE	4	10	10	10	1.07	....	Fog. No snow on ground
31	....	....	....	....	....	....	....	....	..	..	..	......		....		....		..	..	..	....	....	
Mean	1.798	1.762	1.792	35.9	38.4	35.4	41.8	30.8	84	79	82		10		8		10	9	8	8	11.35	6.9	

MONTREAL, Quebec

DECEMBER, 1927

ϕ=45° 30′ N. λ=73° 35′ W. Height above Sea, 187 feet

Hours of Observation, Time of the 75th Meridian: I 7.40 a.m. II. 3.00 p.m. III. 7.50 p.m.

Day	Pressure at 32° 29 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity						Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I		II		III		I	II	III	Rain	Snow	
1	0.807	1.084	1.192	20.0	20.0	18.3	33.5	17.6	74	69	70	NW	6	W	8	SW	8	0	3	0	0.04	1.8	
2	1.118	0.884	0.775	22.4	28.2	31.2	32.2	18.3	77	90	92	SE	6	SW	14	SW	6	10	10	10	....	11.6	
3	0.959	1.270	1.462	17.1	14.7	8.0	32.0	5.5	76	63	61	W	10	W	10	NW	8	3	0	0	....	....	
4	1.657	1.431	1.226	-0.3	4.8	6.0	7.8	-1.0	72	71	78	NE	12	NE	12	NE	8	2	4	5	....	....	
5	0.780	0.544	0.446	14.9	19.5	27.2	35.7	7.8	82	88	90	NE	10	SW	8	SW	8	10	10	10	....	....	
6	0.764	0.892	0.971	27.0	28.0	25.8	29.0	24.0	69	58	64	NW	8	W	4	W	4	2	9	10	....	....	
7	1.007	0.821	0.649	19.0	22.7	27.6	37.6	16.8	79	88	90	N	12	NE	12	N	10	10	10	10	0.28	0.4	
8	0.130	0.344	0.517	42.1	28.9	21.0	48.0	19.5	91	65	52	E	10	W	24	W	28	10	10	1	0.38	T	Wind 30 miles W.
9	0.969	0.953	1.021	10.0	17.2	18.2	19.5	8.6	52	62	65	NW	10	W	4	W	10	4	10	3	....	0.5	
10	1.055	0.930	0.973	20.4	28.7	28.0	29.0	17.2	74	75	87	SW	12	SW	12	SW	10	10	10	10	T	0.3	
11	1.057	0.893	0.770	29.0	23.0	34.0	34.2	27.3	86	88	84	SW	4	SW	6	SW	4	10	10	10	0.03	T	
12	0.733	0.866	0.949	35.1	32.0	27.3	37.9	24.3	91	67	72	SW	6	NE	4	NE	4	10	2	0	0.12	....	
13	0.659	0.513	0.469	29.0	30.0	29.2	31.8	24.6	87	91	92	NE	14	N	8	NE	6	10	10	10	0.23	0.3	
14	0.385	0.619	0.785	32.0	35.0	28.8	36.8	21.1	93	73	64	SW	6	SW	6	NW	10	10	7	0	....	....	
15	1.036	0.959	0.885	13.0	18.0	16.9	21.1	12.6	68	58	63	NW	12	NW	6	NW	8	0	1	0	....	16.0	
16	0.542	0.195	0.126	11.0	21.9	26.7	27.1	10.8	85	91	93	NE	18	NE	14	NE	14	10	10	10	....	0.6	
17	0.364	0.426	0.493	18.0	23.8	22.2	23.8	17.6	91	74	83	W	12	NW	4	NW	10	10	10	10	....	T	
18	0.556	0.498	0.493	18.0	19.0	17.9	23.3	16.3	83	72	81	NW	10	NW	10	W	6	9	5	6	....	1.6	
19	0.312	0.189	0.166	12.6	14.3	18.2	22.9	12.1	81	83	87	SW	12	W	20	W	20	10	10	10	....	1.6	
20	0.203	0.338	0.447	26.0	32.0	33.6	34.4	22.9	90	89	89	NW	26	SW	16	SW	14	10	10	10	T	1.2	
21	0.644	0.680	0.728	62.0	26.2	24.2	34.2	24.2	82	81	83	NW	24	NW	24	NW	24	10	10	10	....	....	
22	0.759	0.750	0.748	24.0	26.2	25.2	27.0	23.6	82	86	89	NW	18	W	10	W	8	10	10	10	T	T	
23	0.777	0.795	0.856	29.8	11.4	7.8	24.1	4.6	80	67	74	W	10	W	10	W	10	10	5	10	....	0.1	
24	1.007	1.078	1.133	0.3	7.5	8.3	9.0	-0.9	82	67	72	W	22	W	18	W	20	10	1	0	....	....	
25	1.265	1.249	1.228	6.2	13.4	11.1	14.0	5.9	78	68	71	NW	12	NW	16	NW	20	0	0	0	....	....	
26	1.228	1.223	1.146	6.7	13.1	15.2	15.6	6.7	81	83	82	W	10	SW	8	SW	8	10	0	0	....	T	
27	0.994	0.935	0.948	22.9	31.8	34.1	34.9	15.2	85	84	83	SW	6	SW	12	SW	8	10	10	10	....	....	
28	1.100	1.065	1.015	32.0	24.9	23.0	36.7	22.5	86	78	78	NE	10	NE	6	NE	12	10	10	10	....	T	
29	0.585	0.548	0.604	25.0	37.0	39.4	40.3	24.5	86	90	91	SW	8	SW	6	SW	8	10	10	10	0.21	T	
30	0.714	0.691	0.733	40.0	39.6	36.5	41.8	36.0	84	74	80	SW	8	SW	6	SW	6	9	4	10	....	....	Snow on ground 7-5 inches
31	0.546	0.231	0.002	32.2	32.5	32.7	36.0	32.1	91	94	94	N	14	NE	18	N	12	10	10	10	1.08	....	
Mean	0.797	0.771	0.773	21.3	23.7	23.3	29.4	16.7	81	77	79		12		12		11	8	7	7	2.37	34.4	

MONTREAL, Quebec

JANUARY, 1928

$\phi = 45° 30' N.$ $\lambda = 73° 35' W.$ Height above Sea, 187 feet

Hours of Observation, Time of the 75th Meridian: I. 7.40 a.m. II. 3.00 p.m. III. 7.50 p.m.

Day	Pressure at 32° 28 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity						Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I		II		III		I	II	III	Rain	Snow	
1	0.936	1.104	1.218	20.9	4.9	5.6	36.0	3.9	76	71	72	NW	14	NW	28	NW	20	8	10	10	0.07	0.2	
2	1.683	1.882	2.017	0.6	1.8	1.3	5.0	-0.6	67	65	64	NW	18	NW	12	NW	10	2	1	1	....	....	
3	1.982	1.911	1.980	14.0	19.0	18.0	19.4	1.7	71	64	82	SW	14	SW	12	SW	10	10	8	7	....	0.2	
4	2.074	1.900	1.787	12.6	21.1	22.2	22.9	10.4	78	66	63	SW	8	SW	10	SW	10	4	10	10	....	T	
5	1.944	2.090	2.065	5.1	10.7	12.7	23.2	4.9	62	60	66	W	12	W	8	W	10	0	5	10	....	1.0	
6	1.826	1.752	1.679	20.7	35.0	36.2	38.8	18.1	90	86	80	SW	10	SW	8	SW	12	10	10	10	....	0.7	
7	1.826	1.749	1.770	35.6	37.4	36.6	37.6	35.3	86	85	90	SW	10	SW	6	SW	6	10	10	10	0.01	....	
8	1.833	1.847	1.882	35.7	31.1	27.3	37.5	26.8	90	85	88	SW	8	N	6	NE	10	10	10	10	0.01	....	
9	1.687	1.540	1.480	29.5	32.7	33.6	33.9	27.0	92	92	89	NE	2	SW	6	SW	6	10	10	10	....	T	Fog
10	1.210	1.263	1.283	33.6	35.9	34.1	36.0	33.0	89	81	87	SW	10	SW	8	SW	10	10	10	10	....	T	Fog
11	1.103	1.283	1.446	32.7	28.9	27.7	34.0	22.0	92	92	89	SE	10	N	6	N	6	10	10	10	....	2.3	
12	1.696	1.654	1.540	13.4	17.0	18.8	27.0	12.5	73	73	78	SE	10	W	6	W	8	2	6	10	....	2.0	
13	1.166	1.099	1.107	35.0	38.0	37.4	39.1	18.1	89	84	90	SE	10	SW	6	SW	8	10	10	10	0.07	0.8	
14	1.733	1.731	1.715	19.1	22.2	20.0	35.8	12.5	69	49	82	NW	16	N	14	NE	12	0	10	10	....	2.8	
15	1.908	2.167	2.358	12.2	8.0	3.2	12.5	2.6	86	55	63	NE	16	NE	10	NW	10	10	2	3	....	3.4	Wind 32 miles NE.
16	2.458	2.274	1.975	2.2	1.5	0.9	2.6	-4.8	70	68	80	E	12	NE	8	E	12	10	10	10	....	2.9	
17	1.615	1.480	1.400	9.8	25.2	29.4	31.0	-1.8	83	88	92	SW	10	SW	4	SW	8	10	10	10	....	4.1	
18	1.567	1.472	1.609	27.0	30.8	28.9	33.0	24.1	72	67	70	SW	12	SW	14	SW	8	4	2	1	....	T	
19	1.794	1.462	1.149	2.3	8.0	17.3	29.5	1.9	61	63	86	NE	18	NE	18	E	14	0	10	10	....	4.3	
20	0.903	0.992	1.081	27.4	18.8	10.8	32.2	4.5	77	72	64	SW	12	SW	24	SW	12	0	3	0	....	1.1	
21	1.462	1.551	1.706	-9.7	-6.0	-5.5	4.5	10.3	59	59	63	NW	12	NW	12	NW	10	4	0	0	....	....	
22	1.715	1.718	1.611	5.8	21.0	24.4	25.3	-6.9	81	78	74	SW	10	SW	8	SW	10	10	10	10	....	0.2	
23	1.487	1.660	1.904	30.4	28.0	16.9	35.0	14.1	80	70	59	W	10	SW	14	W	12	10	2	0	....	0.4	
24	1.862	1.591	1.412	13.0	13.9	18.2	24.2	10.0	72	79	88	NE	6	NW	14	N	14	10	10	10	....	2.4	
25	0.404	0.709	1.024	26.1	15.1	9.7	33.4	4.6	94	91	90	N	12	SW	26	W	18	10	10	10	....	8.5	
26	1.511	1.566	1.742	-1.4	3.2	0.0	4.6	2.0	78	70	70	W	14	W	20	W	14	0	0	0	....	....	
27	2.020	1.985	2.029	-2.2	4.9	2.0	5.0	-5.0	69	68	69	NW	10	SE	8	NW	10	2	5	5	....	....	
28	1.964	1.911	1.908	-7.5	3.2	5.2	5.6	-9.3	75	73	76	NW	16	W	10	W	10	0	10	10	....	....	
29	1.915	1.873	1.891	5.0	10.7	7.0	11.1	3.9	73	59	65	W	8	W	6	W	12	10	2	0	....	....	
30	2.079	2.082	2.057	0.8	9.9	5.9	9.9	1.4	82	61	76	N	4	NW	4	SW	6	10	0	5	....	....	Snow on ground 26
31	2.009	2.014	2.002	1.8	14.0	15.7	18.2	1.1	82	77	82	N	8	SW	4	SW	8	5	0	10	....	T	inches
Mean	1.660	1.655	1.672	14.8	17.6	16.8	23.8	8.1	78	73	77		11		11		10	6	7	7	0.16	37.3	

MONTREAL, Quebec

FEBRUARY, 1928

ϕ=45° 30′ N. λ=73° 35′ W.   Height above Sea, 187 feet   Hours of Observation, Time of the 75th Meridian   I. 7.40 a.m.   II. 3.00 p.m.   III. 7.50 p.m.

Day	Pressure at 32° 29 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	0.679	0.471	0.470	13.7	25.3	26.0	27.6	12.1	80	85	81	SE 4	SE 10	SE 10	10	10	10	....	0.4	Fog
2	0.873	1.038	1.193	5.9	5.7	0.9	24.1	0.0	68	51	60	NW 14	W 6	W 12	1	0	0	....	0.1	
3	1.410	1.227	1.108	-3.4	9.6	1.5	10.0	-5.9	70	70	71	SE 16	NE 8	N 8	0	10	1	....	T	
4	0.740	0.530	0.835	28.0	37.2	25.1	38.0	5.0	84	89	61	SW 10	SW 8	NE 8	10	10	10	0.12	0.3	
5	1.212	1.280	1.397	0.9	4.9	2.0	16.0	0.4	60	57	58	NW 12	SW 6	W 10	0	0	0	....	....	
6	1.537	1.432	1.347	-1.9	7.9	4.9	8.0	-3.9	74	62	68	SW 6	SW 10	W 8	10	0	0	....	....	
7	1.106	0.970	0.909	12.9	24.9	22.0	25.5	5.7	66	60	69	SW 4	SW 8	SW 8	10	6	0	....	....	
8	0.650	0.530	0.512	22.0	25.9	26.0	27.3	16.2	80	87	90	NE 18	NE 16	E 12	10	10	10	0.15	....	
9	0.526	0.552	0.631	20.2	19.2	17.9	22.3	17.9	90	91	91	NE 20	NE 20	NE 20	10	10	10	....	3.7	
10	0.805	0.772	0.784	18.0	20.9	20.0	21.4	17.2	90	83	86	NE 12	NE 10	NE 10	10	8	10	....	1.2	
11	0.705	0.632	0.640	16.2	21.2	18.0	22.1	13.8	86	76	78	SE 6	NW 6	NW 14	10	0	2	....	0.2	
12	0.899	0.982	1.088	16.9	20.1	12.6	22.0	11.0	70	64	69	SW 6	SW 8	NW 20	2	0	0	....	....	
13	1.222	1.166	1.107	8.3	19.2	15.9	21.5	6.7	72	65	72	SW 10	SW 6	SW 6	0	0	0	....	....	
14	0.860	0.728	0.652	9.0	25.0	25.2	29.6	8.2	81	75	88	N 10	N 4	NE 8	4	10	10	0.15	0.3	
15	0.204	0.182	0.276	33.8	32.3	30.4	34.1	28.8	93	92	92	NE 8	NW 8	N 8	10	10	10	0.46	....	
16	0.407	0.379	0.423	32.0	32.2	31.0	33.0	28.8	90	76	80	SW 8	SW 6	SW 6	10	10	10	....	0.1	
17	0.616	0.602	0.632	27.0	30.0	26.8	31.9	24.2	79	68	66	SW 10	SW 12	SW 8	10	2	0	....	1.0	
18	0.426	0.292	0.354	14.4	21.2	15.1	26.5	7.9	79	74	78	NE 12	NE 18	NE 16	2	10	10	....	0.3	
19	0.761	0.730	0.584	-4.9	-2.1	4.8	16.6	5.3	72	64	68	NW 10	NW 8	W 6	0	0	10	....	0.1	
20	0.465	0.473	0.624	18.8	20.0	11.2	22.5	4.9	57	53	53	SW 14	W 12	W 12	2	2	0	....	0.8	
21	1.085	1.111	1.132	-6.1	2.8	2.9	4.9	-7.0	58	53	60	NW 8	W 10	W 10	0	0	0	....	....	
22	1.277	1.166	0.977	8.5	21.9	24.6	30.3	4.3	74	64	73	NW 12	SW 16	SW 6	0	10	10	....	0.8	
23	0.556	0.328	0.295	34.1	36.9	38.0	39.0	30.3	90	91	89	SW 10	SW 8	SW 8	10	10	10	0.22	0.5	
24	0.576	0.610	0.747	18.0	21.0	13.4	34.8	7.3	75	66	48	NW 12	NW 8	NW 14	1	9	0	0.02	T	
25	1.232	1.176	1.166	10.0	-6.4	-6.8	7.3	11.3	51	51	51	NW 12	NW 10	NW 14	0	0	0	....	....	
26	1.135	0.949	0.839	4.5	7.5	10.0	13.9	-8.2	57	56	66	NW 12	W 9	SW 10	0	1	10	....	6.3	
27	0.502	0.943	0.626	21.7	26.1	18.4	26.8	13.9	76	61	67	NW 10	SW 8	NW 10	10	7	5	....	0.6	
28	0.975	0.901	0.770	10.3	19.9	17.9	20.1	7.7	63	58	67	NW 8	SW 6	SW 8	0	0	0	....	....	
29	0.510	0.371	0.370	10.5	21.0	26.2	32.0	8.0	76	87	88	NW 6	NE 6	SW 6	5	10	10	....	3.4	
30	......	......	......	....	....	....	....	....	..	..	..	....	....	....	..	..	..	....	....	
31	......	......	......	....	....	....	....	....	..	..	..	....	....	....	..	..	..	....	....	
Mean	0.826	0.777	0.776	12.8	19.0	16.6	23.8	8.2	74	70	72	10	9	10	5	5	5	1.12	14.1	Snow on ground 18 inches

MONTREAL, Quebec

MARCH, 1928

ϕ=45° 30′ N. λ=73° 35′ W. Height above Sea, 187 feet

Hours of Observation, Time of the 75th Meridian: I. 7.40 a.m. II. 3.00 p.m. III. 7.50 p.m.

Day	Pressure at 32° 28 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	1.363	1.444	1.541	24.9	26.5	21.2	32.0	19.9	72	63	61	SW 10	SW 14	SW 12	0	1	0	....	0.1	
2	1.441	1.484	1.467	21.4	21.5	20.0	27.4	16.9	82	52	53	SW 4	SW 12	SW 10	10	4	10	....	0.5	
3	1.697	1.710	1.750	9.9	12.5	10.0	16.9	8.0	59	52	61	W 8	SW 10	NW 7	7	0	1	....	....	
4	1.661	1.211	1.243	7.3	26.4	21.4	32.0	5.5	78	74	92	SW 12	SW 24	SW 24	10	10	8	....	0.9	
5	1.723	1.799	1.881	5.1	9.7	9.9	14.3	1.8	63	58	60	SW 10	SW 16	W 10	0	0	4	....	....	
6	2.182	2.194	2.176	4.0	15.0	12.2	15.1	2.2	65	54	59	NW 16	SW 8	W 10	0	2	0	....	....	
7	1.952	1.722	1.757	15.2	13.1	14.3	20.0	8.9	76	88	88	SE 10	N 8	N 8	10	10	10	....	2.4	
8	2.071	2.065	2.154	17.8	24.0	19.1	25.0	13.4	67	56	64	W 10	SW 6	W 10	0	2	1	....	0.2	
9	2.200	1.915	1.823	4.9	10.9	12.5	13.5	3.2	64	64	87	NE 14	NE 14	NE 20	10	10	10	....	1.9	
10	1.979	2.017	1.988	16.0	22.5	18.4	25.0	13.5	86	78	71	NE 14	NE 5	NW 6	0	2	0	....	0.8	
11	1.908	1.742	1.659	13.7	32.1	32.2	34.0	10.6	81	70	75	SE 4	S 12	SW 10	10	10	10	....	....	
12	1.601	1.622	1.734	34.0	40.1	38.6	42.0	31.7	86	72	73	SW 8	W 4	SW 8	10	4	10	....	....	
13	1.909	1.762	1.644	32.2	45.2	44.0	46.9	29.0	90	59	61	S 2	E 4	E 6	0	7	10	T	....	Fog
14	1.552	1.582	1.614	37.1	36.9	34.9	44.5	33.5	91	78	76	SW 16	SW 14	SW 12	10	2	10	0.51	T	
15	1.603	1.626	1.701	29.0	30.0	26.1	33.5	24.7	61	58	63	NW 6	W 10	NW 8	2	9	4	....	T	
16	1.817	1.743	1.733	19.1	25.3	22.3	25.8	15.8	67	63	67	NW 6	SW 10	W 14	0	3	0	....	....	
17	1.791	1.772	1.813	22.0	31.2	25.6	32.2	19.4	63	58	69	NW 8	NW 8	NW 6	0	0	0	....	....	
18	1.606	1.397	1.282	24.1	29.2	31.6	32.2	22.2	78	91	94	NE 14	NE 16	NE 14	10	10	10	....	7.5	
19	1.170	1.191	1.244	28.3	34.3	31.0	36.0	27.3	91	81	87	SW 4	SW 8	SW 10	10	10	10	....	2.1	
20	1.305	1.341	1.416	30.1	33.3	33.3	38.2	29.1	86	79	69	NW 8	W 6	W 8	10	10	10	....	0.2	
21	1.533	1.523	1.506	31.3	34.1	31.0	39.8	29.7	64	57	64	NW 10	W 10	W 8	4	0	0	....	....	
22	1.193	1.121	1.301	33.1	37.0	37.0	39.2	29.2	90	89	64	SE 10	W 10	W 12	10	6	2	0.06	0.6	
23	1.771	1.747	1.717	15.2	23.7	25.9	29.2	14.0	54	57	60	NW 12	W 8	W 11	0	0	10	....	....	
24	1.305	1.240	1.322	33.0	46.5	35.7	47.2	24.2	72	59	73	SW 16	SW 10	SW 8	10	0	10	0.01	....	Thunderstorms
25	1.493	1.518	1.506	35.0	39.7	37.7	40.9	31.0	78	68	74	SW 6	SW 8	SW 8	10	6	10	....	....	
26	1.321	1.206	1.186	38.6	47.0	38.2	52.6	34.0	87	67	89	SE 6	NW 6	NE 8	10	10	10	0.02	....	
27	0.853	1.005	1.264	35.0	28.2	17.2	36.0	17.2	90	80	64	SE 14	SW 14	W 16	10	10	4	0.28	0.3	
28	1.453	1.536	1.603	17.8	23.0	21.0	24.9	15.3	59	51	55	N 10	W 12	W 12	10	1	0	....	T	
29	1.753	1.655	1.659	21.2	32.0	30.5	33.1	16.7	62	56	61	SW 10	SW 10	SW 10	0	0	0	....	....	
30	1.576	1.348	1.217	29.0	31.1	25.6	31.9	25.3	49	57	91	N 8	NE 10	NE 10	2	10	10	....	3.3	
31	1.213	1.376	1.517	26.0	29.9	26.1	35.9	24.1	89	68	61	NW 10	W 12	N 8	10	10	10	....	2.2	
Mean	1.613	1.568	1.594	22.9	28.7	26.0	32.2	19.3	74	66	70	10	10	11	6	5	6	0.88	23.0	Snow on ground 15 inches in fields, patches in city

MONTREAL, Quebec

APRIL, 1928

=45° 30′ N. λ=73° 35′ W. Height above Sea, 187 feet

Hours of Observation, Time of the 75th Meridian: I 7.40 a.m. II. 3.00 p.m. III. 7.50 p.m.

Day	Pressure at 32° 29 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	0.770	0.831	0.913	25.8	29.6	30.0	34.9	23.9	65	45	56	SW 6	SW 6	SW 8	10	0	0	....	....	
2	1.145	1.152	1.144	32.9	40.0	34.9	41.3	27.1	56	45	60	SW 6	SW 10	SW 8	1	1	0	....	....	
3	0.924	0.807	0.883	37.4	44.0	44.0	45.8	31.8	68	68	71	SE 16	SW 10	SW 10	0	10	10	0.02	....	
4	1.106	1.013	0.893	40.1	41.2	38.0	44.8	36.4	66	82	80	NE 10	NE 8	NE 10	10	10	10	0.17	....	
5	0.806	0.721	0.725	43.8	60.2	58.9	63.0	36.4	76	61	65	SE 4	SW 6	SW 8	10	10	2	....	....	
6	0.778	0.686	0.696	46.2	49.6	39.0	51.8	35.0	77	75	80	NE 16	NE 12	NE 14	1	2	0	....	....	
7	0.627	0.476	0.450	44.0	67.8	59.9	69.0	33.4	69	48	52	NE 6	S 12	S 3	1	0	0	....	....	
8	0.480	0.479	0.565	44.8	35.4	33.0	57.7	32.7	66	74	78	SW 12	SW 14	SW 14	5	0	5	0.24	T	
9	0.634	0.653	0.735	26.1	31.0	30.0	32.7	23.5	59	60	63	SW 16	W 18	W 10	7	10	0	....	0.1	
10	0.922	0.915	0.938	29.4	38.9	33.2	41.0	25.1	69	50	58	NW 10	W 12	W 10	0	6	0	....	....	
11	0.974	0.781	0.677	40.0	45.8	37.1	46.7	28.2	56	45	64	SE 6	NE 12	NE 10	0	3	0	....	....	
12	0.365	0.361	0.414	35.5	33.2	33.3	38.8	32.2	67	89	89	NE 16	NE 10	NE 10	10	10	4	0.02	0.1	
13	0.426	0.590	0.722	33.3	39.0	38.0	44.2	33.0	89	67	75	SW 12	SW 8	SW 8	10	10	8	0.07	....	
14	0.790	0.413	0.227	32.1	33.8	36.5	40.2	30.1	64	92	97	NE 10	NE 8	NE 10	10	10	10	0.58	3.4	
15	0.430	0.603	0.692	28.0	25.7	24.9	36.4	21.6	71	60	64	SW 20	SW 12	SW 8	10	2	2	....	T	
16	0.833	0.770	0.733	21.3	30.3	30.3	32.2	17.2	51	50	52	SW 10	SW 12	NW 8	0	0	0	....	....	
17	0.678	0.639	0.691	27.3	36.0	33.5	36.3	25.0	50	45	45	NW 10	NW 10	NW 8	10	10	0	....	....	
18	0.748	0.589	0.563	33.9	50.1	44.0	50.3	29.1	64	43	52	SW 12	SW 18	SW 10	10	1	0	....	....	
19	0.351	0.183	0.317	28.6	27.7	28.0	41.3	27.0	89	90	91	NE 14	NE 12	NE 8	10	10	10	T	3.5	
20	0.826	0.903	0.974	26.0	32.3	30.0	33.9	25.2	71	57	60	NW 12	SW 12	SW 6	7	0	0	....	....	
21	1.160	1.060	0.997	34.0	42.5	40.5	44.0	28.0	46	37	44	SW 4	SW 6	SE 8	0	10	10	....	....	
22	0.883	0.757	0.696	37.1	44.1	40.9	44.3	34.0	95	73	74	SE 6	E 4	E 6	10	10	10	0.34	....	
23	0.604	0.566	0.544	34.2	41.1	38.8	41.8	32.9	86	89	88	E 6	NE 6	NE 8	10	10	10	0.05	0.2	
24	0.334	0.301	0.295	33.1	33.0	32.0	39.0	32.0	87	83	99	NE 10	NE 10	SW 6	10	10	10	0.17	2.3	
25	0.319	0.357	0.473	32.6	43.8	39.8	44.7	32.2	91	66	81	W 6	SW 6	W 3	10	10	10	0.10	2.2	
26	0.721	0.790	0.846	29.2	41.9	36.0	42.0	34.6	54	66	69	NW 14	W 12	W 3	0	10	0	....	....	
27	0.862	0.809	0.828	36.3	46.0	42.8	47.0	32.2	71	44	52	NW 6	SW 10	SW 6	10	6	2	....	....	
28	0.647	0.472	0.316	36.8	40.2	37.6	42.0	35.4	76	96	86	NE 12	NE 10	NE 16	10	10	10	0.06	....	
29	0.170	0.168	0.250	43.0	43.1	40.5	43.5	36.1	93	94	91	NE 8	W 6	W 6	10	10	10	0.21	....	
30	0.303	0.170	0.222	43.1	52.7	48.9	52.8	38.6	77	81	82	SE 10	SW 8	SW 16	0	10	7	0.20	....	Thunderstorm
31	......	......	......	....	....	....	....	....	..	..	..	....	....	....	..	..	..	....	....	
Mean	0.687	0.634	0.647	35.0	40.7	37.8	44.1	30.3	71	66	71	10	10	9	6	7	5	2.23	11.8	

SHERBROOKE, Quebec

NOVEMBER, 1927

$\phi = 45° 24' N.$ $\lambda = 71° 53' W.$ Height above Sea, 620 feet

Hours of Observation, Time of the 75th Meridian: I. 8.00 a.m. II. 2.00 p.m. III. 8.00 p.m.

Day	Pressure at 32° 28 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity						Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I		II		III		I	II	III	Rain	Snow	
1	1.456	1.410	1.388	54.3	63.0	56.6	64.6	46.5	77	66	83	SW	8	SE	5	SE	6	10	3	7	....	....	
2	1.222	1.054	1.200	55.8	69.2	53.3	70.5	44.2	78	93	86	S	10	S	20	W	14	6	3	10	0.01	....	
3	1.202	0.979	0.841	41.7	43.0	47.6	56.2	41.4	96	98	98	NW	3	SW	3	W	3	10	10	10	3.11	....	
4	0.399	0.440	0.649	49.0	40.0	36.5	54.5	35.5	99	97	90	W	8	NW	9	SW	8	10	10	10	1.92	....	
5	0.860	0.972	1.096	35.8	44.8	34.0	45.2	33.6	82	50	90	SW	11	SW	3	C	0	1	7	8	0.01	....	
6	1.042	0.945	0.967	32.0	41.7	35.6	43.8	31.3	95	49	91	W	1	NW	9	W	11	1	8	10	....	T	
7	1.134	1.230	1.420	29.8	31.8	29.2	33.5	28.8	81	74	76	W	12	W	20	W	19	10	10	7	0.01	0.1	
8	1.603	1.593	1.608	26.8	28.0	23.9	29.6	23.8	67	66	86	W	9	W	9	SW	2	9	10	0	....	....	
9	1.613	1.600	1.699	22.3	28.4	27.4	30.6	18.0	80	82	76	E	2	W	4	W	4	10	10	10	....	0.5	
10	1.752	1.695	1.636	30.0	34.2	33.5	36.8	26.2	89	81	97	C	0	SE	1	SE	3	10	10	10	....	0.6	
11	1.484	1.382	1.210	34.3	36.5	40.6	59.8	32.5	93	92	95	SE	5	SE	3	E	8	10	10	10	0.15	1.1	
12	0.937	1.160	1.288	57.0	49.0	41.6	61.0	40.6	86	58	98	S	19	SE	17	SW	33	10	8	10	0.06	....	
13	1.825	1.888	1.929	30.4	35.5	31.0	38.0	28.8	89	61	89	W	13	SW	12	SW	1	0	1	0	....	....	
14	1.848	1.674	1.641	26.3	47.8	44.8	49.0	25.1	90	37	64	SE	4	SW	9	S	5	1	8	10	....	....	
15	1.578	1.480	1.386	42.8	51.0	44.0	59.0	40.9	93	93	95	SE	2	C	0	SE	6	10	7	7	0.19	....	
16	1.307	1.251	1.235	58.2	62.0	56.3	65.4	43.8	76	75	94	SE	13	S	5	SW	4	9	10	10	0.29	....	
17	1.165	1.002	0.796	55.8	49.5	58.8	66.4	44.8	88	95	95	W	12	NW	4	SE	19	10	10	10	0.58	....	
18	1.028	1.094	1.249	34.7	30.3	27.5	38.0	27.2	90	85	86	W	15	W	15	W	12	10	10	10	0.34	T	
19	1.331	1.359	1.454	24.7	25.0	23.5	27.9	22.8	91	81	83	SW	7	SW	16	W	16	10	10	10	....	0.4	
20	1.628	1.617	1.613	19.1	22.3	18.1	27.4	17.7	85	68	87	W	16	W	9	SE	1	10	9	0	....	0.1	
21	1.426	1.357	1.389	27.4	33.2	37.0	38.2	15.2	84	84	83	C	0	S	3	SW	3	10	10	10	....	0.1	
22	1.374	1.326	1.293	36.4	38.1	37.1	49.4	35.8	95	98	97	S	1	SE	2	SE	6	10	10	10	0.32	....	
23	1.095	1.221	1.396	49.4	39.0	36.0	50.7	36.0	97	93	85	SW	3	W	5	W	11	10	10	10	0.30	....	
24	1.586	1.422	1.318	23.5	25.7	26.2	29.0	22.8	80	75	93	N	8	NE	7	NE	10	10	10	10	....	2.0	
25	1.392	1.436	1.514	27.3	27.0	28.2	29.8	25.0	91	88	93	W	7	SW	4	C	0	10	10	10	....	0.1	
26	1.583	1.438	1.322	25.0	37.5	38.7	42.8	23.8	98	54	79	SE	3	S	4	S	9	0	10	10	....	....	Fog
27	1.098	1.103	1.404	41.0	43.4	30.9	44.8	30.8	92	95	76	E	5	W	7	NW	21	10	10	0	0.11	....	
28	1.679	1.554	1.338	18.6	29.5	32.6	41.6	18.8	91	63	74	NW	3	NE	7	S	10	2	6	10	....	....	
29	0.829	1.041	1.243	41.0	45.3	40.0	47.5	30.8	82	64	73	SW	15	SW	26	SW	6	10	6	10	0.28	0.4	
30	1.048	0.886	0.725	36.5	49.8	46.0	51.3	33.8	95	94	96	S	6	SE	4	NW	10	10	10	10	0.46	....	
31	....	....	....	....	....	....	....	....	..	..	..	....		....		....		..	..	..	....	....	
Mean	1.317	1.287	1.308	36.2	40.1	37.2	46.1	30.9	88	77	87		7		8		9	8	9	8	8.14	5.4	

SHERBROOKE, Quebec

DECEMBER, 1927

$\phi = 45° 24' N.$ $\lambda = 71° 53' W.$ Height above Sea, 620 feet

Hours of Observation, Time of the 75th Meridian: I. 8.00 a.m. II. 2.00 p.m. III. 8.00 p.m.

Day	Pressure at 32° 28 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity						Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I		II		III		I	II	III	Rain	Snow	
1	1.162	1.477	0.726	27.0	20.3	17.4	32.0	17.0	94	88	98	SW	29	SW	23	W	7	4	1	1	0.22	0.5	
2	1.689	1.512	1.306	17.4	26.6	28.0	31.9	14.3	84	74	82	SE	4	SE	5	SE	7	10	10	10	....	4.5	
3	1.382	1.611	1.905	25.0	14.5	6.1	26.0	5.8	77	83	78	SW	18	W	14	W	7	8	5	0	....	2.8	
4	2.113	1.937	1.708	-5.3	9.0	4.9	13.4	-5.8	96	68	95	C	0	C	0	C	0	4	5	9	....	....	Lunar corona
5	1.280	1.084	1.017	13.4	24.0	25.9	30.5	3.0	93	91	99	SE	2	W	2	SE	6	10	10	10	....	1.4	
6	1.248	1.365	1.470	29.3	27.0	19.8	31.4	19.8	77	73	88	W	11	NW	7	C	0	6	6	5	....	....	
7	1.534	1.397	1.243	26.6	29.6	35.3	44.7	14.8	86	89	72	SE	2	E	3	SE	7	10	10	10	0.03	0.2	
8	0.739	0.832	1.065	42.8	33.4	23.3	49.0	23.2	93	92	88	SE	15	W	8	SW	16	10	10	10	0.52	0.2	
9	1.385	1.446	1.530	11.5	14.5	16.5	17.8	10.8	71	65	80	W	17	SW	11	SW	18	5	2	0	....	....	
10	1.614	1.464	1.510	17.8	26.4	27.5	30.6	15.2	76	71	92	S	10	SW	12	S	6	8	10	10	....	1.0	
11	1.587	1.460	1.304	28.5	32.7	32.9	37.0	27.4	89	89	88	S	2	S	4	SE	2	9	10	10	....	T	
12	1.221	1.329	1.424	35.5	34.2	31.0	38.2	31.0	90	75	78	W	15	W	13	W	10	10	10	10	0.02	....	
13	1.221	1.121	0.996	29.6	32.4	34.7	36.0	27.3	83	93	93	E	6	SE	4	SE	5	10	10	10	0.05	0.3	
14	0.838	1.043	1.261	34.8	35.6	26.0	40.0	26.0	97	80	85	SE	4	W	17	NW	19	10	10	10	0.45	0.5	
15	1.487	1.423	1.385	10.5	15.5	10.3	16.0	9.1	86	69	84	NW	10	NW	9	W	1	1	0	0	....	....	
16	1.123	0.798	0.617	13.8	26.0	26.0	28.5	9.0	85	85	94	SE	3	E	14	W	7	10	10	10	....	1.1	
17	0.797	0.902	1.010	22.0	22.5	15.4	24.8	13.8	93	79	93	SW	22	W	13	SW	2	10	1	10	....	6.5	
18	1.041	0.986	0.967	19.2	18.8	18.4	21.5	15.2	82	72	92	W	6	SW	12	SW	13	8	1	10	....	T	
19	0.775	0.676	0.604	15.0	14.0	17.5	24.8	14.0	88	82	92	SW	15	SW	17	SW	19	10	10	10	....	0.5	
20	0.679	0.797	0.923	24.6	30.5	33.5	35.2	17.5	92	89	90	W	6	W	9	W	12	10	10	10	....	1.2	
21	1.087	1.138	1.232	32.0	28.5	25.0	37.8	25.0	89	89	94	SW	8	W	8	W	5	10	10	10	....	0.2	
22	1.271	1.238	1.253	25.2	27.8	27.0	30.8	25.0	95	91	96	C	0	C	0	C	0	10	10	10	....	0.1	
23	1.245	1.235	1.313	24.5	17.8	6.6	27.4	6.0	91	71	91	SW	3	SW	13	SW	10	10	6	8	....	1.2	
24	1.422	1.489	1.605	2.0	6.7	3.0	8.8	1.5	86	84	87	W	11	W	11	SW	5	10	10	10	....	0.2	
25	1.727	1.710	1.736	6.5	14.0	6.0	14.0	4.0	84	78	88	W	3	SW	5	C	0	0	0	0	....	....	
26	1.713	1.651	1.639	4.3	14.2	2.3	17.2	-4.6	82	77	97	C	0	C	0	SE	4	10	3	0	....	0.5	
27	1.518	1.446	1.460	17.2	28.1	33.7	34.7	0.8	87	86	79	SE	5	SE	10	SW	14	10	10	10	....	....	
28	1.599	1.583	1.651	33.3	32.7	32.1	42.7	29.9	87	91	91	W	5	N	1	SE	4	10	10	10	....	....	
29	1.192	1.088	1.158	36.9	37.5	40.8	44.8	31.3	76	91	87	S	5	N	2	SW	4	10	10	5	0.12	T	
30	1.279	1.212	1.257	38.1	43.3	38.7	47.5	32.3	87	74	84	SE	6	SW	7	C	0	9	9	10	....	....	Trace of-snow-on ground
31	1.088	0.773	0.599	36.3	38.6	39.7	44.0	35.7	92	92	92	SE	3	SE	3	SE	6	10	10	10	0.53	....	
Mean	1.292	1.265	1.254	22.4	25.0	22.8	30.9	16.0	87	82	89		8		8		7	8	7	8	1.94	22.9	

SHERBROOKE, Quebec

JANUARY, 1928

ϕ=45° 24′ N. λ=71° 53′ W. Height above Sea, 620 feet

Hours of Observation
Time of the 75th Meridian

I. 8.00 a.m.
II. 2.00 p.m.
III. 8.00 p.m.

Day	Pressure at 32° 27 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	1.427	1.523	1.719	31.6	14.7	5.4	38.7	5.3	83	70	70	SW 14	NW 18	W 21	10	5	0	....	T	
2	2.135	2.325	2.497	1.2	3.1	2.1	5.1	1.1	68	68	80	W 21	SW 16	SW 3	3	6	1	....	....	
3	2.524	2.443	2.480	2.6	17.8	17.8	21.7	2.3	78	57	66	SE 4	SW 14	S 8	1	5	5	....	....	
4	2.600	2.399	2.364	11.0	19.6	20.1	27.6	10.3	88	60	66	SW 3	S 9	S 10	1	9	10	....	....	
5	2.304	2.584	2.557	7.6	7.0	10.7	26.1	6.1	89	70	64	W 26	SW 22	SW 11	10	2	3	....	0.5	
6	2.370	2.305	2.225	25.1	30.1	33.6	40.6	10.3	86	88	71	SW 8	S 7	S 12	10	10	10	....	0.5	
7	2.341	2.314	2.303	36.7	37.2	36.6	42.1	33.6	89	89	82	SW 7	S 4	S 1	10	10	10	....	T	
8	2.321	2.329	2.385	36.8	36.1	35.8	42.5	35.1	92	89	91	SW 3	W 5	W 5	10	10	10	....	....	
9	2.208	2.053	1.994	33.5	34.8	33.0	40.5	32.8	95	97	93	SE 1	SE 1	SE 1	10	10	10	0.02	....	
10	1.838	1.771	1.793	23.3	34.2	34.5	37.1	32.8	92	83	85	SW 9	W 10	SW 13	10	10	10	....	0.8	
11	1.652	1.626	1.970	33.4	33.5	22.2	41.8	22.0	96	98	92	SE 3	NW 3	NW 7	10	10	10	....	2.4	
12	2.172	2.153	2.032	3.0	19.5	24.0	33.3	2.6	97	82	87	C 0	SE 2	SE 3	2	4	10	....	....	
13	1.752	1.650	1.647	33.3	39.2	35.7	41.2	23.8	90	83	93	SE 8	S 4	C 0	10	10	10	0.03	2.5	
14	2.143	2.272	2.235	25.5	25.0	24.0	29.0	23.0	75	62	87	NW 20	W 3	SE 2	3	8	10	0.07	0.1	
15	2.306	2.561	2.815	11.0	5.8	-4.0	13.0	-4.0	96	81	96	NW 6	NW 7	W 2	8	0	0	....	3.0	
16	2.941	2.723	2.459	18.0	1.7	6.0	19.5	19.2	100	78	96	C 0	C 0	SE 3	0	10	10	....	....	
17	2.102	2.003	1.922	10.5	23.0	23.6	28.5	6.0	90	86	99	SW 5	W 9	SE 2	10	10	10	....	8.0	
18	2.046	1.962	2.092	25.0	29.0	27.1	32.0	22.0	72	72	87	W 12	W 21	NW 23	10	10	10	....	2.8	
19	2.297	2.120	1.795	2.3	15.2	20.0	25.5	-2.4	94	62	84	SE 1	E 2	SE 17	0	5	10	....	T	
20	1.452	1.417	1.601	25.5	25.5	13.0	29.4	13.0	94	80	68	S 2	SW 22	W 13	10	10	0	....	3.3	
21	1.854	1.968	2.144	10.5	-7.5	-6.5	5.2	11.0	91	80	80	W 19	SW 24	SW 16	10	8	0	....	....	
22	2.189	2.190	2.188	5.2	13.4	20.4	33.0	-7.5	83	84	78	SW 5	W 10	SW 12	10	10	9	....	0.4	
23	2.002	2.104	2.398	32.8	28.2	18.0	32.8	18.0	80	86	68	SW 22	SW 13	SW 15	10	10	0	....	2.8	
24	2.464	2.169	1.957	2.2	23.4	32.8	39.0	0.0	95	73	82	SE 2	SE 7	SE 5	10	10	10	....	....	
25	0.797	1.136	1.495	37.0	21.4	9.6	41.5	9.0	95	97	98	SW 10	SW 28	SW 34	10	10	10	0.25	3.0	
26	1.947	2.030	2.249	2.5	8.0	0.2	8.2	0.0	73	62	88	SW 22	SW 20	W 8	0	0	0	....	1.0	
27	2.464	2.455	2.523	-5.8	5.6	-1.8	7.0	-6.2	92	61	100	SW 4	SW 4	C 0	0	0	0	....	....	
28	2.463	2.379	2.371	-8.4	11.0	9.2	12.0	-9.2	96	60	79	SE 2	N 2	E 3	0	7	8	....	....	
29	2.337	2.240	2.359	7.0	10.3	4.5	11.6	4.0	77	75	85	NW 1	NW 16	W 4	10	10	4	....	....	
30	2.535	2.544	2.566	-4.9	10.7	2.2	12.8	-5.2	96	62	92	C 0	SW 5	S 2	0	1	0	....	....	
31	2.531	2.488	2.517	2.0	19.4	12.5	21.1	-2.3	89	67	90	SE 3	SE 7	SE 5	10	4	10	....	....	Snow on ground 9 inches
Mean	2.148	2.136	2.182	13.7	19.2	16.8	27.1	8.0	88	76	84	8	10	9	7	8	7	0.37	31.1	

SHERBROOKE, Quebec

FEBRUARY, 1928

Φ=45° 24′ N. λ=71° 53′ W. Height above Sea, 620 feet

Hours of Observation
Time of the 75th Meridian

I. 8.00 a.m.
II. 2.00 p.m.
III. 8.00 p.m.

Day	Pressure at 32° 28 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	1.201	1.033	0.998	6.1	26.0	26.8	28.0	5.0	95	78	76	SE 4	S 8	SW 9	8	10	9	....	0.1	
2	1.257	1.421	1.654	8.5	4.6	0.0	11.9	0.0	79	60	70	W 2	NW 30	W 10	8	2	0	....	0.4	
3	1.885	1.757	1.615	15.2	10.5	15.3	30.8	15.4	100	49	69	E 3	SE 2	SE 5	0	0	8	....	....	
4	1.299	1.038	1.196	30.0	41.0	32.5	44.3	15.3	78	62	74	S 9	SW 13	NW 25	10	10	10	0.06	0.1	
5	1.655	1.701	1.847	-1.0	2.1	-1.5	4.2	-2.8	88	67	90	NW 15	NW 13	C 0	2	0	0	....	....	
6	1.991	1.909	1.821	-9.5	6.0	2.8	9.5	10.2	95	57	86	C 0	SW 4	SE 1	0	0	1	....	....	
7	1.615	1.468	1.409	5.2	27.5	17.3	29.5	-1.8	83	54	84	SE 2	SW 5	SE 4	7	10	1	....	....	
8	1.180	1.049	0.984	19.5	29.5	30.8	35.2	12.8	85	89	96	SE 1	E 6	E 8	10	10	10	0.03	0.3	
9	0.978	1.024	1.085	26.3	24.2	21.2	29.5	21.0	84	96	96	NE 15	NE 14	NE 20	10	10	10	....	2.5	
10	1.251	1.213	1.250	15.8	22.2	18.8	23.5	14.6	93	79	95	W 3	NW 9	W 4	9	10	10	....	1.2	
11	1.179	1.131	1.183	16.7	23.5	15.5	24.0	15.0	95	79	91	C 0	NW 8	W 3	10	7	10	....	0.6	
12	1.288	1.423	1.596	13.4	19.3	10.5	20.9	10.5	93	77	90	W 7	NW 13	W 2	8	9	0	....	....	
13	1.737	1.655	1.603	-8.0	18.4	10.0	20.0	9.0	92	68	96	SE 1	SE 2	SE 6	0	0	0	....	....	
14	1.411	1.272	1.226	4.3	30.0	30.6	38.8	1.8	92	67	83	SE 3	SE 3	SE 4	6	10	10	....	0.1	
15	0.747	0.650	0.741	37.0	39.5	34.2	44.5	30.3	90	85	90	NE 4	SW 1	W 12	10	10	10	0.05	....	
16	0.962	0.890	0.937	27.0	33.5	31.5	37.0	27.0	96	82	82	W 1	W 10	W 10	10	10	10	....	0.1	
17	1.138	1.098	1.170	26.2	31.8	25.6	34.5	25.4	86	79	72	SW 12	SW 19	SW 3	7	10	0	....	0.3	
18	0.920	0.698	0.763	15.8	29.8	16.7	32.0	15.3	86	54	85	NW 2	NE 10	NW 15	8	7	6	....	....	
19	1.184	1.239	1.167	-1.0	5.6	5.0	18.2	-1.0	85	61	78	W 13	SW 7	SE 3	6	0	10	....	0.2	
20	0.963	0.947	1.115	18.2	20.2	13.6	22.7	5.0	66	82	71	SW 11	W 14	NW 25	1	10	3	....	1.3	
21	1.480	1.585	1.649	-4.8	-0.5	-0.4	11.0	-4.8	79	54	76	W 15	SW 17	SW 1	0	0	0	....	....	
22	1.743	1.705	1.533	11.0	21.9	24.0	33.4	-5.8	86	60	64	SW 5	S 10	SE 8	7	10	10	....	0.5	
23	1.192	0.890	0.793	33.0	37.5	39.3	44.0	24.0	91	93	88	SE 8	SE 3	S 3	10	10	10	0.19	2.5	
24	0.983	1.102	1.211	25.0	19.8	15.8	30.0	15.6	87	66	57	SW 20	W 25	W 27	10	7	8	0.06	0.3	
25	1.613	1.612	1.614	10.6	-4.8	-7.9	-4.0	11.0	72	57	92	NW 15	W 10	W 8	0	0	0	....	....	
26	1.599	1.488	1.350	11.5	4.8	5.0	16.8	13.5	90	53	70	S 1	SW 12	SE 3	0	3	10	....	....	
27	1.017	0.987	1.081	16.8	22.8	19.5	24.0	4.3	87	73	77	SW 6	W 15	NW 19	10	10	1	....	2.3	
28	1.458	1.415	1.362	3.2	16.0	9.0	18.6	2.0	82	59	83	SW 1	S 2	SE 2	0	0	0	....	....	
29	1.119	0.927	0.937	4.6	27.0	30.6	33.2	1.3	85	88	74	SE 4	SE 13	SE 12	5	10	10	....	1.8	
30	......	......	......	....	....	....	....	....	..	..	..	....	....	....	..	..	..	....	....	
31	......	......	......	....	....	....	....	....	..	..	..	....	....	....	..	..	..	....	....	
Mean	1.312	1.253	1.272	9.4	20.4	16.9	25.7	5.9	87	70	81	7	10	9	6	6	6	0.39	14.6	Snow on ground 9 inches

SHERBROOKE, Quebec

MARCH, 1928

ϕ=45° 24′ N. λ=71° 53′ W. Height above Sea, 620 feet

Hours of Observation, Time of the 75th Meridian: I. 8.00 a.m. II. 2.00 p.m. III. 8.00 p.m.

Day	Pressure at 32° 28 Inches + I	II	III	Temperature I	II	III	Ma.	Mi.	Relative Humidity I	II	III	Wind Direction and Velocity I		II		III		Cloudiness (overcast=10) I	II	III	Precipitation Rain	Snow	REMARKS
1	0.880	0.904	1.024	27.8	27.2	22.6	30.2	22.2	70	69	77	SW	6	SW	24	SW	18	10	4	10	....	0.1	
2	0.973	0.957	1.027	23.0	22.9	18.5	28.2	17.0	88	57	71	SW	4	SW	26	W	18	10	7	10	....	3.3	
3	1.113	1.151	1.246	-0.2	14.1	4.3	15.1	-1.0	91	62	97	W	2	SW	17	SW	7	6	7	2	....	0.1	
4	1.258	0.899	0.741	5.0	27.9	30.8	32.1	2.8	90	58	62	E	4	SE	22	S	25	6	10	4	....	....	
5	1.151	1.236	1.380	3.5	8.3	6.6	9.0	3.5	74	67	75	SW	22	SW	21	W	3	8	6	1	....	0.5	
6	1.598	1.650	1.674	4.8	13.5	6.3	15.0	4.3	80	56	81	SW	12	W	12	W	3	2	6	0	....	....	
7	1.519	1.251	1.208	2.0	20.6	20.3	22.8	-3.0	83	91	96	SE	3	E	3	E	2	7	10	10	....	3.3	
8	1.483	1.534	1.661	17.5	20.4	13.3	21.5	11.6	84	59	87	W	19	SW	20	NW	8	8	9	0	....	0.7	
9	1.683	1.453	1.323	-6.5	19.0	18.0	22.8	8.7	96	54	92	SE	4	NE	5	E	12	4	10	10	....	0.1	
10	1.423	1.475	1.514	14.0	25.8	17.0	27.6	13.2	91	55	76	NW	4	W	11	W	2	3	3	0	....	1.0	
11	1.475	1.333	1.231	4.8	33.2	30.9	36.3	-0.5	80	59	69	SE	3	SW	10	SE	5	3	10	0	....	....	
12	1.137	1.132	1.251	33.0	38.0	37.4	40.7	29.3	87	77	82	SE	3	SW	7	W	3	10	10	6	....	....	
13	1.465	1.358	1.255	25.4	46.0	41.8	50.5	23.6	99	46	68	SE	4	SE	5	SE	3	10	2	2	....	....	Fog
14	1.088	1.134	1.143	41.0	35.2	25.3	44.5	35.2	91	83	70	S	9	SW	15	W	12	10	10	9	0.27	....	
15	1.090	1.075	1.100	30.3	30.0	24.5	37.5	24.5	75	73	81	SW	18	SW	24	SW	16	10	10	0	....	0.1	
16	1.278	1.229	1.231	17.7	26.2	20.5	28.2	17.5	86	63	86	W	15	W	12	W	2	2	1	0	....	....	
17	1.263	1.254	1.307	18.5	29.6	24.5	32.2	15.8	85	60	78	W	5	NW	8	W	1	0	0	0	....	....	
18	1.106	0.936	0.766	27.0	30.2	31.8	36.9	16.8	97	96	90	E	3	NE	23	1NE	18	10	10	10	....	2.9	
19	0.596	0.695	0.740	28.5	32.0	30.5	35.0	27.4	94	77	89	NW	7	W	15	SW	8	10	10	10	....	2.1	
20	0.762	0.798	0.891	29.5	34.0	30.5	36.5	28.2	89	71	87	W	11	W	17	SW	12	10	10	10	....	1.4	
21	0.998	0.996	1.006	29.0	34.4	26.5	35.6	26.5	79	71	76	W	15	SW	20	SW	14	10	6	0	....	....	
22	0.736	0.629	0.780	34.0	35.0	34.5	40.4	22.3	79	90	95	SW	9	SW	4	NW	13	10	10	10	0.05	0.5	
23	1.210	1.235	1.238	9.5	20.8	19.8	25.4	9.2	79	60	68	NW	18	W	11	SW	3	0	0	0	....	....	
24	0.874	0.771	0.853	25.4	47.5	40.8	52.6	14.3	82	58	79	SE	6	SW	3	W	8	10	7	0	0.05	....	Thunderstorm
25	1.022	1.051	1.064	35.3	45.2	37.6	46.2	31.8	80	59	79	NW	7	SW	4	SE	2	8	7	1	....	....	
26	0.916	0.793	0.710	40.8	57.8	50.0	62.0	35.8	84	56	69	SE	6	S	4	S	9	9	7	7	....	....	
27	0.355	0.488	0.709	45.5	30.5	18.2	47.0	17.8	87	94	83	SW	6	W	11	W	24	10	10	10	0.07	1.5	Thunderstorm
28	0.946	0.979	1.090	17.2	22.7	20.0	24.0	13.8	77	55	78	SW	12	SW	29	SW	18	10	5	0	....	0.1	
29	1.226	1.153	1.147	20.5	31.3	27.5	34.0	16.4	68	65	82	SW	18	SW	21	SW	11	0	1	0	....	....	
30	1.003	0.901	0.686	23.8	32.0	29.0	34.8	19.8	89	59	94	N	2	NE	3	E	5	0	10	10	....	0.8	
31	0.629	0.807	1.003	27.5	30.0	24.0	34.5	23.8	88	73	87	W	20	NW	19	W	15	10	10	7	....	4.7	
Mean	1.105	1.076	1.097	21.1	29.7	25.6	33.5	16.5	85	67	81		9		14		9	7	7	5	0.44	23.2	Snow on ground 4 inches

SHERBROOKE, Quebec

APRIL, 1928

y=45° 24′ N. λ=71° 53′ W. Height above Sea, 620 feet

Hours of Observation, Time of the 75th Meridian: I. 8.00 a.m. II. 2.00 p.m. III. 8.00 p.m.

Day	Pressure at 32° 28 Inches +			Temperature					Relative Humidity			Wind Direction and Velocity			Cloudiness (overcast=10)			Precipitation		REMARKS
	I	II	III	I	II	III	Ma.	Mi.	I	II	III	I	II	III	I	II	III	Rain	Snow	
1	1.241	1.312	1.423	25.0	32.0	26.1	34.6	21.6	75	65	74	NW 12	NW 12	SW 8	0	10	2	....	0.3	
2	1.654	1.655	1.669	16.8	40.0	34.2	42.3	10.6	77	33	69	SE 3	SW 7	SW 1	1	1	1	....	....	
3	1.538	1.376	1.440	33.1	50.6	47.0	53.5	22.4	67	61	59	SE 5	S 17	SW 8	1	10	10	0.04	....	
4	1.661	1.606	1.466	40.0	39.4	38.0	46.4	37.8	85	87	92	SE 3	NE 9	SE 6	10	10	0	0.08	....	
5	1.374	1.280	1.303	46.4	66.4	54.0	67.4	37.3	79	45	66	SE 4	SW 10	SE 6	6	7	4	....	....	
6	1.302	1.206	1.191	45.1	71.6	50.7	73.2	39.0	82	39	74	SE 3	SW 9	NE 3	6	3	0	....	....	
7	1.206	1.140	1.098	47.0	72.0	57.5	74.0	37.0	82	38	63	SE 7	S 20	SE 13	1	0	0	....	....	Aurora
8	1.033	0.954	1.117	51.9	55.6	34.8	61.6	34.3	85	54	78	S 5	S 20	W 16	10	8	10	0.07	T	
9	1.135	1.176	1.222	25.0	29.0	28.0	31.0	23.8	78	89	86	SW 27	SW 21	NW 21	10	10	10	....	0.2	
10	1.410	1.418	1.482	27.8	34.8	29.0	38.7	24.8	79	66	86	W 17	W 15	SW 3	3	6	0	....	0.1	
11	1.491	1.339	1.198	29.6	48.5	36.3	50.4	21.8	71	31	80	E 3	SE 10	E 6	0	5	0	....	....	
12	0.848	0.804	0.872	35.0	39.0	35.4	43.0	33.3	85	82	94	NE 14	N 7	W 8	10	10	10	0.11	....	
13	0.938	1.070	1.231	38.0	37.2	36.0	43.0	32.1	85	85	73	SW 14	W 19	W 16	10	10	10	0.03	T	
14	1.303	1.075	0.831	35.0	41.0	37.8	45.5	30.3	80	91	92	SW 7	S 13	SE 8	4	10	10	0.36	....	
15	0.911	1.032	1.149	24.5	29.0	25.0	38.4	24.0	75	82	88	SW 26	W 21	W 18	10	10	10	0.22	T	
16	1.257	1.234	1.204	20.0	29.7	28.5	32.0	17.8	93	67	55	W 25	W 27	SW 11	0	1	0	....	T	
17	1.122	1.108	1.186	27.6	30.0	33.5	35.3	24.4	64	76	85	SW 26	NW 30	SW 19	2	7	10	....	....	
18	1.235	1.135	1.092	35.0	46.8	46.0	53.3	29.0	68	21	26	SW 22	SW 26	SW 14	8	9	2	....	....	
19	0.875	0.625	0.784	35.5	45.0	36.8	47.0	33.4	67	86	85	E 8	NE 2	SW 2	10	10	10	0.13	....	
20	1.277	1.362	1.455	27.8	31.0	29.6	35.5	25.8	74	72	77	W 14	W 18	SW 17	10	9	0	T	1.2	
21	1.651	1.604	1.530	30.0	42.0	38.2	44.5	22.5	76	27	52	SW 5	SW 9	NE 2	0	0	10	....	....	
22	1.426	1.346	1.247	35.2	41.4	37.6	43.6	32.8	90	68	77	NE 9	SE 15	E 6	10	10	10	0.04	0.7	
23	1.124	1.081	0.971	36.4	45.6	36.7	46.6	32.8	88	63	90	E 7	SE 12	SE 13	10	10	10	0.05	1.3	
24	0.796	0.722	0.789	32.9	33.4	32.2	39.8	32.0	94	89	99	NE 12	N 10	SW 10	10	10	10	....	2.3	
25	0.807	0.837	0.948	34.0	36.8	35.0	41.0	30.8	86	83	95	W 9	W 10	W 14	10	10	10	0.03	3.6	
26	1.172	1.224	1.330	35.8	41.3	34.3	44.5	34.0	61	55	75	NW 19	W 18	W 16	8	10	2	0.01	....	
27	1.366	1.352	1.354	35.5	40.5	39.0	44.2	31.6	63	49	67	SW 8	SW 10	SW 3	8	10	9	....	....	
28	1.201	1.013	0.844	33.8	34.2	36.8	42.2	31.3	87	96	88	E 5	NE 9	NE 19	10	10	10	....	2.1	
29	0.707	0.706	0.768	41.8	41.6	39.5	47.6	35.7	85	85	89	NE 7	SW 9	SW 10	10	10	10	0.17	....	
30	0.892	0.809	0.844	40.2	47.0	49.5	57.0	38.0	79	85	75	SW 8	S 5	S 9	7	10	10	0.13	....	
31	......	......	......	....	....	....	....	....	..	..	..	....	....	....	..	..	..	....	....	
Mean	1.198	1.153	1.168	34.4	42.4	37.4	46.6	29.4	79	66	77	11	14	11	7	8	6	1.47	11.8	

APPENDIX E

ICE FORMATION ON THE ST. LAWRENCE AND OTHER RIVERS

1. When the problem of preparing plans for the improvement of the St. Lawrence river was first undertaken, particularly by the Canadian Government, about ten years ago, there was a great deficiency of basic data on which to predicate designs. Since that time systematic surveys have been made of ice covers, packs and gorges, as they occur, and as a result of these, much exact knowledge is now available. This data is presented in summary in this appendix.

2. ICE PRESSURE. In northern latitudes a solid covering of ice forms on quiet river and lake surfaces in winter. This melts away with the advent of warm weather. The thickness of ice civer varies with the coldness of the climate. A thickness of about 2.5 feet is found in latitude 45 and 5.5 feet in latitude 57 in the eastern half of North America. Sheet ice as formed on lakes and rivers is made up of great numbers of crystals standing with axes vertical and closely packed side by side. As the air with which ice is in contact changes in temperature from day to day, the temperature of ice on rivers and lakes changes also. In cases where the ice surface is free from snow, the amplitude of this change at mid depth is about one-half that of the air so long as the temperature of the air is below freezing. If an ice sheet is covered with snow this change in amplitude is less than on-half that of the air.

3. As ice heats and cool it expands and contracts. Daily expansion and contraction of ice sheets is noticeable on lakes and rivers in northern regions. In some cases cracks have been observed to open or close as much as ten feet in a period of several days and these usually occur in the same places year after year.

4. The coefficient of free unrestrained expansion of ice is given by many authorities as about .00004 per degree Fahrenheit change in ice temperature per unit of length. On this basis a sheet of ice one mile long, with a temperature change of 5 degrees, would expand or contract to the extent of one foot. Actually, movements of two feet per mile have been observed at free ends of ice sheets on large lakes and rivers during extreme changes of weather. On small lakes and rivers, the movement of the ice is believed to be restrained by the shores at least to a sufficient extent to prevent it being much noticed.

5. There are records of failure of some light dams and structures which were due to ice action but the fact that dams of dimensions not sufficient to resist theoretical ice action are in place, proves that the full crushing strength of ice is not applied to them.

6. In order to set up a more definite value for probable ice pressure on dams, a series of tests were carried out by Professor Ernest Brown of McGill University and the engineering staff of the Department of Railways and Canals in the winter of 1925-26. These show that sheets of ice flow or slowly change their shape as soon as subjected to pressures in excess of about 100 pounds per square inch. A special report giving details of tests made in this connection is given in appendix "F".

7. In view of the foregoing, the Board has reached the conclusion that ice pressure will not exceed 22,000 pounds per linear foot on the upstream side of dams under weather conditions to be expected in the St. Lawrence region.

8. ICE FORMATION IN RAPID WATER. As is well known, the precipitous rapids of northern rivers remain open in winter and solid smooth ice covers form on the gently flowing sections; thus, open and closed conditions alternate with one another. The laws or conditions governing the location of the boundaries between an open and closed surface are not well known. Observations of the behaviour of rapids and open stretches of river show that they are subjected to much cooling in winter, but they do not freeze over because the ice crystals formed in preserving the heat equilibrium, attach themselves to the bottom or are carried off by the turbulent water before they have time to connect to one another or bridge the stream. As the water with its burden of ice moves downstream it ultimately reaches a river or lake expansion where its velocity and turbulence moderate and where the ice and slush move quietly on its surface. Under these conditions ice bridges form across the river or lake and then the pack, as it is called, advances upstream until it reaches a point where the velocity becomes so great that ice is carried under the surface of the pack and is deposited there in the form of a "hanging dam". These hanging dams continue to increase in length as long as the temperature of the air is below about 20 degrees Fahrenheit, or while snow is falling and as long as large open surfaces remain in the river above. As soon, however, as the temperature of the air rises above 20 degrees Fahrenheit or the area of the water surface exposed above reduces in size, the length and steepness of the water slope through these dams becomes less, and in the warm weather of approaching spring the jam melts away. The formation of an ice cover on a stream acts as a blanket and prevents the formation of frazil in the water beneath.

9. Sometimes ice gorges cause the inundation of large areas above them as in the vicinity of Montreal and sometimes they greatly reduce the flow of water as in the St. Clair river.

10. EFFECT ON POWER IMPROVEMENT. In the improvement of northern rivers for power it is usually possible to establish water surface levels high enough to secure low velocities and eliminate or reduce to small proportions all water surface areas remaining open in winter. This opportunity is generally available because most rivers have deep wide valleys with small winter flows compared with those of summer.

11. Much difficulty is found in reducing open water areas on the St. Lawrence river to small proportions. The river carries a large winter flow which must be maintained, the river valley is relatively narrow and the water level at the head of the rapids sections cannot be raised on account of property values involved in flooding.

12. As a consequence of this situation a number of investigations were made to determine the facts with regard to the following matters:—

(*a*) Conditions under which smooth ice covers, ice packed covers, and hanging dams may be expected to form.

(*b*) The amount of ice formed by a given open water exposure in a given locality.

(*c*) The loss in head due to ice covers and packs of various kinds, or the effect of such packs on the flow of water under them.

13. FACTORS AFFECTING ICE COVERS. Whether an ice cover forms or does not form across a river depends upon the temperature of the air, the temperature of the water, the velocity of the wind, and the velocity and turbulence of the water.

14. Actual observations at a number of points on the St. Lawrence show little variation in what takes place at a given point from year to year. For instance, an ice cover always forms on lake St. Louis at a point where the average velocity is about one foot per second and gradually makes downstream to a point where the average velocity is close to two feet per second. An ice cover forms at the lower end of lake St. Peter at a point where the average velocity is from 1.0 to 1.25 feet per second. At the foot of Vercheres Island where the average velocity of the water is about 1.4 feet per second, ice covers do not form until the ice pack reaches this point from below. At other points on the river, such as the sections at Croil

island, Cat island and at Drummond island, ice covers do form at from 1.30 to 1.40 feet per second, under extremely cold weather conditions. After an ice cover has started in quiet water near shore it will extend into swifter water. The actual surface velocities along the edge of an ice sheet have been observed to be as high as 2.5 per second.

15. The term "average velocity" as herein used is the velocity determined by dividing the river discharge by the area of the cross section at the water level. The term "surface velocity", where used, is the observed velocity determined by surface floats. The surface velocity at a section may be as much as 50 per cent in excess of the average velocity.

16. It is not probable that an ice cover would always form on a section of the St. Lawrence early in winter unless provision is made for reduction of the average velocity in the section to about 1.25 feet per second.

17. After ice covers are formed and attain some thickness it is found that average velocities can be increased up to 2.5 feet per second without danger of breaking up the ice sheet. This is current practice in the operation of power canals in the St. Lawrence district.

18. Near the immediate outlet of large lake expansions and in some rivers in Ontario large openings or air holes are sometimes found where the velocity is below one foot per second. This phenomenon is apparently caused by heat accumulated remaining in the water underneath the ice. Not many cases of this are found in the St. Lawrence where the velocity is so low, but the phenomenon is noticeable at the outlet of Rice lake on the River Trent and in other places.

19. In stretches of river where average velocities exceed 1.40 feet per second, ice covers will not form from shore to shore but after a bridge is formed below, ice and slush will pack upstream against an average velocity up to 2.25 feet per second without the floating slush or crystals being carried underneath the advancing ice bridge. This fact permits channels of reasonable size to be used for power works in northern latitudes, and is of economic importance in reducing the cost of improving rivers to obtain the power available in them.

20. The formation of the ice pack which forms each winter at the foot of lake St. Peter and gradually builds up to Montreal has been watched for many years, because it furnishes information

of special value in connection with ice packs. Gauges were established in this stretch of river twelve years ago and water level records are available which show the change in slope which occurs in this reach as the ice pack advances from day to day.

21. From the above records and direct observations, the conditions under which the ice pack failed to advance have been clearly defined. If slush or frazil is carried underneath an ice bridge and is deposited in the form of a hanging dam its presence is reflected in steep slopes which continue throughout the winter. If the ice bridge advance without slush or frazil being carried underneath the cover, the section will not show any slush in place and surface slopes in succeeding winters will be moderate and uniform.

22. The observed data are shown on table No. 1. This table-shows that frazil is likely to be carried under the ice cover and deposited of the average velocity exceeds 2.25 feet per second, but is not ordinarily carried under unless the velocity exceeds that figure. The section chosen at Lanoraie is one in which the conditions are as adverse as can be expected anywhere.

23. On account of the need for reliable information on this matter an effort has been made to obtain corroborative data in other parts of the river. This search has only been partly successful as no other section is available which is naturally suited to furnishing such information. In the International Section of the St. Lawrence river and on the Niagara river, records show ice packs advancing upstream under velocities which may vary from 2.4 to 3.2 feet per second depending upon the temperature of the air and the amount of frazil and slush ice carried in the water (table 2). These velocities may also depend to some extent on the crookedness of the river as records in general show higher velocities at the head of advancing packs in the International Section than in the St. Lawrence below Montreal. Records also show the average velocity of the water at the point where deposits of frazil and slush cease at the lower ends of hanging dams to be about 2 feet per second. It is probable that some ice is generally carried under sections when the ice pack is advancing, but obviously the point where it would cease to be carried under is near at hand else the pack would not advance. Again, the fact that water does not carry ice under a cover at a velocity less than 2 feet per second suggests that volicities of less than 2.25 feet per second would not cause it to submerge. Records of receding ice jam is during the breakup period (table 3) indicate that the average velocity of the water at the head of the jam in these cases varies from 2.2 to 2.5 feet per second.

24. The deduction made from this information is that an

average velocity of less than 2.25 feet per second must be provided to ensure an unobstructed section, especially in mild weather immediately following cold periods.

25. LIMITING VELOCITIES FOR ADVANCE OF ICE PACKS. In the improvement of the St. Lawrence it is important to define conditions under which a stretch of river will remain open and free ice covers of all kinds. River channels were cross-sectioned in winter and re-cross-sectioned in summer; flows were metered in winter and in summer, and every effort was made to ascertain the truth in each case which appeared to furnish typical information. A variation is found in the velocity and temperature required to produce a bridge in different sections of the river. This is shown by table 2.

26. An examination of data accumulated shows that with velocities between 2.7 and 3.3 feet per second ice covers, if formed, will go and come with changes of weather but, with velocities in excess of about 3.3 feet per second, surfaces will generally remain open under all winter conditions on the St. Lawrence.

27. RATES OF ICE PRODUCTION. In addition to determining the water velocity conditions under which ice covers and packs of various kinds are formed, the volume of ice in the form of frazil made by a given exposure to cold is important because it is not always possible to arrange for the whole of a river to be ice covered. Two methods for determining this volume are available.

28. The actual contents of hanging dams in lake St. Louis, lake St. Françis, and above Croil island have been measured by cross-sections under the ice at these points. The measurements made when related to the water surface exposed show the production of from 8 to 15 cubic feet of ice per square foot of exposure. These variations depend upon the place of measurement and the coldness of the winter in the year in question.

29. Another method of arriving at the volume of ice formed is by the establishment of the rate at which a water surface loses heat previous to its being cooled down to the freezing point in the fall of each year and the application of the rate found to later exposures. The temperature of both air and water was recorded at Kingston, Brockville, Drummond Island, Dickinson's Landing, Cornwall, Hamilton island and Coteau, for periods of about two months previous to the actual formation of ice in the years 1924 and 1925.

30. By relating heat losses to differences in temperature found between air and water, the rate of transfer of heat between

surfaces was established with a fair degree of accuracy. An examination of the statement attached (table 10) shows that this rate may be taken at about 95 British Thermal Units transferred per day per square foot per degree difference in temperature between air and water, and is independent of the character of the river sections in question. That is, the surface of rapids, the surface of lakes and the surface of smooth sections of river all give about the same cooling coefficient or rate of heat transfer.

31. As shown from an inspection of diagrams which have been prepared, the coefficient derived from these measurements is affected in some degree by snowfall, rainfall and wind. A correction for the effect of snowfall and rainfall has been made in the results given but the effect of wind cannot easily be taken into account. As its effect is small compared to the general difference in temperature between air and water it may be disregarded in the use of this data.

32. As one pound of ice is formed by water at 32° Mahr. giving up 144 British Thermal Units, the total amount of ice formed by a given length of the river in a given time can be approximately determined from temperature records. During the winter of 1924-25, for a period of 80 days the average temperature of the air in the vicinity of Montreal was 17.6° Fahr. below the freezing point, making an aggregate of 1,410 degree days. Taking the cooling coefficient of 95 British Thermal Units per degree day given in paragraph 30, it will be found that this exposure accounts for 16.3 cubic feet of ice per square foot of surface. Actually, 14.4 cubic feet of slush per square foot of surface exposed was found by measurement under the solid ice cover at the head of lake St. Louis at the end of that winter, as shown on table 4. Similarly, in the year 1923 the water surface area exposed in the vicinity of Ogdensburg was subjected to 1,246 degree days of freezing which should form theoretically 14.2 cubic feet per square foot of surface exposed. Cross-section measurements made at the head of lake St. Francis show a deposit of 13.0 cubic feet per square foot of surface exposed between lake St. Francis and Ogdensburg. Other measurements in other years indicate similar relations, as shown on table 4.

33. An approximation of the volume of ice formed by a given exposure can alſo be made from the rate at which ic packs make upstream from Lanoraie to Longue Pointe below Montreal in zero weather. If cold weather comes on gradually in winter lake St. Peter freezes over a few days before lake St. Louis or lake St. Francis and the area of water at the freezing point can be approximated from temperature measurements at a number of points in this section of the river.

34. In the year 1925-26 specially good means were provided for estimating the area forming ice because lake St. Francis in that year froze three days before lake St. Louis, and lake St. Louis was open while the pack advanced from Lanoraie to Longue Pointe. In that year the temperature of the water coming down the river reached the freezing point at Cedars about the time the ice pack reached Sorel coming up, but a high west wind kept lake St. Louis open while the pack advanced up stream to Vicker's dry-dock, just below Montreal. The actual travel of the pack upstream during the two days with 27 degrees of freezing was fifteen miles. With ice taken as fifteen inches thick 25,500,000 cubic yards would be formed or accumulated in one day in this section of the river. This gives about the same volume as is derived by the use of 95 as the cooling coefficient and 77 square miles as the area of surface exposed at that time.

35. An inspection of tables No. 5 and 6 indicates that the degree days of freezing to which water surfaces are exposed in the vicinity of Kingston, after they reach a freezing temperature, is only about 80 per cent, and at Ogdensburg 90 per cent of that to which similar areas are exposed at Montreal. This difference is due to the moderating influence of lake Ontario on the temperatures of both air and water in the upper river as well as to differences in latitude.

36. The general seasonal variations in temperature of the air and water all along the St. Lawrence from lake Ontario to Montreal are shown in a number of diagrams which are attached to this Appendix (plates 1 and 2). These show the manner in which the great volume of water held in lake Ontario lengthens the season of open water to a decreasing extent all the way down the river from Kingston to Montreal. On account of the proximity of lake Ontario water, temperatures opposite Kingston at the beginning of winter are still 9 degrees above the freezing point when the inflow from the Ottawa river at the head of lake St. Louis reaches the freezing point. The temperature of the water at Kingston is generally about 6 degrees above the freezing point when the water at the foot of lake St. Peter, 65 miles below Montreal, reaches the freezing point. Usually ice begins to form opposite Kingston at the head of the St. Lawrence about sixteen days after the ice begins to form on lake St. Peter below Montreal and almost a month after ice begins ot form on lake of Two Mountains at the outlet of the Ottawa river.

37. Early in the spring of the year, warmer water from the depths of lake Ontario makes itself felt and ice generally disappears in the stretch of river above Ogdensburg about two weeks before a through channel is available at the head of lake St. Louis and lake St. Peter. However, as soon as lake St. Louis and lake St. Peter are clear of ice the temperature of the water at these points rises rapidly

and is soon found to be higher than that flowing out of lake Ontario. Throughout the early summer months the temperature of the water downstream from lake Ontario is tolerably uniform at all points.

38. As a consequence of the above conditions the winter or ice-covered period in the St. Lawrence at the head of the International section is about one month shorter than that of the river in the vicinity of Montreal.

39. In addition to considering the amount of frazil created by a given exposure, consideration should be given to the fact that water which flows for any great length of time underneath an ice cover, even in winter, accumulates a certain amount of heat from some source. Temperature measurements of the water at the foot of lake St. Francis and at the foot of Bergan lake show that the water flowing out of these ice-covered sections is about 0.03 of a degree warmer than freezing throughout the whole winter period from the time the ice is formed until soft slush makes its appearance on the surface of the ice in March. Measurements also show the temperature of the water under the ice is about 0.16 of a degree warmer than freezing opposite Clayton and 0.08 of a degree warmer than freezing at Prescott during at Prescott during the coldest part of the winter. This heat has an important bearing on the design of works, especially at Galop rapids. If the flow of the river in winter be taken at 200,000 cfs. and the average temperature of the weather as 20 degrees below freezing, it will require an exposure of 45,000,000 square feet to cool the water to the freezing point. This means that three miles of open water may exist at this point and yet no frazil on the average accumulate, as cold weather is always succeeded by warmer spells and the average temperature for winter months seldom falls below +12° Fahrenheit.

40. SLOPES THROUGH ICE COVERED SECTIONS. Gauge relations show that even the smoothest forms of ice covers impose resistance to the flow of water in the sections which they cover. This is easily seen by comparison of summer and winter slopes between Summerstown and Coteau, on lake St. Francis, Ottawa and Grenville, on the Ottawa river, Peterborough and Hastings, on the Trent, and the slopes in certain canals where the discharge is known.

41. The data gathered with regard to the resistance of this form of ice cover indicate that it is comparable to the resistance of concrete surfaces. In canals where a value of "M" in Bazin formula, of 4.0 satisfied summer conditions a value of 2.3 will satisfy winter conditions, the ice cover being taken as part of the wetted perimeter. A value of "M"=1.0 averaged with the value established for open

water conditions will give its value close enough for practical purposes.

42. The resistance to flow caused by an ice cover formed by the accumulation of slush and frazil at the head of an advancing ice bridge is of great importance in the design of the St. Lawrence Project, and elaborate arrangements were made to establish values for this form of resistance.

43. Special gauges were established at Varennes, Repentigny and Lavaltrie on the St. Lawrence river below Montreal. These were read winter and summer for two years and slopes were related to discharges derived from gauges farther up river. Through this section of the river no deposits of frazil are found and average summer velocities vary from 2 to 2.6 feet per second while winter velocities vary from 1.3 to 1.6 feet per second, depending upon the state and discharge of the river. From these relations and actual cross-sections of the river made winter and summer, values of "M" in the Bazin formula were obtained. These are shown on table No. 7.

44. Gauge readings between Lanoraie and Sorel and discharge relations were also used to determine values for these years in which it was apparent no frazil or slush was carried into the section (table 8). The values obtained in this way check closely with those obtained in the section first described. In this reach velocities vary from 2 to 3.4 feet per second in summer, to 1.6 to 2 feet per second in winter.

45. The data above described indicate that winter slopes on the St. Lawrence river may safely be figured with a value of "M" in the Bazin formula taken as the average between that applicable to summer conditions and 5.5 for January and 4.5 for February and March. All the values of "M" derived from gauge readings show a gradual smoothing of the ice cover as the season advances from the time it is first formed until it begins to melt out in the month of March.

46. The foregoing results apply to ice covers when formed as a packed surface without hanging deposits. The slopes occurring when all kinds of ice are carried underneath the section and lodged in the form of hanging dams, jams or gorges require consideration.

47. A number of ice jams or gorges occur on the St. Lawrence each winter. One of these is at the head of lake St. Francis; one is at the head of lake St. Louis; and one is opposite the city of Montreal between the foot of Lachine rapids and Longue Pointe.

In addition to these, occasional jams accur between Morrisburg and Croil island and in the Niagara river.

48. The gorge at the head of lake St. Francis has been watched with care for a number of years and slopes obtained in this section are interesting but, as the river is divided at this point by Cornwall island, deductions from records must be made with care.

49. The gorges which occurred in the river between Morrisburg and the foot of Croil island were especially instructive. Those which occurred at this point in 1887 and in 1905 also furnish information of value, though the records of these jams are not complete. When the jam of 1923 occurred the Department of Railways and Canals placed a large staff of men at recording the phenomena, and records of great value were obtained.

50. In 1925 an extensive gorge occurred in the lower Niagara river. This jam was especially instructive in view of the sraight uniform character of the river. The water level at the head of this jam and the volume of the ice in the section were carefully determined by surveys carried out by the Department of Railways and Canals.

51. The surface slopes opposite Montreal have been recorded for a number of years. Many cross-sections of jams near Montreal were made by the Montreal Flood Commission in 1887. The gorge at the head of lake St. Louis was cross-sectioned by the staff of the Canadian section of this Board in 1925.

52. From the surface irregularity of ice jams it might appear that no prediction could be made as to the form which such jams take or as to the slope of the water surface flowing through them. Many cross-sections, however, disclose the fact that these hanging dams tend to assume a definite shape with ribbons of clear water of uniform sectional area flowing underneath the jam.

53. Just after an ice movement or a consolidation of a jam the underlying ribbon of water is often irregular but it soon changes to the typical and regular form. The average velocity of the water in the resultant section is generally about three feet per second but does reach four feet per second in some cases and also falls to two feet per second at the foot of gorge in mild weather.

Typical sections of jams are shown on plates 12 and 13.

54. Observations of gorges during formation show that frequently there is a serie of pushes in the upper part of the gorge in which the cover at the head is telescoped and on-coming ice from

the upper part plunges under the lower part in a continuous stream which sometimes keeps moving for a full day at a time. These partly compressed coverings of ice in pushing down the river bend around curves and change their shape with difficulty. Ice coverings appear to make upstream against higher velocities in crooked channels than they do in straight reaches.

55. The observed slopes o fthe St. Lawrence through ice jams are shown on table 9. These are plotted on plate No. 7. This plate shows that surface slope in feet per mile is always greater after heavy snowfalls than even during periods of intensely cold weather.

56. Records as plotted on plates 3 to 6 show that the advent of moderate weather succeeding cold period or periods of snowfall always produces some lowering of water level at the head of the jam. These often show a rise in the lower portions of the jam indicating a movement of ice from the upper to the lower parts. Continuous moderate weather also produces openings at specially narrow points in the river. These openings ,when they break out, generally show velocities in excess of 7 feet per sceond and in some cases volicities as high as 9 feet per second. This shows that, for a time at least, the ice deposited in a jam or gorge will resist velocities as great as 7 feet per second.

57. Plate No. 7 shows that in general the slope of an ice jam can be taken at about 1.6 feet per mile if there is no snow and very little curvature in the river, while a slope of about 2.7 feet per mile under the same conditions will maintain with recent snowfall. This diagram also shows that if the river is so crooked that it turns 120 degrees per mile, a slope of about 3 feet per mile will be set up in ordinary winter weather by an ice jam and 4.6 feet per mile in such a reach after a snow fall. What slope would be set up if by some chance the water level at the foot of a jam should be lowered is not known and there seems to be no way of determining it.

58. The fact that open slits break out at narrow points in the river with velocities of 7 to 9 feet per second indicates that such velocities are close to the maximum to be expected under ice jams under any conditions. Further indications of the truth of this statement are given in the fact that certain power canals which operate without ice covers find velocities of about 7 feet per second much more satisfactory than velocities of 4 feet per second, because velocities of 7 feet per second prevent adherence of anchor ice to the floor of the canal.

59. In addition to the diagrams shown on plates 3 to 6 many others have been prepared which show changes in water level from

day to day at various points in the jams as these form below the Lachine rapids, at Montreal, and at the foot of the Long Sault rapids and at the head of lake St. Francis. Strangely, the highest winter levels opposite Montreal are associated with warm, not cold, winters. This is due to the fact that in warm winters a channel remains open through La Prairie Basin until a late date and large amounts of ice periodically move down from there into the section below Montreal, filling that section of the river with frazil and chuck ice before the advent of spring brings down the final consignment from La Prairie Basin in the breakup period.

60. In summary, the conclusions arrived at by the Board as a result of this study may be stated as follows:—

1. Sheets of ice in the latitude of the St. Lawrence River may, under certain conditions, exert a pressure of about 22,000 pounds per linear foot of dam.

2. Smooth ice covers may be expected to form in rivers with velocities up to 1.25 feet per second in zero weather provided there is no high wind preventing such action.

3. Ice covers may be expected to pack upstream up to a velocity of 2.25 feet per second without danger of ice going under the cover.

3. Water surface slopes through ice jams on the St. Lawrence river can be taken as 1.6 feet per mile if there is no snow and 2.7 feet with recent snowfall if the stretch is comparatively straight.

5. The amount of frazil to be expected from a given area of water exposed to cooling action of air can be calculated from the following formula: Volume of ice formed per day=95 x Aver. Diff. in temperature between air and water x sq. ft. of water exposed divided by 144 x 57.4.

6. For obtaining winter slopes under ice covers formed by packing upstream, the value of "M" in the Bazin formula may be taken as 5.5 for January and 4.5 for February and March, averaged with ordinary values applicable to the stretch in question in summer, the wetted perimeter being taken as including the ice cover.

Prepared by D. W. McLACHLAN.

Adopted by Board, July 5, 1927.

EXTRACT COPY OF p.p. 8, 9 and 24 FIELD BOOK OF

F. F. GRIFFIN, J. W. DUNFIELD, J. R. DESLOOVER and H. L. MAHAFFY

DATED SEPTEMBER 21st, 1928

SEE PAGE 8, 9, 24 CLOUDY — September 21st, 1928

Sta. C	Sight B	D. S. T. Time	Reading No.	ANGLE	Depth	Sta. B	Sight C	ANGLE	Water Level
		9h48'30"	1	67°45'	15.9			63°28'	Mr. Griffin
		9h51'	2	81°52'36"	14.9			54°02'	Mr. Dunfield
		9h52'40"	3	93°26'	12.8			47°32'	Mr. Desloover
		0h54,	4	104°20,	13.5			41°56'	Mr. Mahaffy
		9h55'	5	112°57'	14.0			38°06'	
		9h56'30"	6	119°45'	11.1			36°08'	W. L. 318.4 9h46' D.S.T.
		9h59'20"	7	133°50'	11.7			29°40'	
		10h01'10"	8	139°26'	13.4			27°33'	
		10h03'30"	9	146°11'	13.3			23°57'	
		10h05'30"	10	145°07'	14.2	Coming Down		23°51'	
		10h06'40"	11	142°55'	12.1			24°51'	
		10h08'10"	12	138°20'	11.9			26°21'	
		10h10' 0"	13	130°15'	11.4			29°12'	
		10h11'30"	14	123°10'	12.0			31°30'	
		10h13'	15	113°19'	12.8			33°22'	
		10h14'30"	16	101°40'	13.5			35°30'	
		10h15'40"	17	84°15'	15.2			41°56'	
		10h17'	18	68°38'	16.0			51°45'	

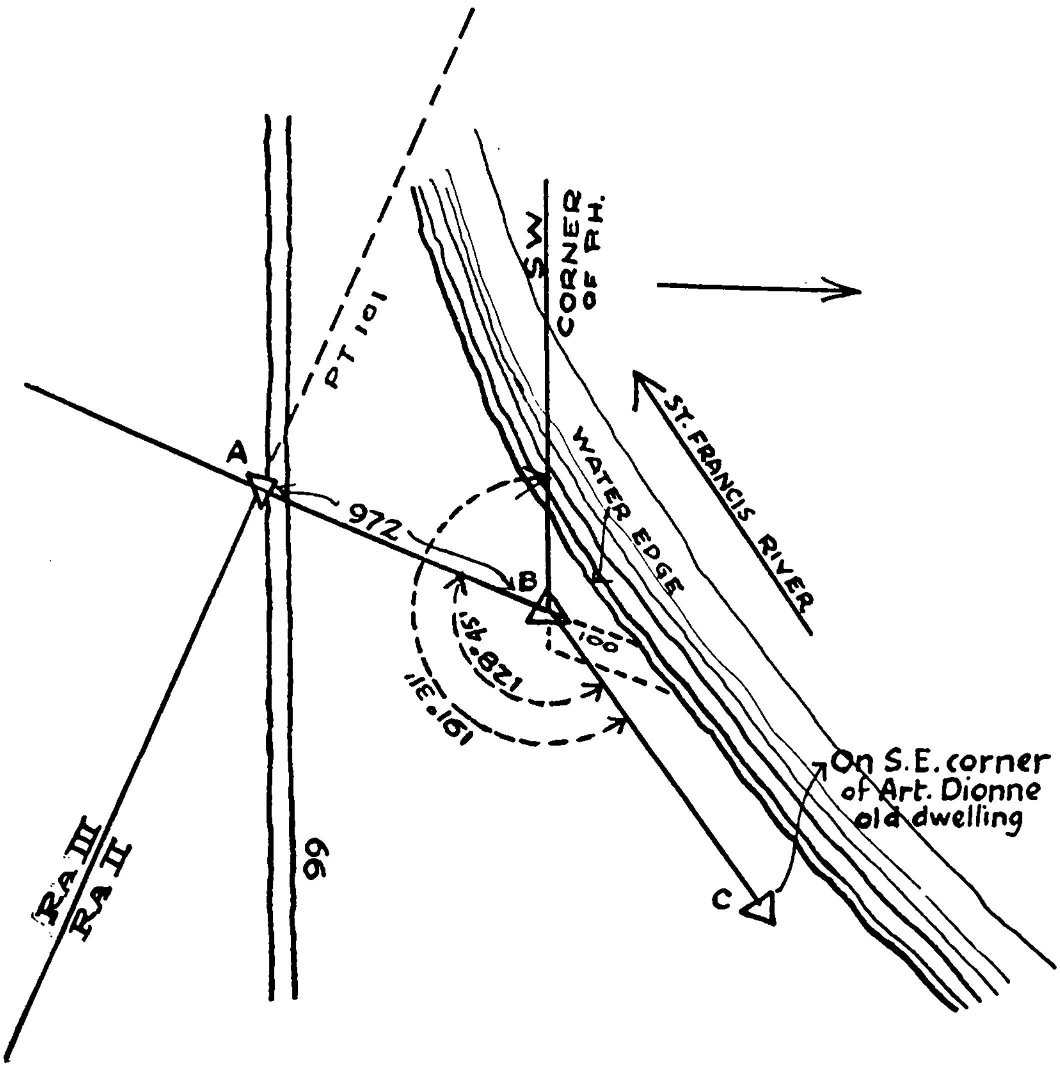
EXTRACT COPY p.p. 8, 9 *and* 24 *FIELD BOOK OF...*

Sta. C	Sight B	D. S. T. Time	Reading No.	ANGLE	Depth	Sta. B	Sight C	ANGLE	Water Level
		10h18'	19	55°12'	17.7			64°15'	
		10h19'20"	20	44°24'	18.4			81°25'	
		10h20'30"	21	39°30'	19.0			95°51'	
		10h22'	22	33°48'	19.7	Going	Upstream	101°35'	
		10h23'15"	23	32°42'	19.5			93°24'	
		10h24'15"	24	37°50'	17.8			76°05'	
		10h25'30"	25	45°40'	17.0			50°10'	Mr. Griffin
		10h26'40"	26	62°43'	16.4			38°23'	Mr. Dunfield
		10h27'50"	27	86°00'	15.0			29°25'	Mr. Desloover
		10h29'00"	28	113°46'	15.0			23°28'	Mr. Mahaffy
		10h30'00"	29	131°56'	13.6			19°40'	
		10h31'	30	144°09'	13.4			17°31'	
		10h32'20"	31	151°50'	12.8			15°32'	
		10h33'30"	32	154°43'	14.2			15°12'	
		10h34'45"	33	156°31'	14.7			15°00'	
		10h36'00"	34	158°10'	14.7			14°42'	
		10h37'15"	35	159°26'	15.3			14°26'	
		10h38'20"	36	160°25'	14.6			14°11'	(on continuation of
									(lot line between
		10h39'40"	37	162°15'	15.0				(lot 97 and 98 R. 11
									(Twshp. Wickham
		10h42'00"	38	163°35'	15.3			13°41'	

EXTRACT COPY p.p. 8, 9 and 24 FIELD BOOK OF...

Sta. C	Sight B	D. S. T. Time	Reading No.	ANGLE	Depth	Sta. B	Sight C	ANGLE	Water Level
		10h43'15"	39	163°54'	14.9			12°38'	(abt. 300' downstream (from Labonte Gauge
		10h45'30"	40	160°47'	16.0	Going Upstream		14°30'	
		10h48'10"	41	155°30'	18.2			17°20'	
		10h50'30"	42	148°13'	15.3			20°20'	
		10h53'00"	43	140°56'	11.8			23°30'	
		10h55'00"	44	133°00'	12.0			26°40'	
		10h56'30"	45	126°20'	11.0			29°28'	
		10h57'30"	46	119°09'	13.4			31°39'	
		10h59'40"	47	104°13'	14.0			34°29'	W. L. 318.3
		11h01'	48	88°41'	16.0			38°18'	
		11h02'30"	49	61°43'	16.0			53°34'	
		11h05'	50	39°34'	17.0			90°06'	
		11h01'	48	88°41'	16.0			90°06'	
		10h02'30"	49	61°43'	16.0			53°34'	
		11h05'	50	39°34'	17.0			38°18'	

SEE PAGES 8 and 9


PT 101
SW CORNER OF P.H.
ST. FRANCIS RIVER
WATER EDGE
A
972
B
100
128° 45'
191° 31'
C
On S.E. corner of Art. Dionne old dwelling
99
RA III
RA II

WATER LEVEL READINGS

HEMMINGS FALLS and DRUMMONDVILLE

DATE — 1927	TIME	Water Level Hemmings Falls Headrace	Water Level Drummondville Headrace
November 4th	1 AM	319.6	266.0
	2	319.7	266.3
	3	319.9	266.6
	4	319.9	266.6
	5	319.6	266.5
	6	319.2	266.7
	7	318.4	266.8
	8	318.0	266.6
	9	317.7	266.7
	10	317.6	266.6
	11	317.6	266.4
	12 Noon	317.9	266.5
	1 PM	318.2	266.5
	2	318.4	266.5
	3	318.6	266.5
	4	318.8	266.6
	5	319.0	266.6
	6	319.1	266.6
	7	319.3	266.7
	8	319.5	266.7
	9	319.5	266.7
	10	319.7	266.7
	11	319.8	266.7
	12 Midnight	319.8	266.7
November 5th	1 AM	319.8	266.8
	2	319.7	266.8
	3	319.7	266.8

WATER LEVEL READINGS (Continued)

DATE — 1927	TIME	Water Level Hemmings Falls Headrace	Water Level Drummondville Headrace
	4	319.7	266.8
	5	319.6	266.8
	6	319.6	266.8
	7	319.4	266.7
	8	319.3	266.6
	9	319.2	266.6
	10	319.0	266.6
	11	318.9	266.6
	12 Noon	318.9	266.6
	1 PM	318.8	266.8
	2	318.7	266.8
	3	318.6	266.7
	4	318.5	266.7
	5	318.3	266.7
	6	318.2	266.7
	7	318.0	266.7
	8	317.8	266.7
	9	317.7	266.6
	10	317.5	266.6
	11	317.3	266.6
	12 Midnight	317.1	266.6
November 6th	1 AM	316.9	266.5
	2	316.7	266.5
	3	316.5	266.4
	4	316.3	266.4
	5	316.1	266.3
	6	315.9	266.2

READINGS COPIED FROM POWER HOUSE DAILY LOG SHEETS AND CERTIFIED CORRECT.

December 12th 1932.

WATER LEVEL READINGS

HEMMINGS FALLS and DRUMMONDVILLE

DATE — 1928	TIME	Water Level Hemmings Falls Tailrace	Water Level Drummondville Headrace
April 7th	1 AM	270.0	265.5
	2	269.8	265.5
	3	269.7	265.6
	4	269.9	265.6
	5	270.0	265.7
	6	270.6	265.8
	7	270.7	265.7
	8	270.6	265.5
	9	270.6	265.7
	10	270.5	265.7
	11	270.5	266.0
	12 Noon	270.7	266.0
	1 PM	271.4	266.1
	2	272.5	266.4
	3	271.5	266.4
	4	271.5	266.0
	5	272.0	266.3
	6	269.5	265.6
	7	274.3	266.3
	8	271.0	266.9
	9	271.0	266.2
	10	272.6	266.4
	11	272.8	266.5
	12 Midnight	272.8	266.4
April 8th	1 AM	272.2	266.4
	2	271.9	266.4
	3	271.9	266.4

WATER LEVEL READINGS (*Continued*)

DATE — 1928	TIME	Water Level Hemmings Falls Tailrace	Water Level Drummondville Headrace
	4	271.4	266.3
	5	271.4	266.3
	6	271.4	266.4
	7	272.0	266.4
	8	272.1	266.3
	9	272.1	266.5
	10	272.5	266.6
	11	272.5	266.6
	12 Noon	272.8	266.4
	1 PM	273.0	266.5
	2	273.1	266.5
	3	No Record	266.8
	4	do	No Record
	5	do	267.6
	6	do	266.8
	7	do	266.6
	8	do	266.5
	9	do	266.3
	10	do	266.3
	11	do	266.2
	12 Midnight	do	266.2

READINGS COPIED FROM POWER HOUSE DAILY LOG SHEETS AND CERTIFIED CORRECT.

December 12th, 1932.

WATER LEVEL READINGS (*Continued*)

Water Level Drummondville Tailrace	**TIME**	**DATE**
236.6	1 Am	April 7th, 1928
236.6	2	
236.8	3	
236.8	4	
236.8	5	
237.0	6	
237.4	7	
237.5	8	
137.5	9	
237.5	10	
237.2	11	
237.2	12 Noon	
237.1	1 PM	
237.2	2	
238.3	3	
238.0	4	
238.0	5	
237.6	6	
237.8	7	
237.7	8	
237.7	9	
237.7	10	
237.7	11	
237.6	12 Midnight	
237.6	1 AM	April 8th, 1928.
237.8	2	
238.0	3	
238.0	4	

WATER LEVEL READINGS (*Continued*)

Water Level Drummondville Tailrace	TIME	DATE
238.0	5	
238.0	6	
238.0	7	
238.0	8	
do	5	
do	6	
do	7	
do	8	
do	9	
do	10	
do	11	
do	12 Midnight	
238.2	9	
238.3	10	
238.3	11	
238.2	12 Noon	
238.1	1 PM	
238.1	2	
239.0	3	
No Record	4	

READINGS COPIED FROM POWER HOUSE DAILY LOG SHEETS AND CERTIFIED CORRECT

December 12th, 1932.

EXHIBIT No 72 DU DEMANDEUR

Drummondville, Que. May 13th, 1918.

Mr. C. B. Brown,
Chief Engineer, C. G.
Moncton, N. B.

Dear Sir:

The Southern Canada Power Co. Limited are beginning the construction of an Hydro-Electric Development at Drummondville. In order to carry out this work we find that it is necessary to widen and deepen the present canal which passes under your lines, between the railway station in Drummondville and your railway bridge over the St. Francis River.

We are sending you herewith six plans, two each, 1st of the proposed construction under railway, 2nd, Typical cross-sections of the walls, and 3rd, general plan showing relation of this portion of same to the whole.

It is proposed to make the crest of this dam at 264 level. With two feet of water passing over crest of this dam and the sluice way section open, the largest flood which has occurred on this river, will be taken care of. With referrence to our Datum, on which our plans are based, the levels are one foot higher that used by Canadian Government Railways.

I wish to call your attention to our method of protecting your railway structures at either end, especially from the crest at the western end of the dam.

As there are a great many points for discussion in connection with this matter and as there could be handled much more effectively by a personal interview, especially if same took place at Drummondville, where the details might be gone into on the spot, if you can make it convenient, the writer will gladly meet you here and go thoroughly into the matter with you. Should you be able to do this, will you kindly wire time of your arrival.

Yours very truly,

F. W. TEELE,

Vice-President.

EXHIBIT "A" DE LA DEFENDERESSE

CANADA PAPER COMPANY

April 3rd, 1929.

April 1928

Date	Actual Head	Head & Tailwater	
1	13	8 + 5	
2	13	7 + 6	
3	13	7 + 6	
4	13	7 + 6	
5	11	10 + 1	Mill Down 3 hrs for ice
6	8	9 + 1	Mill Down 12 hrs for ice
7	7½	9 — 1½	Mill Down 8 hrs for ice
8			Boards off Dam.
9	8½	10 — 1½	
10	9	9½— ½	
11	10	8½+ 1½	
12	11	7 + 4	
13	12	6½+ 5½	
14	12	6 + 6	

EXHIBIT "F" DE LA DEFENDERESSE

Jan. 3rd., 1927 — Rutherford up-river. Ice a little thicker. No sign of frazil. Ice about 10" to 12" thick.

Jan. 11th., 1927 — Rutherford up-river. Frazil forming above island. Mostly packed snow. Ice 14" to 18" thick.

Jan. 21st., 1927 — Rutherford up-river. Frazil thicker near island. Ice thickness 18" to 21".

Jan. 28th., 1927 — Rutherford up-river. Ice same as last visit. Ice 20" to 25" thick.

Feb. 11th., 1927 — Rutherford up-river. Ice same as before — 25" to 26" thick.

Feb. 19th., 1927 — Rutherford up-river. Frazil clearing out slowly. Ice 25" to 26" thick.

Mar. 4th., 1927 — Rutherford up-river. Frazil going fast around island. Ice thickness 18" to 21". No sign of break-up.

Mar. 7th., 1927 — Kitson up-river with Rutherford. Found no open water, but water on ice in a few small places near island.

Mar. 8th., 1927 — Same as March 7th.

Mar. 9th., 1921 — Found no open water, but a little more on top of ice near island.

Mar. 10th., 1927 — Rutherford up-river. Looks like an open patch of water part way across island just below point of island.

Mar. 11th., 1927 — Same as March 10th.

Mar. 12th., 1927 — One or two patches of open water just below island.

Mar. 13th., 1927 — About same as 12th.

Mar. 14th., 1927 — Patches of open water considerably larger. Ice in forebay getting watery appearance. Seems to be rotting.

Mar. 15th., 1927 — More open water. No sign of jam. Ice breaking up a little near island.

Mar. 16th., 1927 — Rumoured this afternoon that ice had jammed at Brown's Island. Rutherford was up this morning, but saw no jam.

Mar. 17th., 1927 — Kitson up-river. Ice jammed at upper end of Brown's Island, and extended for three-quarters mile down-stream.

Mar. 18th., 1927 — Kitson up-river. Jam moved down about 50 feet.

Mar. 19th., 1927 — Kitson up-river on opposite side of dam. Ice had moved down in line with Labonte's house.

Mar. 20th., 1927 — Jam moved down about 75 feet. From this date on, jam stationary, and rotting fast.

Dec. 14th., 1927 — Winter of 1927-1928. Rutherford up the river by road. Ice level all the way up to Brown's Island.

Jan. 11th., 1928 — Rutherford reports it is rumoured that there is a jam near Brown's Island, Ice said to be 8 feet thick.

Jan. 12th., 1928 — Rutherford went up to Brown's Island to look at rumoured ice jam, and found nothing but a little ice broken up. Nothing serious. Ice thickness 12" to 14". Open water below the island. Bored ice every 100 ft., from Power House to island, and found no frazil at all, except a very slight amount around the island shore; would say to a depth of one foot.

Feb. 21st., 1928 — Rutherford tested for frazil. None found between Power House and Brown's Island. Ice 18" to 20" thick. Frazil close to island a little deeper.

Mar. 23rd., 1928 — Rutherford up-river to examine ice conditions. Nothing unusual: about the same as previous visit. Rutherford did not examine all around island as on former occasion, as it was a very wet day. Ice thickness 20" to 24".

Mar. 27th., 1928 — Ice rotting out.

Mar. 28th., 1928 — No sign of ice breaking up.

Apl. 1st., 1928 — Same as previous report.

Apl. 3rd., 1928 — No change.

Apl. 4th., 1928 — Ice conditions upstream same. Ice rotting out in forebay.

Apl. 5th., 1928 — Ice breaking up a little near island.

M. RUTHERFORD.

EXHIBIT "J" DE LA DEFENDERESSE

Drummondville, le 26 sept., 1932.

SEANCE DU 16 MARS 1921

Le greffier donne lecture du rapport de M. Loorquie, ingénieur envoyé par le département des travaux publics de Québec, pour faire rapport sur les dommages causés aux ponts par la débâcle du 10 courant.

Le greffier fait aussi lecture d'une lettre en date du 16 courant, signée par le maire, et demandant à la compagnie Dominion Bridge de faire les réparations urgentes au pont pour en conserver la superstructure.

Extrait certifié véritable du procès-verbal des délibérations du conseil de la ville de Drummondville, pour la séance tenue le 16 mars 1921.

JOSEPH MARIER,

Sec.-Trés.

EXHIBIT "L" DE LA DEFENDERESSE

Québec, 18 novembre 1932.

Arbre échantillon No.	Diamêtre H-Poitrine	Age absolu approxim.	Age des blessures	Hauteur maxim. de la blessure
1—Pin blanc	12 pouces	65 ans	(a) 5 ans	44 pouces
			(b) 12 "	40 "
			(c) 33 "	36 "
2—Orme	30 "		(a) 5 "	144 "
			(b) 12 "	108 "
3—Noyer	19 "	76	(a) 17 "	55 "
4—Orme	18 "		(a) 5 "	90 "
			(b) 12 "	54 "
5—Orme	10 "		(a) 5 "	90 "
			(b) 12 "	60 "
6—Pin blanc	32 "	125	(a) 5 "	156 "
			(b) 12 "	84 "
			(c) 71 "	72 "
7—Pin rouge	32 "	125	(a) 46 "	60 "
8—Orme	28 "		(a) 5 "	78 "
			(b) 12 "	78 "

Notes explicatives.

L'âge des blessures veut dire le nombre de saisons d'été écoulées depuis la date de la blessure jusqu'à la date de l'inspection.

La hauteur maximum de la blessure indique la distance entre le sol, au pied de l'arbre, et la hauteur maximum de la blessure sur le dit arbre.

ERNEST MENARD.

SUPPLEMENTARY REPORT TO ACCOMPANY REPORT OF MR. ERNEST MENARD

Arbre Echantillon No.	Diametre H-Poitrine	Age absolu approxim.	Age des blessures	YEAR	Hauteur des blessures au dessous du sol	elevation des blessures	élévation maxim. des blessures
1.—Pin blanc	12 pouces	65 ans	(a) 5 ans	1928	3 pieds 8 pouces	268.66	268.66
			(b) 12 "	1921	3 " 4 "	268.33	
			(c) 33 "	1900	3 " 0 "	268.00	
2.—Orme	30 "		(a) 5 "	1928	12 " 0 "	272.8	272.8
			(b) 12 "	1921	9 " 0 "	269.8	
3.—Noyer	19 "	76 "	(a) 17 "	1916	4 " 7 "	268.60	268.6
4.—Orme	18 "		(a) 5 "	1928	7 " 6 "	268.5	268.5
			(b) 12 "	1921	4 " 6 "	265.5	
5.—Orme	10 "		(a) 5 "	1928	7 " 6 "	268.0	268.0
			(b) 12 "	1921	5 " 0 "	265.5	
6.—Pin blanc	32 "	125 "	(a) 5 "	1928	13 " 0 "	257.0	257.1
			(b) 12 "	1921	7 " 0 "	251.0	
			(c) 71 "	1862	6 " 0 "	250.0	
7.—Pin rouge	15 "	125 "	(a) 46 "	1887	5 " 0 "	265.0	265.0
8.—Orme	28 "		(a) 5 "	1928	6 " 6 "	254.0	254.0
			(b) 12 "	1921	6 " 6 "	254.0	

SOUTHERN CANADA POWER CO. LTD.,

Appelante,

—vs—

SA MAJESTE LE ROI,

Intimé.

DECLARATION DES PARTIES

L'appelante admet, comme prouvé, le montant des dommages fixés par le jugement dont elle demande la cassation et ses raisons d'appel sont:—

a—Qu'elle n'est pas responsable; ou

b—Subsidiairement, qu'elle n'est qu'en partie responsable de tels dommages;

Vu la déclaration ci-dessus, l'intimé consent à ce que les exhibits ci-dessous mentionnés, établissant le montant des dommages soufferts par l'intimé, soient omis du dossier imprimé, savoir:—

Les exhibits Nos 5, 43, 44, 45, 46, 47, 48, 49, 50, 57, 58, 59, 60, 61, 62, 63.

L'intimé consent encore à supprimer du dossir imprimé les dépositions des témoins suivants, qui ont simplement établi le montant des dommages soufferts par l'intimé, savoir:

Frederick Lloyd, déposition du 29 novembre;
R. W. Blackbird, déposition du 2 décembre;
Georges Goodlat, déposition du 2 décembre;
John N. Brocklehurst, déposition du 2 décembre;
Georges Goodlat (rappelé) déposition du 2 décembre;

A. G. Dawe, déposition du 2 décembre;
William Darbon, déposition du 2 décembre;
Pierre A. Pelletier, déposition du 5 décembre;
Ferdinand Raoul Tremblay, déposition du 5 décembre;
Fred Lloyd (rappelé) déposition du 5 décembre;
Robert Tweedy (rappelé) déposition du 5 décembre;
James John Sunderland, déposition du 5 décembre.
R. W. Blackbird (rappelé déposition du 5 décembre.

FAIT EN DOUBLE, A OTTAWA, LE 30 JUIN 1934

JOSEPH MARIER,

ALPHONSE DECARY,

Avocats de l'appelante,

L. E. BEAULIEU,

Avocat de l'Intimé.

DANS LA COUR SUPRÊME DU CANADA

En Appel d'un jugement de la Cour d'Echiquier du Canada

Southern Canada Power Co, Ltd,

Défenderesse-appelante,

Le Roi

Demandeur-intimé.

QUATRIÈME PARTIE

JUGEMENT

Judgment rendered 29th December, 1933.

The action is for the recovery of the sum of $81,523.20, damages allegedly suffered in the circumstances hereinafter related.

On April 8, 1928, at about 4.13 p.m., train No. 45 of the Canadian National Railways bound for Montreal from Quebec was derailed in consequence of the wash-out of the embankment between the viaduct over the highway and the bridge crossing the St. Francis river, on the east side of the river, just before reaching Drummondville; as a result the locomotive and the baggage car were thrown into the gap between the two structures and the second class coach fell on the baggage car, its rear truck remaining on the rails. Loss of life and injuries to several persons resulted.

In addition to the facts above recited, plaintiff in his amended information alleges: that the defendant erected further up the St. Francis river and across the whole width thereof a dam at a place called Hemmings Falls, at a distance of about two miles and a half from Drummondville, thereby retaining over a wide area a large quantity of water; that in the fall and winter of 1927 an ice jam of large dimensions formed at the upper end of the bassin, five to six and a half miles long, created by the said dam, which artificial basin is covered during winter with solid and thick ice; that in the spring the ice came down the river and piled up behind this ice jam which had been reinforced during the winter by frazil and broken ice coming down the river; that the defendant dynamited the ice and opened the sluice gates of the dam; that the resulting explosion started the ice moving and the ice and water thereby released came down the river in tremendous volume and washed out the embankment; that the accident is due to the fact, fault and negligence of the defendant; that the said accident and the damages arising therefrom were caused by the erection of the dam, which obstructed the natural course of the spring flow and the ice run-off, and caused ice jams, first at the upper end of the basin, then at the dam; that these jams held back a vast quantity of water and ice, and, at a certain moment, due to the pressure of the ice and water coming down the river, the said jams gave way sweeping everything before them and occasioning the loss of lives and the damages hereinafter mentioned; that the damages which plaintiff has suffered are the following:

A.—Cost of repairs to locomotive No. 5253	$10,898.82
B.—Cost of repairs to car No. 8705	7,577.38
C.—Cost of repairs to car No. 6601	8,760.00
D.—Cost of repairs to tracks	5,254.57
E.—Cost of repairs to structure	13,004.47

F.—Payment for medical services, claims and grants in connection with said derailment:—

Medical and hospital fees	$ 335.00	
Funeral and ambulance expenses	621.00	
Indemnities to passengers	2,083.00	
Indemnities to employees	75.89	
Indemnities to legal heir of employees	13,215.50	
Wages paid to disabled Conductor Blanchard	2,661.96	
Grants for flagging train	600.00	
		19,592.35
G.—Cost of auxiliary and wrecking train service		3,276.62
H.—Cost of diversion of train serrvice		8,744.78
I.—Cost of special train service		4,414.21
Making a total of		$81,523.20

In its amended statement of defence the defendant admits that the Canadian National Railways' train was derailed, on the 8th of April, 1928, at the place mentioned in the information; it admits further that there was on that day a large quantity of water and ice, but says that a fact of this nature, due to climatic and natural conditions, should have been foreseen and the railroad bridge built in such a manner as to resist this overflow; it admits moreover the erection of the dam at Hemmings Falls, and contends that this dam did not prevent nor delay the natural flow of the water, except at low stages of the river when the water can be accumulated without inconvenience; it alleges that, if any jam was formed above the dam, the same was not caused by the dam.

The amended defence further avers: that the ice above the dam was not dynamited; that the sluice gates were opened for a long period before the 8th of April, so as to provide an outlet more than sufficient for the natural overflow of the river and so as to render the flow of the river to its natural stages, but that the defendant incurred no liability in so doing; that the ice jams which may have formed above the dam, if any, were not caused by the dam but were due solely to natural causes; that the erection of the Hemmings Falls dam has reduced the possibility of damages by flood, in so far at least as the lower part of the river is concerned; that the locomotive and cars damaged were not plaintiff's property, but were owned or controlled by Canadian National Railway Co. and that the damages, if any, were suffered by said company; that the action should not have been instituted by the plaintiff, but by the company and that it should have been taken in the manner and before the Court mentioned in the statute creating said company; that the damages claimed in sub-paragraphs A, B, C, D and E of paragraph 8 of the information do not represent only the cost of repairs, but the cost of a complete rebuilding; that the damages claimed in subparagraph F cannot be claimed as a consequence of the accident; that moreover the amounts mentioned in said subparagraph F appear to have been paid in virtue of agreements entered into by plaintiff without the defendant being called to intervene and the latter cannot be held liable for the reimbursement of sums voluntarily paid out without a judicial decision or legal obligation and without defendant's assent; that the damages claimed in sub-paragraphs H and I are not a direct and immediate consequence of the accident and cannot be recovered from the defendant; that the damages claimed are at any rate excessive; that the accident and the damages resulting therefrom have been caused by acts of nature and by the omission on the part of plaintiff to provide his bridge and tracks with devices strong enough to resist the natural flooding of the river; that for many days previous to April 8, 1928, the river was carrying an abnormal quantity of water, the ice was thick and strong, and all the conditions of the river combined with exceptionally hot weather, indicated the possibility of an abnormal flooding; that on the 5th, 6th and 7th of April the ice moved in the upper part of the river causing heavy damages in many localities, especially in Richmond where many of plaintiff's agents and employees live, where the flooding was the most severe exer experienced; that the ice jam formed at Richmond moved down on April 7, at noon, and the enormous quantity of ice and water released went down the river, and, after being stopped at certain places, finally broke the ice down stream and went over the dam (at Hemmings Falls) on April 8, in the afternoon; that, those facts being commonly known previous to April 8, it was the duty of plaintiff, his agents and servants, to foresee that a dangerous situation could develop at any time and to take the necessary steps to prevent such a disaster as the one which occurred; that moreover the railway embankment and subway abutments were washed out long before the arrival of the train and said train could have been signalled and stopped before it arrived at the bridge and the accident would have thus been avoided.

The first question I shall examine is whether the plaintiff was, at the time of the accident, the owner of the railway line and of the locomotive and cars which were damaged.

Up to 1899 the railway line running from Charny to Ste. Rosalie and passing at Drummondville was the property of the Drummond County Railway.

By the Statute 62-63 Victoria, chap. 6, assented to on August 11, 1899, the Governor in Council was authorized to purchase from the Drummond County Railway Company and the latter was authorized to sell and convey to Her Majesty the whole of the railway and undertaking of the company, including its main and branch lines of railway and all buildings, fixtures and appurtenances appertaining thereto. Section 1 of the statute stipulates that upon such purchase being effected the said railway and its branch lines shall become and form part of the Intercolonial Railway and may be operated as such.

Before dealing further with this Act, I believe expedient to mention that in virtue of section 145 of The British North America Act, 1867, it became the duty of the Government and Parliament of Canada to provide for the commencement within six months after the Union of a railway connecting the River St. Lawrence with the City of Halifax, in Nova Scotia (called the Intercolonial Railway in the preamble of said section) and for the construction thereof without intermisson and its completion with all practicable speed.

In order to provide for the fulfilment of the duty imposed on the Government and Parliament of Canada as aforesaid, an act intituled "An Act respecting the construction of the Intercolonial Railway" was passed and assented to on December 21, 1867 (31 Vict. chap. 13).

Section 1 of this act stipulates that there shall be a railway constructed, connecting the Port of Rivière du Loup (in the Province of Quebec) with the line of railway leading from the City of Halifax (in the Province of Nova Ecotia), at or near the Town of Truro, and that such railway shall be styled and known as "The Intercolonial Railway".

Section 2 of the said act says inter alia: "The said Railway shall be a public work belonging to the Dominion of Canada."

Since its construction the Intercolonial Railway has always been the property of the Crown. We find it defined in the following statutes: 44 Vict. chap. 25, s. 122, An Act to amend and consolidate the Laws relating to Government Railways; R. S. C., 1886, chap. 38, s. 67, An Act respecting Government Railways; 54-55 Vict., chap. 50, An Act respecting the Intercolonial Railway; R. S. C., 1906, chap. 36, s. 80, An Act respecting Government Railways; R. S. C., 1927, chap. 173, s. 83, An Act respecting Government Railways. The several sections of the acts above referred to, which define the Intercolonial Railway, with the exception of section 122 of chapter 25 of 44 Victoria and section 67 of chapter 38 of the Revised Statutes of Canada of 1886, which are somewhat less explicit, stipulate that all railways, branches and extensions thereof, etc., *vested in Her or His Majesty,* as the case may be, *under the control and management of the Minister* (i. e. the Minister of Railways and Canals), and situated in the Provinces of Quebec, Nova Scotia and New Brunswick, are hereby declared to constitute and form the Intercolonial Railway.

It may perhaps be noted that the Intercolonial Railway which, according to the statute 31 Vict., chap. 13, was to connect the

Port of Rivière du Loup, in the Province of Quebec, with the line of railway leading from the City of Halifax, in the Province of Nova Scotia, at or near the Town of Truro, was later extended, in the Province of Quebec, from Rivière du Loup to Hadlow, as appears from the definitions in sections 122 of 44 Vict., chap. 25, and 67 of chap. 38 of the Revised Statutes of Canada of 1886. Hadlow is situated between Lévis and Charny, a short distance east of the latter place, reference to which is made from time to time in the testimonies of some of the witnesses.

The statute 62-63 Victoria, chap. 6, previously referred to, which authorized the Governor in Council to purchase the Drummond County Railway was to come into force as soon as another act, namely an "Act to confirm an agreement entered into by Her Majesty with the Grand Trunk Railway Company of Canada, for the purpose of securing the extension of the Intercolonial Railway System to the City of Montreal" (62-63 Vict. chap. 5) was brought into operation by the Governor General's proclamation. A proclamation was issued, dated the 21st of September, 1899, declaring that the said act (62-63 Vict. chap. 5) would come into force on the 26th of the same month; a copy of this proclamation was filed as exhibit 1.

Pursuant to the authorization conferred by the statute 62-63 Victoria, chap. 6, an Order-in-Council was passed on November 4, 1899, recommending the purchase by the Governor General in Council from the Drummond County Railway Company of the whole of its railway and undertaking; a copy of this Order-in-Council was filed as exhibit 3.

By deed in private writing dated November 7, 1899, a duplicate whereof was produced as exhibit 2, the Drummond County Railway Company sold to Her Majesty the whole of its undertaking and railway, including its main line and branches and their connections, and namely "the line of railway extending from Ste. Rosalie, a point on the Grand Trunk Railway in the Province of Quebec, to a point on the western side of the Chaudière River where the said line of railway connects and joins with the Grand Trunk Railway". The point referred to is Chaudière.

The Drummond County Railway has since been the property of the Dominion of Canada and has formed part of the Intercolonial Railway.

By the statute 9-10 Geo. V chap. 13, assented to on June 6, 1919, the Canadian National Railway Company came into existence. This statute is now chapter 172 of the Revised Statutes of Canada, 1927.

In virtue of section 3 of chapter 172 (section 1 of chap. 13 of 9-10 Geo. V), the Governor in Council may nominate such persons as may be deemed expedient not less than five nor more than fifteen (increased to seventeen by 21-22 Geo. V, chap 8, s. 1), to be directors of the company and, upon such nomination being made, the persons nominated and their successors, and such other persons as may from time to time be nominated by the Governor in Council are incorporated as a company under the name of Canadian National Railway Company. Then the directors appointed by the Governor in Council are, under the statute, deemed to be the company.

Section 19 of said chapter 172 contains the following provisions, reproduced literally from the statute 9-10 Geo. V, chap. 13, section 11:

> "19. The Governor in Council may from time to time by Order in Council entrust to the Company the management and operation of any lines of railway or parts thereof, and any property or works of whatsoever description, or interests therein, and any powers, rights or privileges over or with respect to any railways, properties or works, or interests therein, which may be from time to time vested in or owned, controlled or occupied by His Majesty, or such part or parts thereof, or rights or interests therein, as may be designated in any Order in Council, upon such terms and subject to such regulations and conditions as the Governor in Council may from time to time decide; such management and operation to continue during the pleasure of the Governor in Council and to be subject to termination or variation from time to time in whole or in part by the Governor in Council."

Acting under the authority conferred upon him by section 11 of chapter 13 of 9-10 Geo. V, the Governor in Council, on the 20th of January, 1923, entrusted to the Canadian National Railway Company the *management and operation* of, among other lines, the Intercolonial Railway, as appears from a duly certified copy of an Order in Council filed as exhibit 4.

It seems obvious to me that under the statute incorporating the Canadian National Railway Company, the latter is not vested with the ownership of the Government Railways, but that it is only entrusted with the management and operation of the railways, which remain the property of the Crown. See *Dominion Buildng Corporation v. The King* 1930, App. Cas. 90, at 96

If we refer to the sections of the act relating to the "Powers of the Company" and to "Finance", we see, among other things, that the company cannot abandon any lines and cannot issue securities without the approval of the Governor in Council; this is surely not consistent with the right of ownership.

Now if we turn back to section 15 of the Act (chap. 172), relating to the costs of administration and operation of the railways, we find the following stipulations:

> "15. Notwithstanding anything in the Government Railways Act or the Consolidated Revenue and Audit Act, all expenses incurred in connection with the operation or management of the Canadian Government Railways, under the provisions of this Act, shall be paid out of the receipts and revenues of the Canadian Government Railways.
>
> 2. In the event of a deficit occurring at any time during any fiscal year the amount of such deficit shall from time to time be payable by the Minister of Finance out of any unappropriated moneys in the Consolidated Revenue Fund of Canada, the amounts paid by the said Minister under this section to be included in the estimates submitted to Parliament at its first session following the close of such fiscal year; and in the event of a surplus existing at the close of any fiscal year such surplus shall be paid into the said fund."

The receipts and revenues of the Government railways are the property of the Government; the Canadian National Railway Company merely has the administration or management of these funds and out of them it pays the operating and administrative expenses; if there happens to be a deficit in any fiscal year, it is paid out of the unappropriated moneys in the Consolidated Revenue Fund of the Dominion; if, on the contrary, there is a surplus, it must be paid into the said fund.

The Canadian National Railway Company is in fact only an agent or mandatory for the Government.

It has been argued on behalf of the defendant that, under section 33 of the act, the action should have been brought in the name of the Canadian National Railway Company and that it should have been taken before the Superior Court of the Province of Quebec.

The material provisions of section 33 read as follows:

> "33. Actions, suits or other proceedings by or against the Company in respect of its undertaking or in respect of the operation or management of the Canadian Government Railways, may, in the name of the Company, without a fiat, be brought in, and may be heard by any judge or judges of any court of competent jurisdiction in Canada, with the same right of appeal as may be had from a judge sitting in court under the rules of court applicable thereto.
>
> 2. ....

3. Any court having under the statutes or laws relating thereto jurisdiction to deal with any cause of action, suit or other proceeding, when arising between private parties shall, with respect to any similar cause of action, suit or other proceeding by or against the Company, be a court of competent jurisdiction under the provisions of this section."

The first paragraph of section 33 is not imperative, but merely permissive: it uses the word "may". It does not deprive His Majesty of the right to sue in his own name. It may be that the action could have been taken in the name of the Canadian National Railway Company, but I am not called upon to express any opinion on the subject and I shall refrain from doing it.

Having reached the conclusion that His Majesty had the right to institute the action in his name, the question of jurisdiction raised by the defence offers no difficulty: under section 30, subsection (d) of the Exchequer Court Act (R.S.C., 1927, chap. 34) the Court has concurrent original jurisdiction in Canada in all actions and suits of a civil nature at common law or equity in which the Crown is plaintiff or petitioner. Moreover it is well established law that His Majesty can choose his tribunal: see Chitty on Prerogatives, p. 244; *Cawthorne v. Campbell, Lowndes et al* (1); *Attorney-General and Humber Conservancy Commissioners v. Constable* (2); *Attorney-General v. Walker* (3); *Farwell v. The Queen* (4). I have no hesitation in saying that this Court has jurisdiction to take cognizance of the present case.

Reference was made during the argument to the legal status of the defendant company. It was incorporated by letters patent issued on August 20, 1913, under the seal of the Secretary of State of Canada and its chief place of business is at the City of Montreal, in the Province of Quebec.

Carrying on its operations in the Province of Quebec it is subject to the laws of that province and particularly to the Water-Course Act, R. S. Q., 1925, chap. 46, formerly sections 7295 et seq. R. S. Q. 1909 and amendments thereto.

The defendant company, in the years 1924 and 1925, built its dam across the St. Francis River, at Hemmings Falls, approximately two and a half miles or a trifle more upstream from the railway bridge at Drummondville. Under section 4 of the said act it had the right to build the dam in question, subject to the approval of the Lieutenant-Governor in Council as required by section 5.

There is nothing in the evidence to show if this approval was

(1) 1 Anstr. pp. 205 and 208, in note.
(2) L. R., 4 Ex. Div., p. 172.
(3) 25 Grant, p. 233; 3 O. A. R., 195.
(4) (1893) 22 S. C. R., 554.

ever obtained. The fact that the dam had been in existence for several years when this case was tried and that its demolition had apparently not been sought under the provisions of section 5 of the act may justify me to conclude that the work had been approved in due form. Anyhow I think it was incumbent upon the plaintiff to establish that the requirements of the Water-Course Act had not been complied with, if he desired to hold the defendant responsible on this ground.

Under the act, the defendant however remained liable for all damages resulting from the erection of its dam to third parties: see section 12.

These incidental issues being disposed of, the only question to decide is whether the dam erected by the defendant at Hemmings Falls in 1924-25 was responsible for the damages suffered by the plaintiff or whether these damages were caused by an act of God or by plantiff's own negligence.

A large number of witnesses were heard on each side, over 100 in all, many of whom were called several times. The depositions cover somewhat more than 2000 pages. Numerous exhibits were filed, 76 on behalf of the plaintiff, apart from those produced with the particulars, and 57 on behalf of the defendant, including maps, plans, profiles, charts, photographs, records of water levels, records of flow, meteorological reports, vouchers, etc. Much of this evidence has very little or no bearing on the case and can be discarded. I may say that in order to sift the oral evidence and sort out the parts thereof which were relevant and material I had to read it all and annotate a large portion of it and I must admit that the task was long and tedious. At the trial I allowed part of the evidence to go in subject to the objections made by counsel; I could, and maybe I should, have maintained a large number of the objections and even perhaps rejected some of the proof which went in unchallenged and thus reduced to a certain extent the mass of evidence thrown in the record, but I hesitated, knowing that my decision, whichever way it went, would in all probability be appealed and that other judges might look at the evidence adduced in a different light than I might do myself.

The evidence discloses that on Easter Sunday, April 8, 1928, the express fro mQuebec to Montreal which was due at Drummondville at 4.15 p.m., was on time. Before reaching Drummondville station, it had to cross a viaduct over the highway, approximately 20 feet long, and, at a distance of less than a hundred feet further, the bridge which spans the St. Francis River. Between the viaduct and the bridge there was an embankment a little over 90 feet in length and about 20 feet in height: see deposition Brousseau, vol. R2, p. 32, and plan exhibit H. Sometime before the train arrived this embankment was washed out by the overflow of water and ice coming down the river and the tracks were left hanging over a gap. Before reaching the river from the east, which is the direction from which the train was coming, there is a curve in the railway line at a distance of two or two and a half arpents. At the curve the country is wooded so that a person standing on the bridge or the viaduct cannot see an on-coming train before it gets to this curve. Having heard the whistle of the locomotive and realizing the danger in which the train was of dropping into the river, Mrs. Grondin, called as witness by plaintiff, who had been watching the movement of the ice in the river, ran along the tracks in the direction of the train and signalled the engineer to stop: deposition Grondin, vol. 1, p. 61. The engineer immediately applied the emergency brakes and to a great extent reduced the speed of his train. The distance however between the curve and the western abutment of the viaduct was too short to enable him to bring his train to a stop. The locomotive plunged down to the right of the place where the embankment had stood, the baggage car dropped to the left and the second class coach fell on top of the baggage car, its rear truck remaining on the tracks: see plans exhibits 10 and 56 and photographs exhibits 7, 8, 9, 16 and 54.

The fireman, following the advice given him by Mrs. Grondin, leaped from the locomotive before the train reached the gap. The engineer stuck to his post and was grievously burnt in the cab of his engine; he died at the hospital in Quebec on the Thursday follwoing the accident. He had just been removed from the cab when the engine was turned on its side by the impact of the ice and water. Two men were drowned in the baggage car and several passengers were injured as a result of the jerk caused by the sudden stop of the train.

The construction of the embankment which was washed out in the afternoon of April 8, 1928, dates back to 1887. It had been built by the Drummond County Railway Company, when the latter constructed its railway line from Chaudière, a mile or so west of Charny, to Ste. Rosalie, and it became the property of the plaintiff on November 7, 1899, when Her Majesty bought from the company the whole of its undertaking and railway in virtue of the deed exhibit 2. From 1887 to Easter Sunday of 1928 it had stood the ice break-up every year as well as the floods which occurred periodically. The evidence discloses that the section of the line where this embankment was located, extending two and a half miles west and three miles east of Drummondville, was inspected daily and kept in a good state of repairs and that the embankment in question was in a good condition shortly before the accident; I shall deal with this aspect of the case at greater length later.

The St. Francis River runs mostly from south to north, at least from Lennoxville to its mouth; it has its source in Aylmer Lake and empties itself in Lake St. Peter. On its way down from Lennoxville, it passes, in the order indicated, Sherbrooke, Bromptonville, Windsor (also mentioned as Windsor Mills), Richmond, Ulverton

Rapids, Hemmings Falls and Drummondville, to mention only the principal places referred to in the evidence. On a militia map filed as exhibit 29 are indicated the distances along the river, at every five miles, from Lake St. Peter upstream; a note on the plan indicates that the mileage is from the plans in the Report of the Quebec Streams Commission of 1917. Drummondville is about half way between miles 30 and 35; Hemmings Falls is a very short distance above mile 35; Ulverton Rapids at mile 57; Richmond is approximately at mile 64; Windsor at mile 74; Bromptonville a little above mile 80 and Sherbrooke between miles 86 and 87. In this connection, see the chart filed as exhibit Z24.

A water level profile of St. Francis River prepared by D. W. McLachlan, engineer in the Department of Railways and Canals, was filed as exhibit 30. It shows the following levels: at Sherbrooke, 470; at Bromptonville, 454; at the Canada Paper Mills dam at Windsor, 410; at Richmond, 370; at Ulverton Rapids, 355; at the head of the Dauphinais Rapid (mile 45), 321; at Hemmings Falls, 311; at the railway bridge (between miles 32 and 33), 270. McLachlan mentions on his plan that the main water level was taken from the report of the Quebec Streams Commission for the year 1917.

Regarding water levels, further information is found in McLachlan's deposition (vol. 8, p. 7):

> "If you examine the St. Francis River you will find that it is now unimproved from below Windsor mills to Hemmings Falls. The drop in that section of the river is about 80 feet, the water level below Windsor being standing at the elevation 395 in low water, and about 405 or so at high water.
>
> The water level at the head of Hemmings Falls, as you know, is retained at elevation about 317. The distance between those two points is about thirty nine miles."

Olivier Lefebvre, engineer in chief of the Quebec Streams Commission, made a survey of the St. Francis River during the summer of 1917 and prepared a profile plan of the river from its source to its mouth; called as witness on behalf of the defendant, he supplied the following information (vol. L, p. 7):

> "Je dois dire que nous avons déterminé le profil en long de la rivière depuis son embouchure au lac Saint-Pierre jusqu'à sa source qui vient pratiquement au lac Aylmer et tous les rapides ont été notés sur un profil.
>
> Le profil en long de la rivière Saint-François peut être divisé en trois sections, du Lac Saint-Pierre jusqu'au Mille 36, à savoir à la tête des rapides et chutes Hemmings, là la dénivellation totale est de 300 pieds, soit environ huit pieds

par mille, et de la tête des chutes Hemmings jusqu'à Lennoxville, une distance de 54 milles, la dénivellation totale est de 160 pieds, et de Lennoxville jusqu'au Lac Aylmer, il y a une dénivellation de 345 pieds, une moyenne d'environ neuf pieds par mille, la distance est de 45 milles.

Je dois dire que le plan qui indique ce profil est daté de décembre 1917, mais le profil a été déterminé durant l'été de 1917.

La ligne de surface qui est indiquée comme profil de la rivière représente la hauteur de l'eau dans les divers biefs de la rivière lorsque l'ingénieur a fait la détermination."

The plan is in five sections, filed respectively as exhibits Z27, Z28, Z29, Z30 and Z31. The first section (Z27) covers the portion of the river from Lake St. Peter to mile 28; the second one (Z28), the portion from mile 28 to mile 56; the third one (Z29), the portion from mile 55 to mile 84; the fourth one (Z30), the portion from mile 84 to mile 113; the fifth one (Z31), the portion from mile 113 to mile 137.

Lefebvre says that this profile plan indicates the surface of the water, not the depth (ibid., p. 8).

Dealing with the flow of the river in a general way, Lefebvre has this to say (ibid., p. 10):

"La rivière Saint-François a un débit qui est très irrégulier. C'est un cours d'eau en régime torrentiel et ses tributaires sont plutôt rapides et le ruissellement est assez élevé. A la suite de pluies considérables, la rivière se gonfle en très peu de temps, et le débit passe du débit d'eau basse au débit d'inondation dans quelques jours."

Let us now see what have been the different states of the river between the C. N. R. bridge at Drummondville and the head of Hemmings Falls rapid, from 1887 to 1928.

Previous to 1896 there was no dam between Hemmings Falls and the railway bridge. In 1896 the town of Drummondville built a wooden dam at a distance of about 1100 feet above the railway bridge. This dam was about six feet high (dep. Moisan, vol. E, p. 25).

In 1918 the defendant company took over the power plant of the town of Drummondville, including the old wooden dam and erected a new dam approximately 50 feet below the old one, which was demolished. This new dam is a few inches higher than the old one. The former wooden dam crossed the river from shore to shore. The dam erected by the defendant in 1918, which is still in existence, comprises a wing wall on the east shore of the river running downstream for a distance of about 500 feet and standing at elevation 271;

from that point the dam, turning almost at right angle, crosses the river somewhat further than midstream; from there, turning again at practically right angle, it runs downstream past the C. N. R. line until it reaches the power house and it forms with the west shore of the river a canal which brings the water to the power house. The elevation of the section of the dam partially crossing the river is 264: see plans exhibits 19 and Z10; also photo exhibit Y.

In 1924-1925 the defendant built its dam at Hemmings Falls, i. e. the one which plaintiff claims has been the cause of the disaster of the 8th of April, 1928.

One of the effects of the dam at Hemmings Falls was to raise the level of the water upstream nine feet, viz. from an elevation of 309 to one of 318.2 (see plan exhibit 19), and to create a basin between five and five and a half miles in length, where previously there was one not exceeding three and a half miles. It naturally widened the river considerably, particularly on the west shore from the spillway up to Ernest Dionne's property (lot 99 of the township of Wickham), as may be seen by referring to plan exhibit 19. It is easy to judge of the width of the basin in that section by glancing at the aerial photograph filed as exhibit 20. From the northern line of said lot 99 upstream the river narrows to a great extent, although it is somewhat wider than it was before the construction of the Hemmings Falls dam. The new shore line of the river is indicated on plan exhibit 19 by a continuous heavy white line; the original shore line is indicated by a broken or dotted line; a look at the plan will show that the river was widened as far upstream as lot 23B of the township of Simpson on the east side and lot 67 of the township of Wickham on the west side, although to a much lesser degree than in the section below lot 99.

So many references to this dam have been made by the witnesses that a short description may facilitate the comprehension of the evidence. Starting on the east side of the river there is first a concrete wing wall about 420 feet long which on the date of the accident was at elevation 324 but has since been raised to elevation 327, apparently in consequence of the 1928 flood. At the end of this wall is the power house, about 250 feet in length. Then there are four sluice gates, each of them 50 feet wide, having with their frames a total width of approximately 275 feet. Adjoining these gates is the spillway 507 feet long, extending to the west shore of the river. Next to the spillway and forming therewith an obtuse angle is a concrete wing wall running upstream for a distance of 300 feet; this wall abuts on a comparatively elevated point or strip of land, some 300 feet wide at the shore line, forming a natural embankment. Then prolonging the wing wall and the embankment upstream is an earth dyke or, as it has been repeatedly called during the trial, an earth fill 4200 feet long. The plan filed as exhibit 18 and photograph exhibit 20 give a general and complete view of the Hemmings Falls plant; the photographs filed as exhibits 12 and 13 are also of some assistance. I may add that Dunfield has given a fairly accurate description of the plant in his first deposition (vol. 3A, pp. 14 to 16).

The elevation at the sill of the gates is 299, according to plan exhibit 18, and the gates are 22 feet in height. The elevation of the spillway is mentioned on plan exhibit 19 as being 313.7; on plan exhibit 18, which by the way is a copy of the defendant company's general plan of the Hemmings Falls power development, the elevation is given as 314. The small difference of 0.3 foot is insignificant and totally immaterial.

Removable flash boards 7 feet long are placed on top of the spillway to raise the level of the water, when necessary.

The elevation of the wing wall on the west side of the river is 324 and that of the earth fill 327.

Prior to the construction of the Hemmings Falls dam the normal water level from the foot of the Dauphinais rapid downstream for a distance of about 3 2/3 miles gradually fell from an elevation of 310 to one of 309, until the river reached a point a trifle less than one mile and a half upstream from the site of the dam. From that point to approximately 500 feet below the place where the dam now stands there was a drop in the river of nearly 45 feet: see plans exhibits 30, 65, P and Z28. That is what was called Hemmings Falls. As a consequence of the erection of the dam the level of the river which used to be at elevation 309 between the foot of the Dauphinais rapid and the head of Hemmings Falls rapid is now at elevation 318.2. The Hemmings Falls rapid has been wiped out and the Dauphinais rapid reduced by approximately two-thirds. Where there was a basin of about three and a half miles there is now one over five miles long. The part of the basin between the dam and Ernest Dionne's property (lot 99 of the township of Wickham) has been almost doubled in width. At its broadest point it reaches a width of over one half mile, 15 arpents and a fraction to be a little more accurate.

Let us see what were the circumstances in and about the river on the 7th and 8th of April, 1928, at the dam and above it.

So as to render the references to the several testimonies plainer and at the same time avoid repetitions, I may point out that the plaintiff's evidence in chief is contained in volumes numbered 1 to 12, the defendant's evidence in volumes marked A to M and the plaintiff's evidence in rebuttal in volumes lettered R1 to R4.

I shall first deal briefly with the water level, the flow of the river and the manipulation of the sluice gates on the 7th and 8th of April.

Dunfield, assistant plant manager of the Southern Canada Power Company, has given certain figures about the level of the water and the flow of the river in the basin just above Hemmings Falls dam, on the 7th and 8th of April, 1928, in his first deposition as witness on behalf of plaintif (volume 3A of evidence, pp. 5 et seq.); they are as follows:

	Water Level	*Flow*
On April 7, at noon	316	about 50,000 c.f.s.
On April 7, at 7 p.m.	320.5	about 100,000 c.f.s.
On April 7, at 7.40 p.m.	317.8	about 55,000 c.f.s.
On April 8, at 9 a.m.	316.8	about 61,000 c.f.s.
On April 8, at 3 p.m.	317.4	not mentioned

Dunfield says that at 3 o'clock in the afternoon of the 8th the water rose suddenly and a few minutes later it reached its peak, to wit 325.6.

The same witness indicates the movements of the gates during that same period; a few words on the subject may prove useful.

At noon on the 7th gate 1 was closed, gate 2 was opened 12 feet, gates 3 and 4 were wide open.

At seven o'clock p.m. on the 7th, at which time the biggest flow of the day occurred, the four gates were wide open.

At 7.40 p.m., when the water level had dropped from 320.5 to 317.8 and the flow had decreased from 100,000 cubic feet per second to 55,000 cubic feet per second, gate 1 was closed. At 7.40 p.m. the water was 3.8 feet over the spillway. Five of the six turbines or units were then in operation.

At 8.50 p.m. gate 1 was raised five feet; gates 2, 3 and 4 remained wide open.

Asked if gate 1 was opened because the flow had increased, Dunfield (loc. cit., p. 10) answered in the affirmative and he added that the flow was then about 62,000 cubic feet per second.

At 9.40 p.m. gate 1 was opened 10 feet and at 9.55 p.m. it was opened up clear of the water. According to Dunfield the level at 10 p.m. was 317, but it had started to rise and in order to prevent it rising too high gate 1 was opened. At 10.25 p.m. gate 1 was closed to about ten feet of opening and it remained in that position until Sunday morning, the 8th, at 9.20; gates 2, 3 and 4 remained wide open all night.

At 9.20 a.m., on the 8th, gate 1 was opened 16 feet; gates 2, 3 and 4 were left wide open.

At 3 p.m. gate 1 was pulled up clear of the water. At that time the water "jumped quite suddenly" according to Dunfield (loc. cit., p. 12). Dunfield could not say if the raising of the gate concided with the rise of the level of the water. I am very much inclined to believe it did, but the operation was manifestly tardy.

With respect to the manipulation of the sluice gates, the flow and the water levels on April 7 and 8, reference may be had to the chart filed as exhibit 51.

There is a great deal of evidence regarding the condition of the river on the 7th and 8th of April, from the Hemmings Falls dam up to the Dauphinais rapid and even beyond. The Dauphinais rapid, so called because it is opposite a property belonging to one Dauphinais (lots 69, 70, 72 and 73 of the township of Wickham), has often been mentioned; it is situated between miles 39 and 41, is a little over a mile in length and has a drop of about 10½ feet (see plans exhibits 30 and Z28).

Between noon and one o'clock p.m. on Saturday, the 7th, Alexandre Mercure and Adélard Cusson, the former of whom has lived on the edge of St. Francis River, between Hemmings Falls and Drummondville, for over 47 years, drove up to Dauphinais' and the west bank of the river to inspect the condition of the ice. Both state that the ice from Dauphinais' down to the Hemmings Falls dam was solid as in winter (dep. Mercure, vol 3, pp. 3 and 4; dep. Cusson, vol. 4, p. 69). At the Dauphinais rapid there was a jam made of broken ice and frazil, twenty to twenty-five feet in height and this extended upstream as far as one could see.

From Dauphinais' Mercure and Cusson went to Cadieux's camp, which is somewhat further up the river. They noticed there that the water had reached the gallery, but that it had receded a couple of feet (Mercure, loc. cit. p. 7; Cusson, loc. cit., pp. 3 and 4). Mercure says that in his opinion the water had gone up between 25 and 30 feet above its usual level (loc. cit., p. 7) and Cusson estimates that, at the time they were at Cadieux's camp, the water was from 18 to 20 feet higher than normal (loc. cit. p. 71).

From there they proceeded to Généreux's camp but were unable to reach it; they had to cross a ditch; the bridge over the ditch was gone and the ditch filled with water. They decided to go to Demontigny's camp, which is about a mile above Dauphinais' and a couple of arpents below Gnéreux's camp. From the gallery of Demontigny's camp they could see an enormous accumulation of ice in the river, broken and piled up, both upstream and downstream for a considerable distance (Mercure, loc. cit., p. 7; Cusson, loc. cit., p. 73).

A few minutes after they had reached Demontigny's camp, they noticed that the ice had started moving.

Cusson decided he would go back to Dauphinais' to observe the movement of the ice. He says that the ice had come up almost to the windows of Dauphinais' house (loc. cit., p. 7). Cusson then returned to Demontigny's camp, shortly after the ice stopped; noticing that the water was flowing back, he and Mercure decided that it was the best time for them to return home, as the situation might become dangerous.

On their way down they noticed that the water had risen high on the road and deposited thereon heaps of ice (Mercure, loc. cit., p. 7; Cusson, loc. cit., p. 8). From the foot of Dauphinais' rapid the ice appeared to be in the same condition as when they had gone up;

it had apparently not moved. They made the remark that the jam could not pass, because the ice in the basin was too solid (Mercure, loc. cit., p. 9; Cusson, loc. cit., p. 9).

Mercure and Cusson returned home between 5 and 6 o'clock p.m.

At about seven o'clock that same evening, Mercure, Cusson and Wilfrid Proulx went up to Hemmings Falls. Mercure and Proulx climbed up on the earth fill dam; the ice was leaning against it and at some places it had gone over; at the upper extremity of the embankment the water and the ice had passed around it and flowed into the road. Cusson who had followed them in his carriage on the highway along the river says that when he came near the end of the earth dyke the road was filled with ice and water and that he told his companions that he could not go any further: see depositions Mercure, vol. 3, pp. 12 and 13 and Cusson, vol. 4, pp. 12, 13 and 14.

On Sunday, the 8th of April, at about one o'clock in the afternoon, Mercure, Cusson, Séraphin Ouimet, a civil engineer and land surveyor, Wilfrid Proulx and Alfred Mercure, son of Alexandre Mercure, drove from Drummondville to Hemmings Falls. Ouimet, Proulx and Mercure father and son went on the earth fill dam; Cusson contined to drive a little further up on the highway which parallels the river, but, when he reached the point marked C on the photograph exhibit 20, he had to turn back on account of the ice in the road; he alighted from his carriage and joined his companions on the earth dyke; from there they examined the river. The condition was practically the same as on the previous evening. All they could see was broken ice, packed and piled up, extending as far down as the dam; the basin was completely filled, as much as they could judge. The ice had gone up on Ernest Dionne's property (lot 98 of the township of Wickham) and spread all over the ground to the outskirts of the wood at the back of his property. At the upper end of the earth dyke, the ice had leaped over and passed round it; it filled the road and was scattered all over the ground for a long distance back. At places it was seven or eight feet high. Mercure and his companions had planned going to Dauphinais' by the river road, but they were forced to abandon their propect for the reason that the road was completely obstructed with ice and impassable (dep. Mercure, vol. 3, pp. 15 and 16; dep. Cusson, vol. 4, pp. 85, 86 and 87; dep. Ouimet, vol. 5, pp. 58 and 59).

Ouimet, Mercure and Cusson came back to the dam, took the road to St. Nicephore (a village approximately two miles from the river on its left bank and about two miles and a half south or southwest of Hemmings Falls, indicated on the map exhibit 29) and from there went down to Dauphinais'. The water had come up to the roof of the house; the trace of the water was still noticeable; the sheds were overturned (dep. Mercure, vol. 3, pp. 18 and 19; also dep. Ouimet, vol. 5, pp. 66 and 73). From Dauphinais' they proceeded down to Ernest Labonté's. They followed the river for a while until they reached a spot where ice had packed up on the road. They had to alight from their carriage and walk on the ice, the best they could. In Labonté's house, which is on a high level, the water had risen to a height of about four feet. The barns had been upset and the ice had spread all over the ground (dep. Mercure, vol. 3, pp. 19 and 20; dep. Ouimet, vol. 5, pp. 74 and 75).

Mercure, Cusson and Ouimet came back to Drummondville late at night and did not witness the accident.

The evidence given by these three witnesses regarding the condition of the river and the flood on the west shore, above Hemmings Falls dam, on Sunday afternoon is partly corroborated by Ernest and Walter Labonté: see depositions Ernest Labonté, vol. 4, pp. 50, 51, 56, 57 and 58, and Walter Labonté, vol. 4, pp. 44, 45 and 46.

Ouimet visited Ernest Labonté's and Dauphinais' properties during the floods of 1927 and 1928. On both occasions he took notes of the heights to which the water had risen. With the aid of these notes he made two plans, filed respectively as exhibits 23 and 24. These plans, which were originally prepared, the former on January 27, 1928, and the latter on September 28, 1927, for the purpose of showing the portions of the properties flooded in the spring of 1927 and the level to which the water had risen, were revised and completed by the witness on June 19, 1928, so as to include the same information concerning the flood of 1928. The section in white alongside the river represents the parcels of each of the properties purchased by the defendant company, when the latter erected its dam at Hemmings Falls, the section shaded in red represents the portions of the properties flooded in 1927 and the section shaded in yellow indicates the additional portions of the properties flooded in 1928.

From the plans and the deposition of Ouimet (loc. cit., pp. 67 to 72) it appears that the water reached the following elevations:

In 1927 at Labonté's	330
In 1927 at Dauphinais'	330
In 1928 at Labonté's	336
In 1928 at Dauphinais'	337

Ouimet explains that he took as his datum 311 at the spillway when, according to the defendant's own figures, the elevation at that point is 314 (see plan exhibit 18). In consequence all the elevations shown on plans 23 and 24 must be increased by three feet (dep. Ouimet, vol. 5, p. 72).

On April 8, 1928, at about one o'clock in the afternoon, Pierre Arguin, taxi driver, was called to the Hemmings Falls plant to take Dunfield and two men up the river. He met them on the east side of the power house and from the wing wall adjoining it he could see the basin; it was full of ice, piled up against the dam and the power house (dep. Arguin, vol. 4, p. 28). They drove down to Drummondville, crossed the river and went up to Hemmings Falls on the west bank. Arguin, Dunfield, and the two men climbed on the earth fill and there looked at the basin; it was filled with ice; the ice had reached the top of the earth dyke. They stayed there a few minutes but soon left because the ice had started to move in the middle of the basin (Arguin, loc. cit., p. 33). One of the men who accompanied Dunfield told the witness to get ready to leave, because the situation might become dangerous. Immediately after Arguin had got into his carriage, the water and ice started to come up on the road (ibid., p. 34).

Arguin says they arrived at Drummondville a few minutes before 4 o'clock; the accident had not yet occurred; the railway embankment on the Drummondville side of the river was just starting to wear away (ibid., p. 35). Witness saw large quantities of water and ice flowing down the river (ibid., p. 36).

Dunfield has given his version about this trip to Hemmings Falls on Sunday afternoon and it corresponds substantially with Arguin's story (dep. Dunfield, vol. I, pp. 87 and 88).

Dunfield however dwelt at greater length on the subject; he filed a plan as exhibit Z5 on which he had made annotations concerning the position of the jams and the movement of the ice in the basin on April 7 and 8. Arguin stated in his testimony that they had to depart because the ice had started to move in the middle of the basin and that the situation might possibly become dangerons (ibid., p. 33, in fine). Dunfield refers to this movement of the ice as a collapse (dep. Dunfield, vol. I, p. 88). He indicates the movement of the jam on plan exhibit Z5 in green: "first movement of jam at about 3.15 p.m. April 8, 1928". Green arrows show that the jam moved into what is indicated on the plan in yellow letters as "open water flowing rapidly". This is obviously the movement of the ice to which Arguin refers in his evidence. The two versions on this point do not differ materially. As to the time at which the jam started to move, alleged on plan exhibit Z5 to be 3.15 p.m., Dunfield in his testimony states that having since seen the charts recorded at Hemmings Falls, the movement must have commenced before 3 o'clock: dep. Dunfield, vol. I, p. 88. This detail may perhaps took unimportant, but it is an element among others which may help to fix the time at which the mass of ice and water which leaped over the dam arrived at Drummondville; I shall discuss this aspect of the case when dealing with the defendant's contention that the plaintiff could have averted the derailment of the train by stopping it before it reached the washed-out embankment.

On Sunday morning, April 8, Dunfield, accompanied by Kitson and Rutherford, both employees of the defendant company, went up the river on the east side with the object of inspecting the condition of the ice and using thermite to try to relieve the pressure in the basin above the Hemmings Falls dam. They proceeded upstream as far as Bergeron's property (lot 10A of the township of Simpson), where they arrived at about half past ten or eleven o'clock, and there came to a distance of approximately fifty feet from the shore. The basin was covered with a sheet of solid ice; there was a jam crossing the river diagonally from Bergeron's property, at about the division line between lots 10A and 10B, on the east side of the river, to the upper end of Arthur Dionne's property (lot 101 of the township of Wickham) on the west side; below this jam, about the centre of the basin, there was an open channel running downstream, the dimensions whereof are not mentioned; the jam and the channel are shown on plan exhibit Z5 by means of yellow hatched lines (see deps. Dunfield, vol. I, pp. 78 and 79; Kitson, vol. D, pp. 12 and 13; Rutherford, vol. D, pp. 11 and 12; Bergeron, vol. 6, pp. 96 and 97). The plan exhibit Z5 is a photostat copy of the defendant's "key plan of flood areas above Hemmings Falls" (marked sheet No. 7 of 6-A-11), which shows the river before the erection of the dam and indicates the original shore lines; exhibits 21 and P are full size copies of the same plan. I thought it expedient to mention this so as to avoid any possibility of error. See plan 19 on which both the old and the new shore lines are indicated.

It is quite obvious that on Saturday and Sunday, April 7 and 8, there was impounded above the Hemmings Falls dam a huge and abnormal quantity of ice and water.

After ascertaining the state of the river on the 7th and 8th of April, it is important to determine what the temperature was on the day of the accident and what it had been during the few preceding days. Mild weather had prevailed since the morning of the 3rd. During the four days which preceded the final break-up and during the whole day of the 8th the thermometer did not descend to the freezing point. From the 4th to the 8th of April, the temperatures at Sherbrooke and Montreal, according to the meteorological reports of the Department of Marine were as follows (see exhibit 33):

SHERBROOKE

Day	*Temperature*				
	8.00 a.m.	2.00 p.m.	8.00 p.m.	Max.	Min.
4	40.0	39.4	38.0	46.4	37.8
5	46.4	66.4	54.0	67.4	37.3
6	45.1	71.6	50.7	73.2	39.0
7	47.0	72.0	57.5	74.0	37.0
8	51.9	55.6	34.8	61.6	34.3

MONTREAL

4	40.1	41.2	38.0	44.8	36.4
5	43.8	60.2	58.9	63.0	36.4
6	46.2	49.6	39.0	51.8	35.0
7	44.0	67.8	59.9	69.0	33.4
8	44.8	35.4	33.0	57.7	32.7

No official records of the temperature are kept at Drummondville nor at Richmond; at least none were filed.

Owing to the persistently mild weather, the snow was melting rapidly and the inflow of the river was in consequence abundant. The precipitation of rain and snow had not been abnormally considerable in the fall and winter preceding the spring flood: the records for Sherbrooke indicate 12.75 inches of rain and 109.0 inches of snow from November 1, 1927, to April 30, 1928, as compared with 6.57 inches of rain and 124.6 inches of snow for the same period in 1919-20, the only year, besides 1928, for which records have been produced (see exhibits 31 and 33). Stress was laid particularly by counsel for the defendant on the fact that in the latter part of November 1927, to wit on the 29th and 30th, there had been plenty of rain — in fact 0.28 inch on the 29th and 0.46 inch on the 30th (at Sherbrooke; the precipitation at Montreal is immaterial) — which naturally had the effect of increasing the flow of the river, and that moreover there had been snowfalls during the first three days of December, viz. 0.5 inch on the 1st, 4.5 inches on the 2nd and 2.8 inches on the 3rd. This is unquestionable: see exhibit 33. The quantity of rain and snow recorded during that period does not appear to me excessive. Moreover we must not overlook the fact that this overflow was taken care of by the river and carried down beyond Hemmings Falls and Drummondville, presumably to the mouth of the river, in the next few days, because of the mild weather, and that the flow of the river was soon after back to normal for that period of the year. During the winter, as I have already said, the precipitation although fairly abundant, was not in any way unusual. What was really out of the ordinary and to some extent abnormal during the ice break-up of 1928 was the mild weather which persisted for five days and nights in succession. This, as previously mentioned, had the effect of melting rapidly the snow on the banks of the river, increasing the inflow and raising suddenly the level of the river at every point where the water was impounded and held back by dams. The question is to know whether the impounding of enormous quantities of water and ice has been beneficial, detrimental or wholly ineffectual. On this question the experts, unfortunately if not unexpectedly, disagree; their opinions are diametrically opposed and I must admit very candidly that, if there had been no other evidence in the record, I would have felt rather perplexed to solve the problem; and perhaps the only solution left would have been to base a decision on ordinary common sense, which may perhaps not always constitute a good legal foundation but which in some cases remains the only issue at one's disposal.

Three experts were heard on behalf of the plaintiff, and four on behalf of the defendant. The three experts of the Crown, namely McLachlan, Ouimet and Lea, reach the conclusion that the Hemmings Falls dam was responsible for the wash-out of the railway embankment on Sunday afternoon, the 8th of April, 1928: see depositions McLachlan, vol. 8, pp. 40 (in fine) and 41; Lea, vol. 9, p. 12; Ouimet, vol. 10, p. 15. The experts for the defence, Beaubien, Surveyer, Lefebvre and Roberts, on the contrary, contend that the accident is in no way due to the dam and that, if it had not been there, the damages to the railway would have been just as serious, nay even more extensive; see depositions Beaubien, vol. J, p. 38; Surveyer, vol. K, p. 67; Lefebvre, vol. L, p. 25; Roberts, vol. M, p. 6. The two versions are not easily reconciled.

I do not think it is necessary nor even expedient to analyse and discuss the various propositions or theories expounded by the experts, some of which have very little if any relevance to the case. It will be sufficient to indicate briefly the considerations which led them to conclude that the dam either was or was not, as the case may be, the cause of the wash-out of the embankment.

The contentions of the experts for the plaintiff may be summarized as follows: a dam in a river is an obstruction and changes the behaviour (régime) of the river; the wooden dam erected in 1896 by the town of Drummondville some 1100 feet upstream from the railway bridge had the effect of holding back water and ice and causing some floods on the properties bordering on the river between the dam and the foot of the Hemmings Falls rapid, e.g. the floods of 1913 and 1915; the dam erected by the defendant company in 1918 to replace the town's dam, although a few inches higher, did not alter the situation materially; like the wooden dam it caused floods along the shores below the foot of the Hemmings Falls rapid; these floods were not of the size and importance of those experienced after the construction of the Hemmings Falls dam. The latter constructed, as we have seen, in 1924-1925 changed the behaviour (régime) of the river considerably; it created a basin five and a half miles in length, where previously there was one three miles and a half long; it raised the water level nine feet; it drowned the Hemmings Falls rapid and submerged two-thirds of the Dauphinais rapid; it reduced the speed of the current to a very great extent. This widely increased basin, impounding huge quantities of practically still water, is conducive to the formation of sheet ice and constitutes an ideal receptacle for broken ice and frazil flowing down the river; it is not only liable but bound to cause ice jams of very large dimensions. Before the dam at Hemmings Falls was built, jams occasionally, though seldom, formed at the foot of the Dauphinais rapid, at Labonté's or at Bergeron's, but they were much smaller in size and had considerably less resistance than those which form every year since the erection of the dam; these jams all went in the spring break-up before the ice upstream arrived and the river got rid of its ice and overflow gradually and in a normal way; without the dam, there could be no huge accumulation of ice and water such as was seen on the 7th and 8th of April, 1928; in a state of nature, the ice, arriving from Richmond, would have met no obstacle either at Dauphinais', at Labonté's or at Bergeron's, but would have flown down in a free river, as it had done every year prior to the construction of the Hemmings Falls dam.

The theory of the defendant's experts is just the opposite and may be briefly summed up as follows: the dam at Hemmings Falls did not in any way affect the behaviour (régime) of the river; it does not constitute an obstacle in the river; with a flow exceeding 50,000 cubic feet per second and the sluice gates wide opened, the flow of the river is the same with or without the dam; there is not a greater quantity of sheet ice in the basin since the erection of the dam and on the other hand there is considerably less frazil; frazil is formed in rapids and, as the Hemmings Falls rapid has been submerged and the Dauphinais rapid reduced by approximately two-thirds, the quantity of frazil which forms in the remaining section (about one-third) of the Dauphinais rapid represents only a small portion of the frazil previously formed in the Hemmings Falls and the Dauphinais rapids; the increased basin has had the effect of slackening the speed of the current and this has reduced the possibilities of damage and in that respect the larger a basin is the more useful it is. The dam impounded a large quantity of ice and water but no more than an ice jam, in a state of nature, would have done; if the dam had not been there the ice would have stopped at Labonté's, due to a bend in the river or the converging shores or to what has been referred to as a hogsback in the river, and it would have stayed there long enough to allow the ice from above to arrive and the same disaster would have happened the moment the ice jam at Labonté's would have left; so, in the opinion of the defendant's experts, not only the dam was not the cause of the accident, but, on the contrary, it avoided greater damages.

In the deposition he gave in the present case, Beaubien, after stating that in his opinion the jam would have stopped at Labonté's just the same as it did on Saturday night, if there had been no dam, attributed the halt of the jam at Labonté's to a bend in the river and the convergence of the shores, whilst in the cases of Labonté and Dauphinais he ascribed it to the so-called hogsback (dep. Beaubien, vol. J, p. 37; vol. K, pp. 27 and 28). I may perhaps note here in passing that Beaubien (vol. J, p. 37) says that it is impossible to affirm that the jam would have stopped if there had been no dam; this admission is, in my opinion, cautious and wise.

At page 38 of Beaubien's deposition we find a statement to the effect that if the dam had not been there Saturday night the damages would have been greater because there were four feet and a half more water in the basin then than on Sunday afternoon. This is, in my opinion, an obvious fallacy: the argument presupposes that, if there had been no dam, there would nevertheless have been the same quantity of ice and water in the basin, as there was on Saturday night. Not only does this hypothesis rest on no evidence whatever, but it seems unreasonable and contrary to sound common sense.

Let us now revert to facts and try to ascertain how the river behaved, during the break-up period, at and above Drummondville before 1924-25, the years when the dam at Hemmings Falls was built. Fortunately there is evidence in the record in this respect, which will help to fix the responsibility for the wash out of the railway embankment.

Several witnesses stated that prior to the erection of the dams, and particularly the dam at Hemmings Falls the floods and the ice break-ups had never been so serious as since their erection. Mercure, who has lived in Drummondville alongside the river, between the Drummondville dam and the Hemmings Falls dam, for the last forty-seven years and more, and who has floated lumber down the river every spring for about forty years (dep. Mercure, vol. 3, p. 2), says that there never were floods as considerable as the one of 1928 before the dam at Hemmings Falls was built, and that there were no ice jams of the size of those which have formed since the construction of the dam. His explanation appears to me very plausible: he says that prior to the erection of the dam at Hemmings Falls there was a rapid of over thirty feet and that ice very seldom formed in that rapid and that, when it did, it was not solid. I had perhaps better quote briefly from this witness' evidence, who is well acquainted with and has had a wide experience of St. Francis River, at least that section of it with which we are concerned; in view of his long acquaintance with the river and the fact that he was living in Drummondville long before the dam of the Town of Drummondville was built, which was in 1896, he has known the river in its different phases, first in a state of nature, then with the dam of the town erected in 1896, later with the dam of the defendant company replacing the town's dam in 1918, and finally with, in addition to the Drummondville dam, the dam at Hemmings Falls.

Speaking first of the formation of the ice and the general condition of the river during the winter, from Hemmings Falls to Labonté's (lot 97 of the township of Wickham; see plan exhibit 19), Mercure says (vol. 3, pp. 24 and 25):

> "R.—Partant de la chute Hemming aller jusqu'à peu près chez Labonté, là où la rivière rétrécit, il ne se formait pas beaucoup de glace. Des hivers, il ne s'en formait pas,

d'autres hivers il s'en formait un peu. Mais ce n'était pas solide. Voyez-vous, de la chute Hemming aller chez Labonté, en deça même il y avait trente (30) à quarante (40) pieds de descente, c'était rapide.

PAR Me PERRAULT, c.r.,

avocat du demandeur:

Q.—De différence de niveau?
R.—Oui. Et sur cette descente-là, d'à peu près un mille et demi, il s'en venait un peu de platin et l'eau des fois restait là et cela gelait. Il se faisait de la glace là-dessus. Mais le plus souvent le rapide était toujours ouvert.

PAR Me GARCEAU, c.r.,

avocat du demandeur:

Q.—Vous savez qu'il se faisait des traverses de glace sur la rivière?
R.—Oui.
Q.—Est-ce que vous avez eu connaissance que jamais il s'est fait une traverse là?
R.—Non, jamais. Partant de la tête du rapide aller à la "dam", il ne s'est jamais fait de chemin. Pas à ma connaissance."

Replying to questions regarding the condition of the river between Bergeron's (lot 10B of the township of Simpson; see plan exhibit 19) and Hemmings Falls before the construction of the Hemmings Falls dam, during the ice break-up period, Mercure states that, when the ice opposite Dauphinais' property came down, the ice at Bergeron's had already left and that the river at that spot was always free (dep. Mercure, vol. 3, pp. 26 and 27):

"Q.—Quand la débâcle se faisait le printemps, les années avant la construction de la chaussée, dans quel état se trouvait la rivière à partir de chez Bergeron, en haut des rapides, aller jusqu'à la chute Hemming?
R.—Quand la glace en haut descendait, c'était toujour libre cela.
Q.—Mettons donc cela sous une autre forme. Quelle glace partait la première, était-ce la glace chez Dauphinais ou chez Bergeron?
R.—C'était la glace à partir de chez Bergeron qui partait la première.

Q.—Avant la chaussée la glace partait de sur le rapide, quand il en existait, avant qu'aucune glace descende d'en haut?
R.—Oui, c'est ce que j'ai constaté toujours."

This has been the experience of the following riverside residents: Mercure, vol. 3, pp. 26 and 41; Walter Labonté, vol. 4, p. 43; Ernest Labonté, vol. 4, p. 54; Sutherland, vol. V, p. 9; Laprade, vol. 6, p. 12.

Opposite Bergeron's property, which, before the erection of the dam, was at the head of the Hemmings Falls' rapid, there was an island (lot 10-C of the township of Simpson, as shown on plan exhibit 19). Mercure cut trees on this island; they were big trees (ibid. p. 27). The island was not very large, between two and three arpents long by 150 feet wide (ibid., p. 28). Mercure says that the ice never caused any damage to the trees and even that it never came up on the island (ibid. pp. 28 and 29):

"Q.—Est-ce que sur aucun de ces arbres-là vous avez constaté que la glace avait fait des ravages, avait travaillé?
R.—Non, jamais. L'écorce de l'arbre, le pruche, jusqu'au pied était solide.

PAR Me PERRAULT, c.r.,

avocat du demandeur:

Q.—Elle n'avait jamais été brisée?
R.—Non, elle n'était pas brisée.

PAR Me GARCEAU, c.r.,

avocat du demandeur:

Q.—Sur aucun des arbres avez-vous constaté si dans les débâcles la glace avait fait quelque ravage?
R.—J'ai constaté que jamais la glace n'avait embarqué sur l'île. Je n'ai jamais vu que la glace ait embarqué sur cette île-là."

This island is now drowned in the basin created by the dam (ibid., p. 31).

In cross-examination the witness is asked if, before the construction of the dam at Hemmings Falls, jams formed at Dauphinais' during the ice break-up in the spring; his answer is that jams did form occasionally owing to the islands which existed then in the river at that spot, but not of the height or thickness of those which form now since the construction of the dam; here is what he says in this regard (ibid., p. 33):

"Q.—Savez-vous personnellement si dans le passé, avant la construction de la chaussée, il se faisait des embâcles de glace aussi chez Dauphinais, quand la glace partait au printemps?

R.—J'ai eu connaissance qu'il ne s'en faisait pas de cette hauteur-là.

R.—Je vous demande s'il s'en faisait?

R.—La glace devait s'accrocher et elle s'accrochait des fois dans les îles. Il y avait des îles qui ressortaient de la rivière dans ce temps-là."

Further on in his deposition, the witness, answering questions put to him by counsel for the defendant, reiterates this statement and explains why, in his opinion, the ice at Dauphinais' and between Dauphinais' and Labonté's was not and could not be as solid and as thick as it is since the building of the dam at Hemmings Falls (ibid., pp. 41 and 42):

"L'AVOCAT: Avant la construction de la chaussée il y a eu de la glace chez Dauphinais comme cela, la même glace que vous avez vue, qui retenait l'embâcle?

R.—Il n'y a jamais eu de "jam" de glace chez Dauphinais comme j'en ai vu en mil neuf cent vingt-huit (1928) ou mil neuf cent vingt-sept (1927).

Q.—Ils n'ont pas été aussi gros?

R.—Non.

Q.—Mais il y en avait chez Dauphinais?

R.—Il n'y a pas de doute que la glace part au printemps et elle doit s'accrocher un peu dans les îles.

Q.—Et il y avait de la glace solide avant aussi pour la retenir chez Dauphinais?

R.—Pas aussi solide qu'aujourd'hui.

Q.—Pourquoi cela?

R.—Il y avait un mille et demi qu'il n'y en avait pas du tout. La grande partie du bassin qui part de chez Labonté à venir à la "dam", c'est un grand bassin très large, il n'y avait pas de glace quand la glace descendait d'en haut dans ce temps-là.

Q.—Ensuite, à prtir d'un peu en avant de chez Labonté à la tête des rapides, aller chez Dauphinais, il y a au-delà de trois milles?

R.—Oui.

Q.—Cela, c'était de la glace solide, l'hiver?

R.—Pas toujours.

Q.—Pourquoi, pas toujours?

R.—Parce qu'il y a des places où il n'y avait pas épais d'eau et il y avait des roches qui ressortaient de la glace.

Q.—Cela n'empêchait pas la glace d'être moins solide?

R.—La glace n'a jamais été de l'épaisseur qu'elle est sur le bassin depuis qu'il y a épais d'eau."

At page 44 of his deposition he adds:

"Q.—Qu'est-ce qui l'empêche (la glace) de travailler comme cela aujourd'hui?

R.—Parce que les îles sont couvertes d'eau. Il y a neuf pieds plus épais d'eau qu'il y avait avant, neuf à dix pieds, quand l'eau est normale. Et quand vous avez un peu plus d'eau, c'est encore plus haut que cela. Et c'est arrêté, cette eau-là, il n'y a pas de courant et cela gêle. C'est comme un vaisseau de glace. Vous mettez de l'eau dans une chaudière sur le perron, il ne fait pas bien froid et ça gèle. Et la rivière n'est pas gelée parce qu'il y a du courant."

This long and wide basin of deep and still water from the dam up to Labonté's is, in my opinion, an ideal "vessel", to use the witness' own expression, for the formation of ice and the accumulation of frazil.

Another reason which affords Mercure the means of remembering that the floods prior to the construction of the dam were not as severe as the flood of 1928 is that, previous to such construction, he used to put logs on the slope of the river bank and, if he had done it in 1928, the logs would have been covered with at least twenty feet of ice (ibid. pp. 33 and 34):

"R.—J'ai constaté qu'avant la construction des "dams" je montais les billots sur un défaut de la côte pour les mettre à l'eau au printemps et si j'avais mis des billots en mil neuf cent vingt-huit (1928) à la même place ils auraient été recouverts de vingt (20) pieds et plus de glace. Et avant cela on avait toujours mis nos billots là et jamais ils n'avaient été noyés, jamais on avait perdu de billots.

Q.—Quand vous dites vingt (20) pieds, ce n'est pas précis?

R.—Je l'ai constaté, je l'ai mesuré, je l'ai marqué sur les arbres.

....

R.—J'ai marqué sur les arbres une marque quand la glace était même sur les lieux. Je regardais en bas et je disais "il y a ici vingt-cinq (25) à trente (30) pieds d'épais." Quand la glace était dans la forêt, pour couvrir vingt (20) arpents, vingt-cinq (25) arpents de forêt, il fallait que cela ait poussé.

Q.—C'était en mil neuf cent vingt-huit (1928) cela?
R.—De mil neuf cent vingt-sept (1927) à mil neuf cent vingt-huit (1928).

PAR Me PERRAULT, c.r.,

avocat du demandeur:

Q.—Depuis la chaussée?
R.—Oui. Elle a été encore plus haute cette année."

Mercure is not expounding theories, but relating facts whereof he has been witness. He has rafted logs on the St. Francis River since 1885; he knows all the holes and nooks in the river; he has seen the river in its natural state and also since it has been dammed at Drummondville and later at Hemmings Falls; he witnessed all the ice break-ups and spring floods for over forty-five years and always took a keen interest in them, as every spring he was waiting for the river to get clear to start floating his logs. I believe his testimony is of great value to the Court. He was asked if he had a claim against the defendant for damages resulting from the floods of 1927 and 1928 and said that A. Mercure & Fils Limitée, in which he had an interest, had sued the Southern Canada Power Company — apparently the action is still pending — and he added that he had helped financially or otherwise in the cases of Labonté and of Dauphinais against the defendant company. I do not think that this can in the least affect the credibility of the witness; he impressed me as being frank and honest and I have no reason not to believe his testimony. Besides, Mercure is corroborated by a number of witnesses, particularly with respect to the greater seriousness of the floods and jams since the construction of the Hemmings Falls dam and the fact that, prior to such construction, the ice below the Dauphinais rapid always left in the spring before the ice from upstream arrived: see dep. Cusson, vol. 6, pp. 68, 69 and 70; Bergeron, vol 6, p. 93; Laprade, vol. 6, pp. 9, 13 and 15; Allard, vol. 6, pp. 40 and 41; Brousseau, vol. 6, pp. 48, 49 and 50; Boisvert, vol. 6, pp. 62 and 63; Bahl, vol. 5, pp. 44 and 45; Ernest Labonté, vol. 4 pp. 54, 55, 56 and 57; Sutherland, vol. 7, pp. 8 and 9; Léopold David, vol. R2, p. 117; Madame Proulx, vol. R2, p. 53; Johnny Proulx, vol. R2, pp. 102 and 103; Walter Labonté, vol. 4, p. 43.

If the conditions of the river, before and after the construction of the dam at Hemmings Falls, were such as described by the plaintiff's witnesses, it is no wonder to me that the quantity of ice and frazil which formed or accumulated in that section of the river between Hemmings Falls and Dauphinais' was considerably less before the dam was built than after. The bassin at the foot of the Dauphinais rapid was much smaller than the basin which now exists; the latter is not only longer and wider but it is also a great deal deeper. One of the effects of the erection of the dam, as we have seen, has been to raise the level of the water in the basin about nine feet and to drown the Hemmings Falls rapid and shorten the Dauphinais rapid by approximately two-thirds. As a result the speed of the current is greatly reduced and the water in the basin is almost still when the sluice gates are closed, the only water escaping is that going through the power house and, when the level is at elevation 314 or more, over the spillway. This basin is an ideal vessel for the formation of surface ice and an almost tight receptacle for broken ice and frazil flowing from upstream. The broken ice and frazil coming down the river either run under the sheet ice in the basin or pack behind it, depending on the velocity of the current; it has been stated, I may note in passing, that, when the current reaches or exceeds 3.25 feet per second, the floating ice and frazil will go under the surface ice, that, when the speed of the current is between 2.25 and 3.25 feet per second, the floating ice and frazil may or may not go under the surface ice depending on whether the river is straight or winding, and that, when the current is less than 2.25 feet per second, the floating ice and frazil will accumulate behind the surface ice (see dep. McLachlan, vol. 8, p. 28; also the extract of the report of the Joint Board of Engineers concerning the St. Lawrence Waterways Project filed as exhibit 41).

In order to show that the behaviour (régime) of the river has not been affected by the construction of the dam at Hemmings Falls, the defendant has endeavoured to establish that prior thereto there were severe floods on the river during the spring break-up. Proof has been adduced to show that there had been floods in 1887, 1913, 1915 and 1921.

The evidence concerning the flood of 1887 lies firstly in the deposition of Ernest Ménard, forest engineer, who, on the 16th and 17th of November, 1932, made an inspection of the trees on the east shore of the river from the highway bridge to a point 700 or 800 feet upstream. He examined several trees and found many of them scarred. Trees were barked, on their south side, to the alburnum or sapwood. The scars on these trees, according to Ménard, were such as would be generally caused by ice or other heavy things — autres choses pesantes — carried down by the water in a river. The scars were not made with an axe or another sharp instrument, but rather by friction (dep. Ménard, vol. F, pp. 69 and 70). The witness made a report on eight trees, which was filed as exhibit L; he supplemented this report by another one filed as exhibit M. The trees numbered from 1 to 8 are indicated on the plan produced as exhibit H. Tree number 7 situated between the river and the new road to Hemmings Falls, a short distance south of the east end of the highway bridge, is said to have been wounded in the spring of 1887 and, as shown on plan exhibit H, it was scarred at elevation 265. Ménard explained how the age of a wound on a tree can be determined (dep. vol. F, pp. 71, in fine, and 72). McLachlan, speaking of the scar found on tree No. 7, says that the tree in question is standing in a steep slope and within 25 feet of the bottom of the highway bridge, built in 1885 or 1886, and that the wound may just as well have been caused by the men working at the construction of the bridge as by the ice floating down the river (dep. McLachlan, vol. R3, pp. 7 and 8). For my part, I am inclined to believe that the scar was caused by the ice, but I must say that the evidence on the whole is not very satisfactory; in fact it could hardly be otherwise, in the absence of eye-witnesses. We have no information whatever regarding the general conditions of the river in 1887; we know nothing about the climatic conditions, the precipitation of snow or rain during the winter and the previous fall, the flow of the river in the spring, the thickness of the ice carried down the river at the time of the break-up, etc. It is extremely difficult, in the circumstances, to determine the seriousness and even the cause of the flood which apparently occurred in the spring of 1887.

Two other witnesses however spoke of a flood which would have occurred in or about the same year.

Onésime Fleurant who, at the trial, was 65 years old and who has floated logs in the St. Francis River for a period of 22 years, commencing at the age of 18, spoke of a flood which occurred a year or two after he became engaged in the floating of logs; this would mean 1886 or 1887. The date is not very definite, but there is nothing astonishing about it after so many years. Referring to this flood, Fleurant says that the water moved a barn on the Hemmings property (vol. F, pp. 10 and 11). The witness states that he indicated the site of this barn, which had been either burned or demolished, to Labrie, Boisclair, Dumaine and Mahaffy (ibid., p. 12). The latter prepared a plan which was filed as exhibit G. On it is shown the site of the former Lafontaine farm buildings; these buildings were at one time occupied by Hemmings and the property was known as the Hemmings farm before being known as the Lafontaine farm (dep. Mahaffy, vol. D, p. 9).

Mathias Berthiaume came to Drummondville in 1880; his brother Adolphe came the following year. Adolphe lived on the Hemmings farm; he was there five years, presumably from 1881 to 1886. Two or three years after he had left, which would be in 1888 or 1889, the barn was moved by a flood (dep. Berthiaume, vol. F, pp. 31, 32 and 33). I am inclined to think that Berthiaume refers to the same flood as Fleurant, although he places it two or three years later, and that both speak of the flood which Ménard has very positively fixed in the spring of 1887; it is difficult to assume that this barn was in the habit of moving every year! At all events this evidence does not add much to what Ménard has told us about the flood of 1887 and it is well nigh impossible to estimate with any degree of accuracy its importance and to determine its cause.

I may perhaps add that the Honourable Walter Mitchell, called as witness by the defendant, declared that he remembered, when a boy about 11 years of age, being taken by his father to a house, which had been flooded, at the corner of the St. Cyrille road; he said it was the Blais house; it is indicated on plan exhibit H. When this flood occurred, the highway bridge had just been built, but the railway bridge had not yet been erected (dep. Mitchell, vol. H, p.. 2 to 4). The highway bridge dates back to 1885 and the railway bridge to 1887; it is possible, in the circumstances, that the flood mentioned by Mitchell is the flood of 1887. His testimony however adds very little to the evidence of the other witnesses.

The next flood to which the defendant's witnesses refer is the one which happened in 1913. At that time the dam of the town of Drummondville was in existence. The break-up occurred early that year, to wit on March 22. An ice jam had formed at the foot of Hemmings Falls rapid, in the basin created by the Drummondville dam, which held back the water. The water and broken ice flowing down the river on that day were diverted by the jam from their natural course, spread over the road, came down the hill and invaded the property referred to as the Lafontaine farm. This property is situated on the west shore of the river, at the foot of the Hemmings Falls rapid. The land is comparatively low. Mahaffy, a civil engineer, prepared a plan, which has already been referred to and which was filed as exhibit G, purporting to show various points affected by the flood of 1913; the site of the former Lafontaine farm buildings was pointed out to him, but the witness says that he found traces of the cellars of the two smaller buildings, indicated on the plan by two black square dots; see dep. Mahaffy, vol. D, pp. 2 and 3. The farmer (Soucy) and his family had to be rescued from the house which was surrounded by water and ice. On the same occasion water and ice overflowed on the Comtois property, situated a short distince downstream from the Lafontaine farm, along the Drummondville highway. The site of the Comtois house, now destroyed, was also pointed out to Mahaffy and it is indicated on plan G by a black square dot. The evidence discloses that the dam at Drummondville was responsible for the jam which formed in the basin at the foot of the Hemmings Falls rapid: see depositions Bouchard, vol. E, pp. 37 to 43; Boisclair, vol. E, pp. 30 and 31; Berthiaume, vol. F, pp. 35 to 38; Laprade, vol. R2, pp. 110 and 111; Mercure, vol. R2, pp. 138 and 139.

In 1915, the break-up occurred at an unusually early date, to wit on the 27th of February; the river was at a high level and carrying down large quantities of ice; according to the evidence the ice came up the highway bridge; it was piled up against the railway embankment; it spread over the road which passes under the railway tracks on the east side of the river; on the west side it carried away the small highway bridge over the canal conveyeing the water to the power house: see depositions Boisclair, vol. E, pp. 26 and 27; Ruel, vol. E, pp. 57 to 61; Hamel, vol. E, pp. 79 to 83; Dumaine, vol. F, pp. 41, 42 and 43; Laprade, vol. 6, p. 10; Allard, vol. 6, p. 41.

Joseph David also gave evidence regarding the flood of 1915, but his version in the present case differs substantially from the one he gave in the cases of Labonté and Dauphinais against the Southern Canada Power Company and I must say that his explanations of the contradictions between his two testimonies are not satisfactory and that his evidence, in my opinion, does not carry much weight.

The witnesses called on behalf of the Crown have laid the blame for this flood, as for the one of 1913, on the Drummondville dam: see particularly depositions Gratton, vol. R2, pp. 79 and 80; Arthur Proulx, vol R2, p. 93; Mrs. Proulx, vol R2, p. 53.

The statement by Ruel that the flood of 1915 was the biggest which ever occurred at Drummondville is not borne out by the other witnesses and is obviously an exaggeration. In cross-examination Ruel says that he occasionally acts as appraiser for the defendant company, when the latter wishes to acquire land, and is paid by the company for his service; I do not mean to insinute that the witness has not given his testimony in good faith, but his intimate and perhaps unconscious desire not to jeopardize the company's interests may account for a few apparent exaggerations with which his deposition is strewn.

The last flood prior to the construction of the dam at Hemmings Falls, concerning which the defendant has adduced evidence is the one which occurred in 1921: see depositions Moisan, vol. E, p. 21, Girouard, vol. E, pp. 33 et seq.; Ruel, vol E, p. 61, and Blanchette, vol. E, pp. 3 to 6. The evidence discloses that on this occasion the ice came up on the highway bridge and caused some damage, the extent whereof is not very definite; water and ice also spread over the road under the railway tracks on the east side of the river (see dep. Girouard, vol. E, pp. 33 to 36, and exhibit J; also deposition Mrs. Proulx, vol. R2, pp. 50 and 51). The gallery of Dion's house in which Blanchette was then living was damaged; the ice broke into the kitchen at the rear of the house and also into the stable. Blanchette says he found from 3½ to 4 feet of ice and frazil in the kitchen (loc. cit., pp. 4, 5 and 6). This house is on the St. Cyrille road, an arpent and a half or so above the C. N. R. line, at a distance of less than 100 feet from the river, about ¼ or ½ of an arpent according to Blanchette's version (lot. cit., p. 2). Some damage was also caused at the power house: see dep. Dunfield, vol. G, pp. 65 and 66.

As in the case of the floods of 1913 and 1915, the evidence shows that the defendant's dam at Drummondville was responsible for the flood of 1921; see depositions Mrs. Proulx, vol. R2, p. 53;

Mrs. Gratton, vol. R2, p. 69; Gratton, vol. R2, pp. 77 and 78; Arthur Proulx, vol. R2, pp. 91 and 92; Johnny Proulx, vol. R2, pp. 102, 103, 104 and 106; Noel Proulx, vol. R2, pp. 59 and 60.

As a result of the flood of 1921 an action was taken against the defendant company by one Walter Thomas, owner of lot No. 4A of the township of Simpson, bordering on the river, above the dam erected at Drummondville by the defendant company in 1918, on the ground that his land had been flooded and damages had been incurred. The Superior Court of the Province of Quebec (Tessier, J.) came to the conclusion that the dam erected by the defendant company was responsible for the flood and condemned the latter to pay damages to the plaintiff. The judgment of the Superior Court was affirmed by the Court of King's Bench (Flynn, Rivard and Letourneau, JJ.) Copies of the judgments of the Superior Court and of the Court of King's Bench were deposited in the record, neither of them being reported. With all due deference may I venture to say that I am not bound by these decisions: I have no knowledge of the evidence adduced in that case, and I am accordingly not in a position to say if the facts proven warranted the condemnation. The case of Thomas, like the present one, depended, as regards the responsibility, mostly if not exclusively on facts. I may note however in passing, as I intend to revert to this question later, that in the Thomas case it was held — rightly, in my opinion — that "le fait que la débâcle sur la rivière S. François, en 1921, aurait eu lieu soudainement et après de grands abats de pluie ne constitue pas une force majeure qui dégage la responsabilité de la défenderesse, et que ce moyen de défense n'est pas fondé".

This closes my review of the evidence as well as my observations, at least for the time being, regarding the floods which accurred at Drummondville, prior to the erection of the Hemmings Falls dam. To complete these remarks I may perhaps add that Moisan referred to another flood which would have occurred in 1892, when the witness was only twelve years of age. Moisan is the only witness to speak of this flood. He may possibly remember this particular flood more vividly than the others, seeing that, according to his statement, the river overflowed on his father's property. He says that his father had taken measurements and that the water had gone up 17 inches above a branch which was about six feet above the ground (dep. Moisan, vol. E, p. 19). The witness has a particularly good recollection of this incident. His memory does not serve him so well in connection with the 1913 flood: indeed he cannot state whether it happened 20, 22 or 25 years ago (dep. Moisan, vol. E, p. 20). I must say that I found this witness inclined to be somewhat evasive in cross-examination.

After dealing with the behaviour of the river during the break-up period, before the construction of the dam at Hemmings Falls, and with the floods of 1887, 1913, 1915 and 1921 — I am intentionally leaving aside the flood of 1892 as the proof concerning it is, to say the least, unsatisfactory — I shall proceed to examine what happened in the section of the river, with which we are concerned, since 1925, when the Hemmings Falls dam was completed.

There is no proof concerning the break-up of 1926. Presumably the flood was not bad and little, if any, damage was done.

In 1927 there was a very severe flood, somewhat similar to that of the following year and considerable damage was caused to the properties above the Hemmings Falls dam. Fortunately for those below the defendant company succeeded in holding the water and ice upstream; I do not propose to dwell at length on the events of the break-up of 1927; a few comments on the depositions and the exhibits having reference thereto will, I think, be sufficient.

The break-up in 1927 occurred on or about the 15th of March. The ice started to move down at Dauphinais' two days before the final break-up, around 7 p.m.; it proceeded a short distance and jammed at Island 71, where it stayed during the night and the next day. The following morning early the ice pushed forward but, after travelling another short distance it finally jammed in the basin, where, with the exception of a few small pieces which went over the spillway, it melted gradually. Frazil had accumulated during the winter at the foot of the Dauphinais rapid, to a lesser degree however than it did in 1929. There were several feet of ice on Island 71; also on lots 22 and 23, where the ice nearly reached the same elevation as in 1928. The ice in the basin was during those three days the same as in winter. See deposition Cusson, vol. 5, pages 16 to 25.

In 1927 the water rose to elevation 330, as compared with 336 and 337 in 1928: see deposition Ouimet, vol. 5, pp. 67 to 72, and plans exhibits 23 and 24.

Witness Bahl says that in 1927 the water came up on his property, but not quite so high as in 1928 (vol. 5, p. 46). In his deposition on behalf of defendant, Jutras states that in 1927 the water rose on his property two or three feet less than in 1928 (vol. C, pp. 22, in fine, and 23). Ernest Labonté, on the other hand, declares that in 1927 his property was flooded, a fact which had never happened before the construction of the dam at Hemmings Falls (vol. 4, p. 57).

In consequence of the floods of 1927 and 1928 several actions were instituted against the Southern Canada Power Company before the Superior Court of the Province of Quebec, District of Arthabaska, in two of which judgments have been rendered by the said Superior Court and by the Court of King's Bench (appeal side): they are the actions of Ernest Labonté and of Napoléon Dauphinais. The Superior Court held the defendant company liable for one-third of the damages, the remaining two-thirds being attribuable to an act of God. The Court of King's Bench (Tellier dissenting, Howard, Rivard, dissenting, Hall and Galipeault, JJ. (by a majority of three against two, reversed this judgment and dismissed the action (according to Mr. Justice Hall's notes) on the ground that the defendant's experts, Beaubien, Surveyer and Lefebvre, were better qualified for a scientific investigation of this kind than the plaintiff's experts, Leluau and Ouimet, that they had devoted a more exhaustive study of the surrounding conditions than the plaintiff's experts had done, that the defendant's experts were supported by the officers of the company who had unusual opportunities to make investigations, and that the defendant's experts had, by a careful study of all the surrounding circumstances, justified their theory that the jam had been caused by an obstruction in the river, to wit a hogsback; reference to this hogsback was frequently made in the present case and I shall deal with it briefly in a moment. Copies of the judgment of the Superior Court and of the notes of Mr. Justice Hall and Mr. Justice Rivard (dissenting) were filed, neither judgment being reported. The actions being for amounts below $2000. no further appeal was possible and as Labonté said in his deposition (vol. 4, p. 57) when asked if his case was finished: "elle m'a bien l'air." I need not repeat what I have said in connection with the Thomas case; for the same reasons I do not think that the decision of the Court of King's Bench in the cases of Labonté and Dauphinais can in any way bind me. I shall refer to them later on when discussing the question of responsibility.

Nothing was said about the ice break-up in 1929, but we know frow Cusson that, towards the end of December 1928 or the beginning of January 1929, he cut holes in the ice at different spots in the basin above the Hemmings Falls dam and found the following thicknesses: opposite Ernest Labonté's, 1½ miles above the dam — 3½ feet; opposite Turcotte's camp, 2 2/3 miles above the dam — 2½ feet; three or four arpents upstream from the Power House — 3 feet: see deposition Cusson, vol. 6, pp. 72 to 75. These holes were dug at places where, prior to the construction of the dam, there was a rapid and the depth of the river did not exceed two feet.

On the 8th and 11th of February, 1929, Mercure and Cusson made a few soundings in the river opposite Dauphinais' for the purpose of ascertaining the thickness of the ice. Mercure filed as exhibit 22 a sketch on which is indicated the thickness of the ice at different points; the thicknesses found and recorded vary; they are, from left to right on the plan exhibit 22, 15 feet, 16½ feet, 17.4 feet, 15 feet and 19½ feet: see depositions Mercure, vol. 4, pp. 10 to 15, and Cusson, vol. 4, pp. 96 to 100. Mercure says that the ice was not even, the elevation in that section varying five or six feet; he admits that he took his soundings where the ice was heaved up. Even with an average thickness of ten to twelve feet, there is five or six times as much ice at that spot as there was before the Hemmings Falls dam was built.

Mercure says that the ice was practically level with the surface of island 71 at its upper end (vol. 4, p. 23). Jutras' property was inundated during the break-up of 1929 but not quite to the same extent as in 1928 (vol. 5, p. 33). Laprade says the ice, at some places, was twenty feet thick (vol. 6, p. 13).

No reference was made to the conditions in which the break-up occurred in the springs of 1930 and 1931. There is evidence however about the flood of 1932. It is said to have been the worst ever experienced in the section of the river in which we are interested; the water rose about 3 feet higher than in 1928: see depositions Jutras, vol. 5, pp. 31 and 32, and vol. C, pp. 18 and 22; Brousseau, vol. 6, p. 49; Bahl, vol. 5, pp. 44 to 46; Boisvert, vol. 6, p. 62.

In 1928 the water had risen, at Labonté's, six feet higher than in 1927 (see plan 23), viz. to elevation 336; in 1927 the water had risen ot elevation 330, which considerably exceeded the highest level previously recorded, at least for the years regarding which proof has been adduced; see the charts filed as exhibit Z14, Z15, Z16 and Z17 and Lefebvre's explanations relating thereto (vol. J, pp. 6 to 9). The highest level reached during the period of four years covered by these charts was 322.5, towards the end of March or the beginning of April 1919 (ibid., p. 8). According to Griffin (vol. G, p. 23) the water rose at Dauphinais', in April 1924, to elevation 327.

Notwithstanding Ruel's statement that there never was a flood as bad as that of 1915, I am satisfied that the three worst floods in that section of the river were those of 1927, 1928 and 1932. In seven years since the construction of the dam at Hemmings Falls, to wit from 1926 to 1932 inclusive, there have been three extremely serious and abnormal floods. Previous to the erection of the dam we know of four important but lesser floods: those of 1887, 1913, 1915 and 1921, making a total of four in 38 years. I find it difficult to think that this is a mere coincidence.

The behaviour (régime) of the river above Drummondville was first affected in 1896 when the town erected its wooden dam some 1100 feet upstream from the railway bridge. It was further modified when in 1918 the defendant company replaced this old wooden dam by a concrete one, which was a few inches higher than the former. It was finally changed, and this time to a far greater extent, by the 54 foot dam which the defendant company erected in 1924-1925 at Hemmings Falls. This dam, as we have seen, raised the level of the water nine feet, drowned several islands and rocks, submerged the Hemmings Falls rapid and about two-thirds of the Dauphinais rapid and created upstream a basin over five miles in length, having a width varying between 12 and 15 arpents for a distance exceeding two-thirds of a mile, viz. from the dam up to Arthur Dionne's property (lot 107, township of Wickham), from which point the basin narrows until it reaches lot 67 of the township of Wickham on the west shore and lot 23B of the township of Simpson on the east shore, where we find the river within its natural bounds (see plan exhibit 19).

I am convinced that these dams, particularly and to a much greater extent the dam at Hemmings Falls, had the effect of facilitating and increasing the formation of sheet ice and the accumulation of broken ice and frazil underneath or behind it. The five and a half mile basin above Hemmings Falls dam impounded enormous quantities of water, ice and frazil. Such a state of affairs is unquestionably conducive to the formation of ice jams of large proportion. Jams may have formed at the foot of Hemmings Falls rapid prior to the construction of the dam, but in no wise comparable to those which formed upstream after the dam was erected. And I am satisfied that a jam formed at the foot of the Hemmings Falls rapid, under natural conditions, would have gone down during the break-up period in an open river, before any ice jams at Labonté's, at Dauphinais', at Ulverton Rapids, at Richmonr or at any other place upstream would have reached the Hemmings Falls rapid, as it has been asserted by several witnesses, all of them well acquainted with the behaviour of the river prior to the construction of the dam.

This brings me to examine a statement made by the defendant's experts, to wit that, the river flowing from south to north, it is natural that the ice at points upstream, for instance Lennoxville, Sherbrooke, Wndsor and Richmond, would, by reason of the higher temperature, leave sooner, in the spring break-up, than the ice at Drummondville which is further north. The distances from these different points to Drummondville, in a straight line, are comparatively short, being approximately as follows:

From Lennoxville to Drummondville	50 miles
From Sherbrooke to Drummondville	47 miles
From Windsor to Drummondville	35 miles
From Richmond to Drummondville	25 miles

The meteorological reports (exhibit 33), to which I have previously referred, show that the temperatures at Sherbrooke and Montreal were not very far apart: a few degrees higher at Sherbrooke, particularly more so on the 6th of April. Now one must not overlook the fact that Montreal is further north than Drummondville and at a greater distance from Sherbrooke than Drummondville is; the difference of temperature between Drummondville and Sherbrooke should accordingly be less than between Montreal and Sherbrooke. In fact Lefebvre, one of the defendant's experts, declares that the temperatures at Sherbrooke and Drummondville during the break-up period in 1928 were the same (dep. Lefebvre vol. L, p. 18).

The simililarity of temperatures at Sherbrooke and Montreal during the first week of April is not exceptional and peculiar to the year 1928, as appears from the meteorological reports for the month of April 1920: see exhibit 31.

All the witnesses agree to say that the ice in the Hemmings Falls rapid, at Labonté's and at Bergeron's, invariably left in the spring before the ice upstream: Mercure, vol. 3, pp. 26 and 27; Walter Labonté, vol. 4, p. 43; Ernest Labonté, vol. 4, p. 54; Laprade, vol. 6, p. 12; Sutherland, vol. 7, p. 9; Johnny Proulx, vol. R2, p. 102; Bergeron, vol. 6, p. 93.

I have previously cited Mercure's testimony on this point, when dealing with the condition of the river during the break-up period. I may perhaps now quote briefly from the depositions of Ernest Labonté and Sutherland.

At page 54 of the former's deposition, we find the following statements (loc. cit., p. 54):

> "Q.—Maintenant, lorsque arrivait le printemps, quand la glace partait, est-ce que c'était chez vous que cela descendait en premier, ou si c'était le rapide?
> R.—Le rapide.
> Q.—Le rapide partait toujours avant que la glace parte de chez vous?
> R.—Oui."

At page 9 of his deposition Sutherland says:

> "Q.—Which ice left first?
> A.—Oh. down in the rapids, down at Bergeron's.
> Q.—The ice from the rapids always left before the ice above?
> A.—Yes.
> Q.—Before the construction of dam did you see any ice jam at Bergeron's or near there?
> A.—No."

It is obvious to me that the contention of the defendant's experts that the ice goes earlier at Lennoxville, Sherbrooke, Windsor and Richmond than at Drummondville on account of the difference of temperature has no foundation whatever.

It has been urged on behalf of the defendant, with respect to the damages arising from the derailment of the train, that the plaintiff had been negligent in not signalling the train and stopping it before it reached the spot of the wash-out. Counsel for defendant submitted that consequently, whatever the event of the case might be, the defendant company should not be held liable for the damages caused to the locomotive, the baggage car and the second class coach nor for the damages arising from the death of or injury to employees or passengers.

It was scarcely half an hour before the arrival of the train at the Drummondville bridge that the ice and water started to wear away the embankment. On this point several witnesses have testified; among these Guèvremont, Marier and Mrs. Grondin were in the best position to see what happened and, in my opinion, their versions carry great weight.

Guèvremont, who lives in Drummondville, says that on the day of the accident he went to the east end of the bridge with his friend Marier to watch the movements of the ice in the river. They arrived there half an hour or so before the train, which reached the bridge at about 4.13 p.m. (see deposition St-Pierre, vol. 1, p. 9) and was due at Drummondville at 4.15 p.m. according to Guèvremont's testimony (vol. 1, p. 34). When the witness arrived at the bridge, there was no damage done (ibid., p. 35):

> "Q.—Je vous demande là, ce que la glace et l'eau faisaient au pont, quand vous êtes arrivé là, une demi-heure, à peu près, avant d'apercevoir le train?
> R.—Pour ainsi dire, il n'y avait aucun dommage de fait, au temps où on est arrivé là.
> Q.—Il n'y avait aucun dommage de fait au temps où vous êtes arrivé là?
> R.—Non."

The witness says that the river was filled with a huge quantity of floating ice; the ice came up to the bridge; some of it spread on the highway under the railway tracks (indicated by the letter B on the photo filed as exhibit 6; see dep. Guèvremont, pp. 34, 35 and 36). Asked what the ice and water did while he was there, the witness answers (ibid. p. 36):

> "R.—C'a toujours fait la même chose, à venir jusqu'à la dernière minute, à quatre heures et treize."

The witness then goes on to relate what happened; I might as well quote the evidence verbatim (ibid., pp. 36, 37 and 38):

> "R.—La dernière minute, je regardais l'heure, on a pensé au train qui s'en venait. Le cri des chars nous a porté à regarder plus loin. Là, j'ai dit à mon ami Marier: "On va retourner avertir le train." On a vu le danger. Même, cela se minait.
> Q.—Cela se minait où?
> R.—Dans la "culvert", en dessous de la partie "B".
> Q.—Mais en dessous de la partie "A"?"

Before continuing the quotation, I may note here that the references to letters A and B in the witness' testimony are to the letters appearing on photo exhibit 6; on the day of the accident, there was an embankment where there is now an open space between the two pillars under letter A, precisely the embankment which was washed out on April 8, 1928.

Proceeding with his deposition, the witness says:

"R.—Là, c'était de la terre, ce n'était pas cédé encore. C'a parti le temps de le dire, une seconde, rien que voir venir l'engin du coin, c'a parti tout d'un coup.

Q.—Le remblai en terre en dessous du point "A", vous dites que c'est parti tout d'un coup?

R.—C'est parti tout d'un coup.

Q.—Miné par quoi?

R.—C'a été miné — l'engin a tombé vis-à-vis la lettre "B". Il y avait encore de la terre. Ca s'est miné jusqu'au bout, parce que l'engin est venu arrêter à quatre, cinq pieds.

Q.—A quatre, cinq pieds de quoi?

R.—Du support du pont.

Q.—Du pilier du pont de fer, à l'est?

R.—Oui.

Q.—Combien de temps à peu près le remblai en dessous de la terre "A" a-t-il été lavé, avant que le train arrive?

R.—Combien de temps? Voyez-vous, cela, vis-à-vis d'ici, c'est la pesanteur de l'engin qui a aidé en même temps, avec la glace; la pesanteur qui est arrivé là-dessus a aidé à miner cette partie-là, partir de là à aller ici.

Q.—C'est-à-dire la partie "A"?

R.—Oui. On a été pour passer là, nous autres, pour aller avertir le train.

Q.—La partie en dessous de "B"?

R.—Oui. Là, on a vu que cela se minait. On a reculé.

Q.—Vous n'avez pas pu passer?

R.—On n'a pas pu passer.

Q.—Vous avez retourné sur le pont?

R.—On a retourné à l'entrée.

Q.—Là, qu'est-ce qui est arrivé?

R.—Là, l'engin est arrivé et il est tombé dans la rivière.

Q.—Il a plongé dans le viaduc "B"?

R.—Oui."

Marier corroborates Guèvremont, with the exception however that, in his estimate, the ice did not reach the bridge, but only came up to four feet from it (dep. Marier, vol. 1, p. 52).

Mrs. Grondin, who lives on the east side of the river, a short distance south of the railway, went out on Sunday afternoon, the 8th of April, around three o'clock. Shortly before she went out, King, the superintendent of the defendant company's power plant at Drummondville, came to her house. She asked him if the ice break-up would be dangerous and he told her that he did not think there was any danger. When she left home, the water was just starting to rise and there was no ice yet coming down the river (dep. Mrs. Grondin, vol. 1, p. 58). She says she left because the water was rising quickly. She went to the railway line. From there she took the children to a barn where they would be safe. It is apparent she was afraid of the flood. She came back to the railway line and there noticed that the ice was coming down. She saw ice, stumps and trees floating down the river. Asked what happened at the bridge, her answer is (ibid., p. 60):

> "R.—Au pont du C. N. R. l'eau minait le "pier". Il y a un "pier", je ne sais pas en quoi. L'eau a miné le "pier". Ensuite, les glaces sont arrivées, les glaces ont emporté les morceaux qui soutenaient la ligne, au-dessus du viaduc."

In speaking of the "pier" the witness evidently refers to the embankment, as is gathered from her following answers (ibid., p. 60, in fine, and p. 61):

> "Q.—Avez-vous regardé le remblai au bout du viaduc, le remblai de terre qu'il y avait là, avant d'arriver au pont?
> R.—Avant d'arriver au pont, je me trouvais en ligne droite, je ne pouvais pas voir le remblai de ce côté-ci.
> Q.—Je vous parle du remblai du côté de St-Cyrille. Vous aviez le viaduc au-dessus du chemin, ensuite, vous aviez un remblai en terre qui allait jusqu'au pont, de votre côté?
> R.—*C'est ce remblai-là que l'eau a miné.*
> Q.—C'est ce remblai que l'eau minait?
> R.—Oui."

Continuing her relation of what happened, Mrs. Grondin says (ibid., p. 61):

> "... Ma petite fille s'est mise à dire: "J'entends crier, crier l'express." J'ai dit: "non, il ne passera pas de chars, ils ont téléphoné pour ne pas qu'ils passent; il n'en passera pas certain." En disant cela, je me revire de bord, on les voyait.
> Q.—Où étaient-ils?
> R.—Ils étaient près de la "curve". J'ai dit à ma soeur et à ma petite fille: "Sauvez-vous, je vais aller en avant donner le signal." J'ai couru en avant des chars, j'ai crié, j'ai fait des signaux comme j'ai pu."

The train passed her; she saw the fireman hanging outside of the window of the engine's cab, and she told him to jump, which he did. Then the engine slowly dived in the gap (ibid., p. 62):

> "R.—Après que le chauffeur a sauté, l'engin s'est en allé et l'engin est arrivé bien tranquillement dans l'abîme.
> Q.—Là, il a enfoncé?
> R.—Il a enfoncé.
> Q.—Cela se trouvait à quel endroit, quand il a enfoncé? Etait-ce sur le viaduc ou sur le remblai?
> R.—C'était dans le remblai et dans le viaduc. Il n'y avait plus à voir comment c'était, c'était tout miné.
> Q.—Vous rappelez-vous si l'eau a monté très rapidement cet après-midi-là?
> R.—Oui, ça s'est fait vite."

In addition to the depositions of these three witnesses, we have the testimony of Sévérin Pineau, who was on April 8, 1928, and still is agent of the C. N. R. at Drummondville. On the date of the accident he was off duty. He lived on a street which leads to the river, the second one abov ethe railway bridge. At noon he went to the river: the water was fairly high, but normal for the season; there was no ice, except for an odd piece from time to time; he was told by one Fournier that the ice had gone down during the night (dep. Pineau, vol. 2, p. 14).

At about four o'clock in the afternoon, he went out and proceeded towards the railway bridge. The river had risen and large quantities of ice were then flowing down; there was however nothing abnormal at first. From where he stood he could not see the railway embankments on either side of the river. After a few minutes he drew closer to the railway. He noticed that at one place the embankment on the east side of the river was commencing to disaggregate (ibid., pp. 15 and 16). His first thought was to go and signal the train, but looking at the time he realized that the train had left St. Cyrille, which is the first station east of Drummondville, and that he had not enough time to cross over to the other side of the river to give the signal. He telephoned to the station agent and told him to call the dispatcher. He went out again with the intention of returning to the river but came back home to inquire if the operator had succeeded in getting St. Cyrille; the answer was in the affirmative, but the agent told him that the train had passed St. Cyrille and that it had been impossible in the circumstances to stop it (ibid. pp. 17 and 18).

On Sunday afternoon (April 8), shortly after two o'clock, Miss Alice Duval, who lives on the east side of the river a good distance upstream from the Grondins, went out with Mr. Grondin and they proceeded in the direction of Hemmings Falls. The basin between Drummondville and Hemmings Falls was clear of ice.

When they were about half a mile from the dam, they heard a noise which seemed like an explosion of dynamite (dep. Duval, vol. 2, pp. 3 and 4). They started back home; after walking a certain distance, she could see, through a glade, the ice coming down the river. They continued to walk in great haste. At a distance of somewhat less than half a mile from the bridge, they heard the whistle of the train and almost simultaneously a loud noise; at the same time they saw steam rising up high (ibid., pp. 5 and 6).

Miss Duval says she left home about 2.15 p.m., and heard the detonation probably a little more (un petit peu plus) than three quarters of an hour later; this would mean shortly after three o'clock. From the Hemmings Falls dam to the railway bridge the distance is a little over two and a half miles. If the ice started to move down immediately after the explosion and travelled at a rate of five miles, which is the speed mentioned by the defendant's experts, it reached the C. N. R. bridge around 3.40 or 3.45. This coincides with and corroborates the statements of the previous witnesses as to the time.

Further corroboration is derived from the deposition of Dunfield and exhibit Z7. This exhibit is a chart from the automatic water level recorder at the defendant's plant at Hemmings Falls from the 8th to the 14th of April, 1928, inclusively. Referring to this chart Dunfield says (vol. I, p. 105):

> "This exhibit Z-7 also shows what the water did during the periods from midnight until the final breakup, which is shown on this chart just about three o'clock."

The peak of the flood was reached at 3 p.m. on Sunday; it rose to elevation 325.6 (ibid., p. 105 in fine, and p. 106). It was at 3 p.m. that the ice and water toppled over the dam in huge quantities; the chart exhibit Z7 indicates from 3 o'clock a sudden drop of the water level. Reckoning with a distance of somewhat over two miles and a half from the dam to the C. N. R. bridge and a speed of five miles an hour, the ice and water which jumped over the dam arrived at the railway bridge in the neighbourhood of 3.40 or 3.45 p.m. This tallies with the versions of Guèvremont, Marier, Mrs. Grondin and Pineau.

On the same occasion and at the same time the embankment on the west side of the river was also washed out: see deposition Dupuis, vol. 11, pp. 43 and 44, and the photographs exhibits 52 and 53. Moisan sets the time at which the embankment on the west side of the river was washed out at between 3.20 and 3.30 (dep. Moisan, vol. E, p. 15). It is quite obvious that the ice and water leaving Hemmings Falls dam at 3 o'clock could not possibly reach the C. N. R. bridge at Drummondville in twenty minutes, and I doubt very much, with the evidence I have before me, whether it could reach it in thirty minutes. I am inclined to believe that the ice and water which leaped over the Hemmings Falls dam at 3 o'clock did not arrive at the railway bridge before 3.40 or perhaps even 3.45.

I do not think that any blame can attach to the plaintiff, in the circumstances, for not having stopped the train; it was impossible, in my opinion, to do it.

Great stress was laid by counsel for plaintif on the fact that the superintendent or other person in charge of the defendant's plant at Hemmings Falls had not notified the railway authorities at Drummondville of what had occurred at the dam. It is proven that no notification was given on the day of the accident and it is also established that notifications of the break-ups have since been given every year. It is hard to say what the railway authorities would have done if they had been notified on the 8th of April, 1928, a few minutes after 3 o'clock, that the defendant company had lost control of the ice and water accumulated in the basin above its dam at Hemmings Falls and that the ice and water was running down in enormous quantities. There is no doubt that, if the agent at Drummondville, upon receiving such notification, had thought that there was any danger, he would have had plenty of time to stop the train either at St. Cyrille or even points further east. St. Cyrille is approximately five miles and a half from Drummondville; the last stop of train No. 45, before reaching Drummondville, was at Aston Junction, which is about 27 miles east of Drummondville (see deposition St. Pierre, vol. 1, pp. 9 and 10) ; there were however many intermediate stations at which the train could have been signalled.

It is possible that the fall of the train could have been avoided if semeone at the power house at Hemmings Falls had only thought of notifying the C. N. R. agent at Drummondville of the break-up and what had followed. The power house was flooded and everything was pretty much disorganizcd and apparently nobody thought of calling up the agent. I must admit that I would feel loath to hold the defendant company responsible solely on this omission. I may say however that anyone interfering with the natural flow of water courses, be it with the authorization of a legislature, should take all possible precautions — and in such matters it is infinitely better to show an excess of precaution than a lack of prudence — to avoid disasters like the one which occurred on that Easter Sunday.

If it were impossible for the plaintiff to prevent the train from falling down the embankment, as I think it was owing to the suddenness with which the embankment was washed out less than half an hour before the train arrived, can it be said that the plaintiff should have foreseen the possibility of the catastrophe and taken the means of preventing it? In other words, should the plaintiff have done something to prevent the accident, which it did not do and could have done? I do not think so for the following reasons.

The embankment had resisted the floods and ice break-ups ever since its erection in 1887. Apparently it was properly and solidly built. True it is that the defendant has attempted to prove that, during the break-up of 1918, the embankment at the west end of the railway bridge had been damaged by water and ice coming down the river. Let us try to determine what were the source and the extent of the damage caused on that occasion.

Dick, who in 1918 was employed as engineer by the Morrow & Beatty Company, which built the dam and power house at Drummondville for the defendant company, says that he went to Drummondville about the 21st of March, 1918, and that it was part of his duties to observe the action of the river during the break-up period in order to see what would happen, so that his employers could protect themselves from future floods, after the construction work was under way (dep. Dick, vol. D, p. 3). On April 3, 1918, he took a photograph, which he filed as exhibit I. He says that the photograph was taken a day or two after the break-up had occurred. It shows a cavity near the end of the embankment on the west side of the river looking from upstream. The witness was unable to tell the dimensions of this cavity except in so far as saying that it was quite large, large enough in his opinion to be a source of danger for train operation (ibid., p. 4, in fine, and p. 5).

On this point we also have the evidence of Toupin, Poulin and Tessier.

Toupin, who in 1928 was section foreman for the C. N. R. and has been on the pension list since April 1, 1932, was shown the photograph filed as exhibit I. He says that he saw the cavity in question, that it was about five feet long by two feet wide and that it seems bigger on the photograph than it really was (dep. Toupin, vol. 2. R2, p. 12):

> "R.—Oui. Il y a une place en bas du "pier", tout à fait en bas du "pier" à droite du pont, il y a une place qui avait été lavée par l'eau, une petite affaire, à peu près cinq pieds de long sur à peu près deux pieds de large.
>
> Q.—Est-ce que c'était aussi considérable que cela semble l'indiquer dans cette photographie?
>
> R.—Non, pardon, pas pour moi.
>
> Q.—Est-ce vous qui avez fait la réparation?
>
> R.—Oui. En haut de cela, ici, en haut de la partie qui a été lavée, il y a une partie qui était descendue, un "ballast" pour les piétons qui descendaient à la rivière."

In the witness' opinion the cavity did not affect the solidity of the embankment (ibid., p. 12):

> "Q.—Etait-ce quelque chose qui pouvait affecter la solidité du remblai?

R.—Non, cela n'affectait rien, ce n'était pas pour la peine."

Speaking of the repairs, which were made three or four months later, Toupin has this to say (ibid., p. 13):

"Q.—Qu'est-ce que vous avez fait? Quels sont les travaux que vous avez faits à cet endroit-là?
R.—A peu près trois ou quatre mois après...
Q.—Trois ou quatre mois plus tard?
R.—Oui. C'avait à peu près aucune valeur.
Q.—Qu'est-ce que vous voulez dire par "aucune valeur"?
R.—Cela n'avait aucune importance, je veux dire. On a rempli cela trois ou quatre mois après. On a mis de la pierre. J'ai jeté à peu près la valeur de deux voyages de chevaux là. J'en ai mis la moitié dans la partie lavée et l'autre en bas.
Q.—Ce serait un voyage à peu près, un tombereau de terre?
R.—Oui, en haut, où est la partie descendue pour (evidently this is an error and the word should be "par") les piétons, là on a mis à peu près une couple de voyages de "ballast". C'est ce que l'on avait l'habitude de mettre tous les deux ou trois ans, parce que les piétons descendaient là, à la rivière, et cela se descendait."

The cavity shown on the photograph exhibit I is the only one the witness ever noticed from 1887 to 1928 (ibid., p. 27).

Poulin, a trackman on the C. N. R. for twenty years, whose duty was to inspect the line every day and make whatever repairs were required, says that, to his knowledge, the railway bridge and embankments never suffered any damage by reason of the ice break-ups. Shown the photograph exhibit I, he states that he never saw this cavity (dep. Poulin, vol. R2, p. 44). He explains his ignorance of it in saying that he worked sometimes on the west side of the river and sometimes on the east side, according to the foreman's instructions (ibid., p. 45); his section of the line in fact extended both east and west of Drummondville.

An admission was made by counsel for defendant that Noel Tessier, another trackman, would corroborate the testimony of Poulin; the admission immediately follows Poulin's deposition (ibid., p. 47).

An undeniable fact is that the embankment in question withstood the brunt of the ice break-ups every spring since 1918 and particularly the flood of 1921, without suffering any damage. In this particular respect see deposition Pineau, vol. 2, p. 19.

It is difficult to judge of the dimensions of the cavity shown on the photograph exhibit I; photographs are sometimes deceptive. If the cavity was only filled three or four months after it was made, it apparently did not affect the solidity of the embankment. Dick says it was quite large; Toupin, on the other hand, declares it was only five feet long by two feet wide and that it was of no consequence. No figures were mentioned regarding its depth. I am not inclined to think that this cavity had as much importance as Dick is disposed to ascribe to it. Besides I am not absolutely convinced that this cavity was caused exclusively by the action of the ice and water; undoubtedly the break-up and the flood which followed had a great deal to do with this erosion, but the continual use of this part of the embankment by persons desiring to go to the river may very likely have been the origin or the source of the trouble: on this subject see deposition Toupin, vol. R2, pp. 12 and 13. When once the surface, or the crust as witness said, is gone it takes less force and less time to wear away the inner part: Toupin has expressed this opinion (ibid., p. 26) and I believe he is right.

As to the solidity and state of repairs of the roadbed in general in the section between Charny and Ste. Rosalie, we have the evidence of Brousseau, who from 1913 to 1920 was engineer for the Levis division and in 1920 was promoted to the position of district engineer; at page 33 of his deposition (vol. R2), he says:

> "Q.—Au point de vue solidité, comment sont-ils, ces travaux-là, comment étaient-ils au mois d'avril 1928?
>
> R.—Ils étaient en très bon état. La ligne de Drummondville a toujours été la ligne où nous dépensons le plus d'argent pour l'entretien des voies à cause de la rapidité des trains et du service fréquent."

A fact worth noting is that the Maritime Express of the C. N. R. from Montreal, eastward bound, passed on the Drummondville bridge on the 8th of April, 1928, after one o'clock in the afternoon without accident.

Noel Tessier, a section man with the C. N. R., passed on the embankment between 7.15 and 7.30 a.m., and again between 8.30 and 8.45 a.m., on Sunday and found everything in order (vol. 11, p. 87).

It seems to me evident that up to 3.45 p.m., or even a few minutes later the embankment was in good condition; it was corroded and worn away all of a sudden and in a very short time.

In the case of *The King V. The Nashwaak Pulp and Paper Co.* (1), not cited at bar but concerning which I believe it is perhaps appropriate to say a few words because of its analogy with the present one, the fact were briefly as follows. On Monday morning, the 10th of May, 1920, a freight train of the Canadian National Railways left Marysville, in the County of York, in the Province of New Brunswick, at 5.30 and at 1¼ miles therefrom when it came to the west embankment of the railway bridge crossing the Nashwaak River ,the engine, the tender and two cars went over the embankment. As a result two members of the crew were killed, one was injured and the tracks and rolling stock were damaged. The Crown sued for the recovery of the damages suffered.

There had been a heavy rain on Saturday and Sunday, the 8th and 9th of May; the river had risen during these two days. Freshets were manifested at different places, around the date of the accident. About three quarters of a mile below the railway bridge, the defendant company had erected a concrete dam and in 1919-1920, at 1000 feet above the dam, had five piers set across the river at the same height as the dam, composed of two shore abutments and three piers, in front of which was a floating boom tied to the piers, for the purpose of gathering the logs. In the result two new piers had been added at that time. The work had been approved by the provincial government.

(1) 21 Ex. C. R., 434.

The theory of the Crown was that during the night preceding the accident the top of the piers had given way under the pressure of the logs; no witness of the occurrence was called. The plaintiff contended that the gathering of a large quantity of logs at the piers had the effect of raising the water three feet higher than the highest level ever reached and that, assuming the logs had gone over during the night preceding the accident, the flow of the water being impeded by the logs, in receding suddenly, had created a suction under the embankment of the railway bridge.

In his judgment, the Honourable Mr. Justice Audette, before whom the case was tried, says that while the above theory is supported by some evidence and contradicted by other, it may be stated that, under conflicting evidence, it was so asserted; and he adds that it was admitted at the trial that the evidence did not disclose the cause of the accident.

The learned judge then states that there was enough positive evidence to justify the inference that it was not good workmanship to construct of sand and gravel an embankment 18 feet high on the edge of a shore without the protection of rip-rap.

The indifference of the railway authorities to the possibilities of trouble was, in the opinion of the Court, further manifested by the fact that the workmen engaged in the construction of the embankment had been taken away before the same had been completed to the satisfaction of the person in charge of such construction.

The Court moreover reached the conclusion that there was no evidence that the river had risen two or three feet, that this contention was only based upon the evidence of witnesses who gathered it from indicia upon the ground and particularly upon the evidence of a railway section man who, at about 9 o'clock on the morning of the 10th, made a mark on a telegraph post at the height he thought the water had gone up to; now, as it had been raining for several days and the post must have been soaked with rain from top to bottom, the Court wondered how the witness could distinguish with certainty the wet from the rain and the wet from the water of the river?

Furthermore if it were in evidence that on Sunday and even on Monday morning there was a large accumulation of logs occasioned by the piers, there was no proof that this had interfered with the flow of the river below.

The evidence disclosed that the railway authorities knew that the roadbed was not in good condition; in fact the engineer of the freight train testified that at the time of the accident he was proceeding at a speed of 5 to 6 miles because he had received instructions to limit the speed to 10 miles an hour due to the softness of the ground. The learned judge, in this connection says (p. 443):

> "Would not the limiting of speed to such a low rate as 10 miles an hour for these reasons amount to the knowledge that their tracks or right of way was in precarious condition and that it would be as plausible to surmise or accept the theory that the accident might have been the result of this bad state of the right of way rather than that assumed sudden receding-of water, in the river — which no one ever saw?"

After considering and discussing other points of lesser interest, the learned judge concludes (p. 445):

> "However, the onus was upon the plantiff to prove his case, and this onus was not discharged by the evidence adduced from which inferences merely could be drawn and which failed to negative the possibility of the accident having been occasioned by other causes which are just as plausible, if not more, than that surmised and relied upon by the plaintiff. The plaintiff failed to show with any reasonable degree of certainty — there is no direct evidence, flowing from weighty, precise and consistent presumptions or conjecture arising from the facts proved — that the accident was actually caused by the positive fault, imprudence or neglect of the defendant. In the result I must find that the plaintiff has failed to prove his case."

The facts and the evidence in the aforesaid case and the present one differ materially.

In the Nashwaak case there was no direct evidence; no one had witnessed the rise of the river; the proof concerning the water level was merely based upon indicia on the ground and the mark which a man had put on a telegraph post at the height to which he surmised the water had risen, when this post might just as well have been wetted by the rain as by the water from the river. In the present case we have the evidence of several persons who, having lived alongside the river for years, saw the manner in which it behaved during the break-up period every spring prior to as well as after the construction of the dams, who, not only in 1928, but also in 1927, 1929 and 1932, actually witnessed the ice break-ups and the floods, many of whom took measurements and soundings to ascertain the level of the water and the thickness of the ice and frazil, and who were accordingly in a position to give and did give evidence of positive character.

Moreover in the present case there was no indication, as in the Nashwaak case, that the embankment was not in good condition; on the contrary the evidence shows that, until a few minutes before the arrival of the train, everything was in order.

No attempt was made by the defendant herein to prove that the embankment had not been properly constructed and maintained, except for the fact that, on April 3, 1918, Dick, to whose testimony I have previously referred, noticed a cavity in the embankment on the west side of the river; I have already dealt with this cavity and I see no necessity to add anything to my remarks.

The facts in the two cases are so different that, in my humble opinion, the decision in the Nashwaak case cannot be of any help in the solution of the issues herein.

I may say however that I fully agree with the view of Mr. Justice Audette that the onus rested on the plaintiff to prove his case. I think that the plaintiff herein has discharged this obligation.

The defendant contends that the accident is attributable to acts of nature or, in other words, to *vis major*.

I cannot agree with this contention. I do not believe that, without the dam at Hemmings Falls, the embankment would have been washed out, even though the river might possibly have carried, on the 7th and 8th of April, more ice and water than on previous occasions. Relying on the evidence adduced regarding the behaviour of the river from 1887 to 1924 during the break-up period, I think that the river would have taken care of its water and ice gradually and normally. The ice at Bergeron's, at Labonté's and even at Dauphinais' would, in my opinion, have gone before the arrival of the ice from Richmond and other places upstream, as it had always done in the past according to the very cogent evidence on this point. As I have already said, the hogsback, to which the defendant's experts are inclined to attach a good deal of importance, would not, in my opinion, have caused a jam sufficiently solid to hold back the flow until the ice from upstream would have reached it; the experience of the past is there to show that it never did. Furthermore it seems obvious to me that a jam formed at the hogsback could not have impounded the huge quantities of water and ice which the Hemmings Falls dam imponded in 1927, 1929, 1928 and 1932. The proof shows that no jam ever did, prior to the construction of the dam and I have no reason to believe that it would have been different in 1928, had the dam not existed. I am not suggesting that the hogsback could not, and, as a matter of fact, did not impound a sufficient quantity of water to flood certain properties upstream bodering on the river, particularly those being on a low level, and it may well be that in 1928 the quantity of water held back would have been greater than in the previous years due to the increased flow resulting from the prolonged mild weather; but I am satisfied that, when the final break-up would have taken place, the jam stopped on the hogsback at Labonté's would, as in the past, have gone down with the ice and water impounded behind it before the jams from points upstream would have arrived and that the additional quantity of water and ice held back in 1928 by the jam, in consequence of the mild weather, would not have been so much greater as to affect the embankment which had withstood the assault of the ice break-up for over thirty-five years. At least there is nothing in the record to induce me to believe the contrary. My conclusion is accordingly that the plea of *vis major* is unfounded.

I can understand the learned judge of the Superior Court and dissenting judges of the Court of King's Bench arriving at the conclusion that the dam was only partially guilty for the flooding of Dauphinais' and Labonté's properties in 1927 and 1928 and that part of the responsibility was imputable to acts of nature, although I am not prepared to say that I would have, in the manner they did, apportioned the responsibility; it is evident that the danger of floods above Hemmings Falls existed before the dam was built; the erection of the dam did not create the danger, but it increased it to a very great extent, in spite of the fact that the defendant company acquired large strips of land to widen the bed of the river. It is clear that any obstruction in a river, be it natural or artificial, interferes with the flow and is liable, when the temperature gets below the freezing point, to cause ice jams. If, owing to climatic conditions, the quantity of water and ice held back by a jam is larger, the flood upstream is naturally bound to be more serious and to cause greater damages.

The conditions below the dam however are different. The dam has greatly affected the flow of the river downstream, especially during the break-up period; instead of the ice and water running out in a natural and normal way, both, with the exception of what goes over the spillway or is allowed to pass through the sluice gates of the power house, accumulate behind the dam in enormous quantities; when the mass of water and ice thus accumulated becomes too great, the dam is apt to lose control, as it did in 1928, and the overflow of water and ice, bound to find an outlet, leaps over the dam or passes round its extremities or does both; on the fatal Sunday afternoon huge quantities of ice and water, which, if they had not been held back by the dam, would have run out gradually in an open river on account of the persistently mild weather, toppled over the dam and rushed down with an irresistible force, tearing away and carrying with them every obstacle they met, barns, trees, stumps, etc., including the railway embankments. As I have said before, I have no reason to believe that the river, in its natural state, would not have taken care of the jam caused by the hogsback, assuming that one would have formed there, which is not at all certain, and carried it downstream without any damage to the embankment, notwithstanding the increased flow resulting from the mild weather of the previous days.

There are a few incidental questions about which it is perhaps not inexpedient to say a few words.

Surveyer, with the aid of information obtained from persons who had witnessed the ice break-up in 1928, prepared a chart which was filed as exhibit Z24 (previously referred to) indicating the movements of the jams from Lennoxville down to Labonté's on the 6th, 7th and 8th of April. His conclusion is that all the ice from upstream arrived at Labonté's before the jam at that point gave way (vol. J, pp. 24 to 27). I believe this chart is fairly accurate. Bergeron (vol. 6, p. 104) says that the ice from Richmond arrived opposite his property at about six o'clock p.m. on the 7th; this coincides with Surveyer's time. It is evident to me that the enormous quantity of ice and water impounded in the basin during the few days which preceded the final break-up was greatly increased by the flow of ice and water coming from upstream. A moment came when the quantity of ice and water in the basin was so great that the dam could not hold it back and the inevitable happened; the excess of ice and water went over the dam. If the dam had not existed, I think there would have been no jam at Labonté's on Saturday night when the ice and water from above arrived, and the latter would, in my opinion, have flown down the river unimpeded; and I see no reason to believe that this ice and water running down normally in a river in a state of nature, though likely somewhat more abundant than in most previous years as a result of the persistently mild weather — we must not overlook the fact that ice and water would have been gradually flowing down in an open river for three or four days prior to the day of the accident, due to the high temperature — would have been sufficient to damage the railway embankment.

Much evidence was adduced regarding the flood which occurred at Richmond on the 6th and 7th of April, 1928. I do not think that this evidence is of much utility, except perhaps to show that at Richmond, as in any other section of the St. Francis river, the inflow was somewhat bigger than usual owing to the mild weather. As a result of this increased inflow the flood at Richmond during the night of the 6th and the morning of the 7th of April was to some extent more serious than it had previously been: see deposition Brouillette, vol. C, pp. 3 et seq. and the photographs filed at exhizits C, D and E; see also depositions Whitcher, vol. B, pp. 2 et seq.; Frank Bédard, vol. B, pp. 2 et seq.; Burns, vol. H, pp. 2 and 3; Mairs, vol. A, p. 2.

The central part of the town, which was flooded, is comparatively low (dep. Brouillette, vol. C, p. 11); Towle filed as exhibit U a plan showing some elevations taken by him at Richmond on December 7, 1932: see dep. Towle, vol. G, pp. 42 to 44. Floods in that section were not unusual (dep. Burns, vol. H, pp. 4 and 5; Whitcher, vol. B, p. 15). The evidence discloses that an ice jam forms almost every year at a place called the "Narrows", a mile or so below the highway bridge at Richmond and that, apart from the river being very narrow at that spot and making a bend, there are numerous obstacles in it, such as ice breakers, piers, rocks and even what has been referred to as an artificial island (dep. Whitcher, vol. B, p. 12; Bédard, vol. B, p. 7; Mairs, vol. A, p. 7). This jam naturally causes the water to flow back; hence the floods. In view of the peculiar conditions of the river at Richmond, the fact that jams and floods occurred there periodically can be of no assistance in the present case. The same remark applies to the evidence adduced in connection with floods at other points upstream.

Let us return for a moment to the tests with the thermite. During the morning of the 8th of April, Dunfield, Kitson, Rutherford and two labourers went up to a point on the river opposite Bergeron's, at a distance of approximately fifty feet from the shore and there exploded a can of thermite with the object of relieving the pressure (dep. Dunfield, vol. I, p. 86); the place where this can of thermite was used is indicated on plan exhibit Z5 by a cross in a circle, to which points an arrow, at the other end whereof is the inscription "Thermite unit 10.30 a.m. April 8". The explosion apparently did not have much effect. An hour or so later another can of thermite was exploded lower down in the basin at a spot also indicated in the same manner with the inscription mentioning the time however as being 11.30 a.m. instead of 10.30 a.m. According to Dunfield (ibid. p. 84) this second experiment had no more effect than the first one.

Albert Manseau and Alphonse Bergeron were present when the first can of thermite was exploded. Manseau refers to a conversation which he and Bergeron had with one of the employees of the defendant company (Dunfield), who told them that they had to use thermite in order to protect their plant (dep. Manseau, vol. 6, pp. 84 to 88). The conversation between Manseau and Dunfield was in English; Bergeron, who does not understand English, says that Manseau translated for him, there and then, into French the conversation; his version agrees with that of Manseau (dep. Bergeron, vol.

6, pp. 98 and 99). Seeing that Dunfield has said that he does not understand French, the translation of his alleged conversation with Manseau for the benefit of Bergeron may perhaps be considered as hearsay evidence. On the other hand, Dunfield does not deny that the conversation referred to by Manseau and held in English took place; he contents himself with saying that most of the people looking at the experiment were French and that, as he does not understand French, it is probable that he did not speak to them; he adds that he does not remember talking to anyone, except that he might have made some casual remarks (dep. Dunfield, vol. I, p. 86). I am satisfied that the conversation related by Manseau did take place. It shows that the people in charge of the Hemmings Falls plant were becoming alarmed over the situation and thought that their plant was exposed, if not to destruction, at least to serious damage. It is difficult and perhaps idle to fancy what would have been the consequences downstream if the thermite had produced the effect which Dunfield and his assistants were anticipating, but I am inclined to believe that the disaster at the railway embankment would have been hastened and possibly aggravated.

Another question about which I should perhaps make a few brief remarks is that of the manipulation of the sluice gates.

It has been said that, with a flow of 50,000 cubic feet per second or more, when the sluice gates are wide open, the flow of the river is the same as if there were no dam. I must candidly admit that I was surprised at this statement; be that as it may, it nevertheless remains that on the 7th and 8th of April there was impounded above the Hemmings Falls dam huge quantities of ice and water, the elevation whereof, between Saturday night, at 7 o'clock, and Sunday afternoon, at 3 o'clock, varied between 316 and 320.5, that the basin was practically filled to capacity from Saturday night to Sunday afternoon and that, when the ice from above arrived at three o'clock on Sunday afternoon, causing a sudden rise, the basin being full, the dam lost all control and was unable to hold it back and, as we know, tremendous volumes of ice and water toppled over the dam and ran down the river carrying with them every obstacle in their way.

The defendant should have taken all possible precautions to minimize the danger not only to its plant but to properties downstream; I am inclined to think that the disaster might have been averted had the defendant manipulated its sluice gates in such a manner as to lower the level of the water in the basin as much as possible, by opening the four gates wider from the time the weather turned decidedly mild, on Thursday, and the inflow increased, until after the final break-up on Sunday afternoon. At 7.40 p.m. on Saturday, the level having dropped from 320.5 to 317.8, gate 1 was closed; five of the six turbines at the power house were then in operation. I quite understand that the defendant company had to keep the water at a certain level to operate its turbines. On the other hand it had duty of adopting all the means at its disposal to avoid causing damage to other people's properties; this it did not do. At 8.50 p.m. on Saturday gate 1 was raised five feet, because the flow had increased according to Dunfield (vol. 3A, p. 10); at 9.40 p.m. the same gate was opened 10 feet and 9.55 p.m. it was pulled up clear of the water. At 10.25 p.m., the level and flow having decreased, gate 1 a.m. on Sunday, when it was opened 16 feet. From that time to three o'clock on Sunday afternoon, gate 1 remained in that position; at three o'clock, when the mass of ice from upstream arrived and the level rose to 325.6, gate 1 was wide opened; it was unfortunately too late. The officers of the company cannot claim that they were taken by surprise; they were well aware on Saturday that the break-up was imminent. On Saturday afternoon Dunfield drove up on the east side of the river as far as Benoit's (lot 19B of the township of Simpson) and noticed the ice opposite Dauphinais' starting to move down (vol. I, pp. 71 to 74). On Sunday morning, as previously stated, Dunfield, apparently uneasy, went up to Bergeron's with Kitson and Rutherford to try to relieve the pressure in the basin with the aid of thermite. In the afternoon he hired a team and went up to inspect the condition of the ice in the basin; he returned in haste apparently expecting trouble. Judging from his behaviour on Saturday and Sunday Dunfield felt unquiet. During all that time the gates were manipulated so as to keep the level of the water sufficiently high to operate the turbines. It is hard to say what would have happened had all the sluice gates been kept more widely open, or, if necessary, fully open, from Friday morning or even Friday night until 3 o'clock p.m. on Sunday, when the ice from above arrived at the dam, but it seems to me that it would have been more prudent and safer to drain off the basin as much as possible so as to make room for the water and ice flowing from upstream, even at the risk of momentarily stopping the turbines and cutting off the supply of electric current. I would have hesitated to hold the defendant company liable solely on the ground that it had not manipulated its sluice gates cautiously and judiciiously; there is too much uncertainty as to whether the defendant company would have succeeded, with the huge quantity of ice and water impounded in the basin by the dam, in lowering the level of the basin sufficiently to enable the dam to hold back the mass of ice and water arriving from upstream. At all events the question is of little, if any, practical interest seeing that I have reached the conclusion that the dam itself, independently of the manner in which the sluice gates were operated, has been responsible for the wash-out of the embankment.

Reverting now to the plea of *damnum fatale* I must say that I agree with Tessier, J. whose judgment was affirmed by the Court of King's Bench, in re Thomas v. Southern Canada Power Company when he says that "le fait que la débâcle sur la rivière S. François, en 1921, aurait eu lieu soudainement et après de grands abats de pluie, ne constitue pas une force majeure qui dégage la responsabilité de la défenderesse".

See *Corporation of Greenock and Caledonian Railway Company* (1), wherein the headnote reads as follows:

> "It is the duty of any one who interferes with the course of a stream to see that the works which he substitutes for the channel provided by nature are adequate to carry off the water brought down even by extraordinary rainfall, and if damage results from the deficiency of the substitute which he has provided for the natural channel he will be liable.
>
> A municipal authority, in laying out a park, constructed a concrete paddling pond for children in the bed of a stream and altered the course of the stream and obstructed the natural flow of water therefrom. Owing to a rainfall of extraordinary violence the stream overflowed at the pond, and, as the result of the operations of the authority, a great volume of water, which would have been carried off by the stream in its natural course without mischief, poured down a public street into the town and damaged the property of two railway companies:—
>
> Held, that the extraordinary rainfall was not a damnum fatale which absolved the authority from responsibility, and that they were liable in damages to the railway companies.
>
> Kerr v. Earl of Orkney (1857) 20 D. 298 applied. Nichols v. Marsland (1875-6) L. R. 10 Ex. 255; 2 Ex. D. 1 distinguished."

See particularly in the above case the notes of Lord Finlay at pp. 569 et seq.

After weighing carefully all the evidence, oral and literal, I can reach no other conclusion than that the dam of the defendant company at Hemmings Falls was responsible for the wash-out of the railway embankment at Drummondville on Sunday, April 8, 1928, and the derailment of train No. 45 of the Canadian National Railways and that consequently the defendant company is liable for the damages suffered by the plaintiff on that occasion. The accident was not, in my opinion, the result of *vis major* nor was it caused by the fault or negligence of the plaintiff.

There remains the question of the amount of the damages.

The plaintiff has established to my satisfaction that the amounts charged for the repairs to the structure and tracks rendered

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(1) (1917) L. R., App. Cas., 556.

necessary in consequence of the washout of the embankment and the repairs to the locomotive, the baggage car and the second class coach are fair and reasonable; I do not think it expedient to go into details and it will suffice to say that the amounts claimed in that respect are satisfactorily proven by the testimonies of Blackbird, Goodlat, Brocklehurst, Dawe, Darbon, Tweedie, to be found in volumes 9 and 12 of the evidence; also by exhibits 43, 58, 59, 60, 61, 62 and 63. I may point out that the plaintiff is only claiming the cost of the temporary repairs to the structure and the roadbed and not the cost of the permanent steel structure erected later.

The amounts paid for medical and hospital fees, ambulance and funeral expenses, indemnities to passengers and employees injured and to the legal heirs of employees killed and the wages paid to Conductor Blanchard during his disability have also been proven to my satisfaction: see depositions McRea (vol. 12, pp. 2 to 8) and Tweedie (vol. 9, pp. 5 to 10) and exhibits 44, 45, 46 and 47.

It was urged on behalf of the defendant that it cannot be called upon the reimburse the indemnities paid to passengers, employees and legal heirs of employees because it was not a party to any suit taken or arrangement made and that it had no opportunity of contesting the claims or discussing the quantum thereof. This contention, in my opinion, is ill-founded: the defendant company was at liberty to contest the validity of the claims or discuss the amounts thereof before this Court if it had seen fit to do it; there is not a tittle of evidence in the record on the part of the defendant to show that these claims were either invalid or exaggerated. I do not believe that any of the items under the head of indemnities are excessive; on the contrary they appear to me fair and reasonable. These indemnities were paid as a direct consequence of the derailment and in law are recoverable from the party responsible for the accident.

An item of $600. is claimed as grants for flagging the train. I am afraid that these items are too indirect or too remote and must for this reason be disallowed. There is no doubt that if Mrs. Grondin had not signalled the train the catastrophe would have been much more serious; considerable damages were avoided through the prompt and courageous action of this woman, and very probably also loss of life and injuries to other passengers and members of the crew; the defendant may be thankful to her for not having to pay larger damages. The awards were well deserved, but again I may say that they are not a direct consequence of the accident, in the strictly legal sense of the word.

The expenses claimed in connection with the auxiliary and wrecking train, the special train service and the temporary diversion of the regular trains, included in plaintiff's exhibits G, H and I with the particulars, have also been satisfactorily established: see depositions Tweedie (vol. 9, pp. 10 to 12, and vol. 12, pp. 2 to 8) and Sunderland (vol. 12, pp. 2 and 3); also the last three pages of exhibit 43.

The witness offered to bring into Court all the vouchers concerning the items mentioned in subparagraphs, D. E, F, G, H and I of paragraph 8 of the information, but counsel for the defendant declared that he did not require them: see dep. Tweedie, vol. 9, p. 17, in fine.

Tweedie, a travelling accountant in the employ of the Canadian National Railways, checked up the items in plaintiff's exhibits D, E, F, G, H and I with the particulars and prepared and filed as exhibit 43 a statement in which he revised and completed the charges made in said exhibits; he found that the plaintiff was entitled to claim $29,322.48 more than what is asked in the information.

My conclusion is therefore that the plaintiff is entitled to recover from the defendant the sum of $80,923.20, being the amount claimed in the information ($81,523.20) less the sum of $600. included in subparagraph F of paragraph 8 of the information under the heading of "Grants for Flagging train".

There will be judgment against the defendant for $80,923.20, with interest from the date hereof, and costs.

In the Exchequer Court of Canada

Friday, the Twenty-ninth day of November, A.D. 1933.

PRESENT:—

THE HONOURABLE Mr. JUSTICE ANGERS.

BETWEEN:—

HIS MAJESTY THE KING, on the Information of the Attorney-General of Canada,

Plaintiff;

— and —

SOUTHERN CANADA POWER CO. LTD.,

Defendant.

THIS ACTION having come on for trial before this Court at the City of Montreal, in the Province of Quebec, on the 29th and 30th days of November, A.D. 1932, the 1st, 2nd, 5th, 6th, 7th, 9th, 12th, 13th, 14th and 15th days of December, A.D. 1932, the 26th, 27th and 28th days of January, A.D. 1933, in the presence of counsel for the above named Plaintiff and the above named Defendant, upon hearing read the pleadings herein, and upon hearing the evidence adduced at trial, and what was alleged by counsel aforesaid, THIS COURT WAS PLEASED TO DIRECT that this action should stand over for judgment, and the same coming on this day for judgment,

THIS COURT DOTH ORDER AND ADJUDGE that the Plaintiff recover from the Defendant the sum of eighty thousand nine hundred and twenty three dollars and twenty cents ($80,923.20), with interest thereon from the date hereof, together with the costs of this action to be taxed.

By the Court,

(Sgd) Arnold W. DUCLOS,

Registrar.

In the Supreme Court of Canada

(On Appeal from the Exchequer Court of Canada)

BEFORE THE REGISTRAR IN CHAMBERS } Wednesday, the 5th day of December, A.D. 1934.

BETWEEN:—

The Southern Canada Power Co., Ltd.,

(Defendant) Appellant

— and —

His Majesty the King

(Plaintiff) Respondent.

UPON the application of counsel for the appellant, upon reading the consent of both parties as to the contents of the case and the declaration of the parties in the printed case;

IT IS ORDERED that the printing of exhibits 5 to 24 inclusive, 29, 30, 32, 34 to 40 inclusive, 42 to 66 inclusive, 68, 71, and 73 to 76 inclusive and also exhibits B, C, D, E, G, H, I, K, N to Z inclusive and Z1 to Z31 inclusive, in the case book to be printed for use on appeal in this Court, be dispensed with, and that 9 copies of the plans and photographs not printed in the case and filed as exhibits in the action, namely exhibits 6 to 24 inclusive, 29, 30, 32, 34 to 40 inclusive, 42, 51 to 56 inclusive, 64 to 66 inclusive, 71, 73 to 76 inclusive, B, C, D, E, G, H, I, K, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, Z1, Z2, Z3, Z4, Z5, Z8 to Z13 inclusive, Z27 to Z31 inclusive, be produced and filed in this Court.

J. F. SMELLIE,
Registrar.

CANADA **Cour Suprême du Canada**

(En appel d'un jugement de la Cour d'Echiquier du Canada)

The Southern Canada Power Co., Ltd.,

Défenderesse-Appelante,

— vs —

Le Roi

Demandeur-Intimé.

Les parties consentent à ce que le dossier imprimé en cette cause contienne les pièces qui sont actuellement imprimées en six volumes imprimés de la page 1 à la page 1110 inclusivement. Il devra être ajouté au dit dossier imprimé les pièces suivantes:—

1o—Le jugement forme 1 de la Cour d'Echiquier;

2o—Le présent consentement;

3o—Un ordre de la Cour, dispensant de l'impression des exhibits énumérés dans le consentement des parties et permettant de produire neuf copies des plans et photographies non actuellement compris dans le dossier imprimé.

4o—Le certificat du registraire quant au contenu du dossier.

OTTAWA, le 3 novembre 1934.

Jos. E. MARIER,
Alphonse DECARY,
Avocats de l'appelante,

L. E. BEAULIEU,
Avocat de l'intimé.

CERTIFICATE AS TO CASE

I, JOSEPH MARIER, hereby certify that I have personaly compared the annexed print of the Case in Appeal to the Supreme Court with the originals and that the same is a true and correct reproduction of such originals.

Drummondville, August 28th 1934.

(Signed) JOSEPH MARIER,
A Solicitor of the Appelant.

In the Privy Council.

No. 70 of 1936.

VOL. 6

ON APPEAL

FROM THE SUPREME COURT OF CANADA

BETWEEN

HIS MAJESTY THE KING on the information of the Attorney-General of Canada (*Plaintiff*) - - - - *Appellant*

AND

SOUTHERN CANADA POWER COMPANY LIMITED (*Defendant*) - - - - - - - - - *Respondent*

AND BETWEEN

SOUTHERN CANADA POWER COMPANY LIMITED (*Defendant*) - - - - - - - - - *Appellant*

AND

HIS MAJESTY THE KING on the information of the Attorney-General of Canada (*Plaintiff*) - - - - *Respondent*

(*Consolidated Appeals*).

RECORD OF PROCEEDINGS.

VOLUME 6.—PLAINTIFF'S EXHIBITS (CONTINUED); DEFENDANT'S EXHIBITS AND JUDGMENT OF THE EXCHEQUER COURT.

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