

MOSES OATES



WEATHER BOOK.

FOR 1881



Toronto News Co., Toronto.

American News Co., N. Y.

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MOSES OATES'

WEATHER BOOK

FOR

1881.

PUBLISHED BY THE
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AND THE
AMERICAN NEWS Co., NEW YORK.

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PREFACE.

WEATHER-FORECASTING AND ITS FUTURE.

IN presenting to the public this little volume, the author feels no small degree of diffidence. A general scepticism prevails amongst intelligent and educated people in regard to the possibility of making a fairly successful forecast of the weather for more than a few days, and one, who on what he believes to be scientific grounds, very imperfectly understood it may be, ventures to give the probabilities of the weather for a whole season is not unlikely to be classed with the astrologers, astro-meteorologists, and other humbugs who have reaped in Britain and the United States an abundant pecuniary harvest from the ignorance and credulity of the least intelligent classes, with whom one successful prediction of extraordinary weather has been ample atonement for twenty total failures. The scepticism alluded to is not in the least surprising. Meteorology has been until lately as imperfectly understood as geology was half a century since, and even yet is in that condition in which the most eminent of those who study it are obliged to search almost in vain after the few simple principles which will yet be found to underlie the whole system of the atmospheric movements of the globe.

But much has been done to encourage perseverance in the search. The patient and laborious collection and systematizing of the meteorological observations which for more than a century were conducted in a desultory manner, the vast array of meteorological statistics accumulated in recent years by the well equipped weather bureaus of the United States and of several European countries, and more important than these, the records of simultaneous observations made within the last two years at 500 stations scattered over almost every country north of the tropic of Cancer, are likely before many years have passed to result in the fulfillment of the prediction made by the eminent meteorologist, Mawry, of the United States Signal Service, that it will soon be possible to forecast the leading features of a coming season with a fair measure of success. In the meantime, the attempts made by the author and several other meteorologists on this continent, to draw inferences regarding the probable weather of a coming season from the partial observations and very imperfect data at command, are not

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without some interest. The author, who has taken a deep interest in meteorology from boyhood, attempted his first forecast in 1878. That forecast, which gave the probable degree of temperature, the rain and snowfall, and succession of changes for every month from the time it was made until the close of the following June, was verified in every particular. Encouraged by this more than looked for apparent confirmation of the theories upon which his forecasts were based, he, in October, 1879, made a second forecast, covering a similar period of time. The first three and a half months of the very peculiar winter of 1879-80 were exactly as had been predicted, and the remainder of the period, excepting a brief interval about the close of the winter, fulfilled his predictions. It would be too sanguine an expectation to hope that 90 per cent. of his predictions will continue to be fulfilled, but the failures no doubt in store, though unpleasant, will only lead to investigations into their causes and renewed diligence in seeking to understand the yet obscure laws which govern the variations of the seasons in successive years. Apart from the interest which may attach to the forecast for the coming winter and spring—which, owing to the obscurity of the indications of the present autumn was prepared with more than ordinary difficulty, and is presented to the public with less confidence than usual, the author hopes his weather book will be of some value in creating greater interest in the fascinating and useful science of meteorology, and in leading Canadians to a fuller appreciation of the fact that in climate, as well as fertility of soil, our Dominion compares favorably with the most favored climates in Europe, and excels the greater part of the world lying in the same latitude.

MOSES OATES.

November 20th, 1880.

P. S.—The author begs to thank the superintendent of the Meteorological Service of Canada, his able Deputy, Lieut. Gordon, R.N., (by whom the astronomical tables contained in this book were prepared), and the staff of Toronto Observatory, for valuable assistance given him, and the uniform kindness he has experienced at their hands.



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ONTARIO:—New Year's Day, Good Friday, Queen's Birthday, Christmas Day, Thanksgiving Day.

QUEBEC.—New Year's Day, Epiphany, Annunciation, Good Friday, Ascension, Corpus Christi, St. Peter's, St. Paul's, All Saints, Conception, Christmas, Queen's Birthday and Thanksgiving Day.

STAMP DUTIES.

On every promissory note, draft or bill of exchange:—

Not more than \$25.....	1 cent
\$25 to \$50.....	2 cents
\$50 to \$100.....	3 cents
If executed singly, for the first \$100..	3 cents
If executed singly, for every additional \$100 or fraction thereof	3 cents
On every draft or bill of exchange in duplicate, for first \$100	2 cents
For every additional \$100 or fraction thereof.....	2 cents
If executed in more than two parts, for each part for first \$100	1 cent
For each additional \$100 or fraction thereof.....	1 cent

The duties to be paid by stamps affixed to each promissory note, draft or bill of exchange, but the person affixing such stamp shall, at the time of affixing the same, write or stamp thereon the date at which it is affixed, and each stamp shall be held *prima facie* to have been affixed at the date stamped or written thereon, and if no date be so stamped or written thereon, such adhesion stamp shall be of no avail.

Penalty for neglecting to affix stamps, or for wilfully writing or stamping a false date thereon, \$100.

POSTAL INFORMATION.

LETTERS RATES, ETC.

Canada.—Letters posted in Canada, addressed to any part within the Dominion (including Manitoba, British Columbia and Prince Edward Island), 3 cents per $\frac{1}{2}$ oz.; if unpaid, such letters cannot be forwarded, but will be sent to the Dead Letter Office. If liable to more than the rate of postage, and insufficiently prepaid the letter will be forwarded to its destination and double the deficiency charged on delivery. Letters mailed at any office for delivery at or from the same office, are charged 1 cent each, and must be prepaid: otherwise they are sent to the Dead Letter Office.

Post Cards.—From any place in Canada to any other place in Canada or the United States, 1 cent each. British and Foreign, 2 cents each.

United Kingdom.—Postage on Letters, 5 cents per $\frac{1}{2}$ oz., whether by Canadian or New York Steamers. If sent unpaid, double postage will be charged.

Newfoundland.—Postage on Letters, 5 cents per $\frac{1}{2}$ oz. Newspapers (see "Transient Newspapers"). Post Cards, 2 cents each. Prepayment necessary.

United States.—The rate on Letters to the United States is the same as in Canada, and must be prepaid.

REGISTRATION OF LETTERS.

The Registration on Letters in Canada.....	2 cents.
On Letters for the United States.....	5 "
Or Letters for the United Kingdom.....	5 "
On Parcels, Patterns or Samples, in Canada.....	5 "
On Book Packets and Newspapers to United Kingdom.....	5 "

BOOK POST.

A Book Packet may contain any number of separate books, publications, works of literature or art, maps or prints, photographs, daguerreotypes, when not in glass or in frames containing glass; any quantity of paper, vellum or parchment [to the exclusion of letters]; and the books, maps, papers, &c., may be either written, printed or plain, or any mixture of the three; and may be either British, Colonial or Foreign. No package must exceed 4lbs., 6 oz., in weight, nor must the size exceed two feet in length, or one foot in width or depth.

Book Packets must be open at *both ends or both sides*, and must not contain any letter or sealed inclosure.

The rate on Book Packets between any two places in Canada, and to Newfoundland and the United States, is 1 cent per oz., which must be prepaid by Stamps.

PARCEL POST.

The charge on Parcels by the Parcel Post, which is limited to places within the Dominion, is 6 cents for every 4 oz., or fraction thereof (with 5 cents additional if Registered). No letter must be inclosed.

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Parcels cannot be transmitted by Post to any place beyond the limits of the Dominion of Canada, nor can any parcel be forwarded to British Columbia or Manitoba *via* the United States, which exceeds in weight the limit of 2lbs. 3 oz.

MISCELLANEOUS MATTER.

Miscellaneous matter described as under, may pass between places in the Dominion of Canada upon prepayment of a rate of 1 cent per 4 oz. The limit of weight is 4 lbs.

Under this head is comprised pamphlets, occasional publications, printed circulars, hand bills, book and newspaper manuscripts, printers' proof sheets, maps, drawings, engravings, photographs, when not on glass, sheet music, printed or written, deeds, insurance policies, &c.

This matter must be done up in covers, open at both ends or sides, or in such manner as to be easily inspected by the Post Office authorities, and must contain no Letter or other communication to serve the purpose of a Letter.

NEWSPAPERS AND PERIODICALS.

Newspapers and periodicals weighing less than 1 oz. each may be posted singly: if prepaid by Postage Stamp $\frac{1}{2}$ cent each.

TRANSIENT NEWSPAPERS.

When addressed to any place within the Dominion, Newfoundland, or the United States, they must be prepaid the following rates by Postage Stamp:—

If weighing less than 1 oz., half a cent each.

If weighing over 1 oz., one cent per four oz. or fraction of four oz.

On transient newspapers addressed to the United Kingdom the rate will be two cents per 4 oz.—to be prepaid by Postage Stamp. Each newspaper is liable to a separate rate of postage, whether sent singly or in a packet, and if above 4 oz. in weight, it is liable to two rates of postage.

PATTERNS OR SAMPLES WITHIN THE DOMINION.

Patterns and samples of Merchandise and Goods for sale, not exceeding 24 oz. in weight, may be posted in Canada, to be forwarded to any place within the Dominion, on payment by Postage Stamp of a rate of 1 cent per 4 oz.

Packages of Samples and Patterns, addressed to any place in Canada, may be registered on affixing thereto a postage stamp of the value of 5 cents in addition to the postage rate, and provided such packet be handed into the Post Office for registration.

Patterns or Samples must be sent in cover open at the ends, so as to be easy of examination. Samples, however, of seeds, drugs, &c., which cannot be sent in open covers, may be inclosed in bags of linen or such like material, fastened in such a manner that they may be readily opened; or in bags entirely closed, provided that

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they be transparent, so that the officers of the Post Office may be able to satisfy themselves as to the nature of the contents.

The packet may bear on the *outside* the address of the sender, in addition to the address of the person for whom it may be intended; and also a trade mark or number, and the price of the sample enclosed; *inside*, there must be no inclosure but the samples or patterns themselves. The particulars, however, of the trade marks, numbers, and prices, may be marked on the articles themselves, instead of on the outside of the packet, at the option of the sender.

UNITED STATES.

Patterns and Samples of Merchandise, when addressed to places in the United States, will continue to be subject to the special rate of 10 cents each, prepaid by postage stamps, and must not exceed 8 oz. in weight.

UNITED KINGDOM.

Patterns and Samples of Merchandise, when addressed to places in the United Kingdom, must not exceed 8 oz. in weight, and must be prepaid by postage stamp at the following rates:—2 cents per 2 oz. or fraction of 2 oz.

RATES OF POSTAGE ON LETTERS AND NEWSPAPERS FOR FOREIGN PLACES.

COUNTRIES.	Letters.	News- papers.	COUNTRIES.	Letters.	News- papers.
	P. ½ oz.	Each.		P. ½ oz.	Each.
Australia (except New S. Wales' Victoria & Queensland)	7 cts.	4 cts.	Mexico	10 cts.	4 cts.
Belgium			5 "	2 "	New South Wales
Cape of Good Hope ..	15 "	4 "	New Zealand	7 "	4 "
Cuba	5 "	2 "	Portugal	5 "	2 "
France	5 "	2 "	Queensland	15 "	4 "
Germany	5 "	2 "	Russia	5 "	2 "
Holland	5 "	2 "	St. Pierre et Miquelon	5 "	2 "
India	10 "	4 "	Spain	5 "	2 "
Italy	5 "	2 "	Sweden	5 "	2 "
			Switzerland	5 "	2 "
			Victoria	15 "	4 "

WEST INDIES—VIA NEW YORK AND HALIFAX.

Via New York for Costa Rica, Curacoa, Nicaragua and Panama, Letters 10 cents per ½ oz.; via New York for Hayti and San Domingo, Letters 7 cents per ½ oz.; via New York for Bermuda, Cuba, Jamaica, Danish West Indies and Bahamas, Letters 5 cents per ½ oz.; Newspapers, 2 cents each. West Indies, except where otherwise stated, postage on Letters via New York, 15 cents per ½ oz.; Newspapers, 4 cents each. Postage on Letters via Halifax, 10 cents per ½ oz.; Newspapers, 4 cents each.

USEFUL HINTS.

Register all valuable letters. Transmit money by Money Orders. Make complaints and inquiries in writing, and address the Postmaster-General at Ottawa. Preserve, and request correspondents to preserve, envelopes of mis-sent or delayed letters. Send to the

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MONEY ORDERS ON THE UNITED KINGDOM.

The Money Order Offices throughout the Dominion draw upon all the Money Order Offices in England, Ireland and Scotland, and the Channel Islands, for any sum up to £10 sterling; and grant as many orders for £10 sterling each as may be needed to make up the amount to be remitted. The terms are as under:

On Orders up to £2 10 sterling.....	20 cents.
" over 2 10 and up to £5 00.....	40 "
" " 5 00 " 7 10.....	60 "
" " 7 10 " 10 00.....	80 "

MONEY ORDERS IN CANADA.

In Ontario, Quebec, Nova Scotia, Manitoba, New Brunswick and Prince Edward Island.

On Orders up to..\$4.....	2 cents.
" " 10.....	5 "
Over \$10 and up to 20.....	10 "
" 20 " 40.....	20 "
" 40 " 60.....	30 "
" 60 " 80.....	40 "
" 80 " 100.....	50 "

MONEY ORDERS ON NEWFOUNDLAND.

For Orders up to £5.....	\$0 25
" over 5 and up to £10.....	0 50
" " 10 " 15.....	0 75
" " 15 " 20.....	1 00

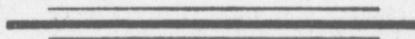
MONEY ORDERS ON THE UNITED STATES.

Money Orders on the United States are drawn in Canada currency, and may be for any sum not exceeding \$50 per one order.

For any sum not exceeding \$10.....	10 cents.
Exceeding \$10 and not exceeding \$20.....	20 "
" 20 " " 30.....	30 "
" 30 " " 40.....	40 "
" 40 " " 50.....	50 "

Money Orders issued in Canada on the United States, are converted into and payable at their value in United States currency.

Money Orders issued in the United States on Canada are drawn in United States currency, and converted into and payable at their value in Canada currency.



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SEAT OF GOVERNMENT—OTTAWA.

GOVERNOR GENERAL.—His Excellency the Right Honorable the Marquess of Lorne, K.T., G.C.M.G., P.C. **PRIVY COUNCIL.**—*Premier, Minister of Interior*, Rt. Hon. Sir J. A. Macdonald; *Minister of Finance*, Hon. Sir S. L. Tilley; *Minister of Militia and Defence*, Hon. Sir A. Campbell; *Minister of Public Works*, Hon. H. L. Langevin; *Secretary of State*, Hon. J. C. Aikins; *Minister of Railways and Canals*, Hon. Sir C. Tupper; *Minister of Agriculture*, Hon. J. H. Pope; *Postmaster General*, Hon. John O'Connor; *Minister of Justice*, Hon. James Macdonald; *President of the Privy Council*, Hon. L. R. Masson; *Minister of Marine and Fisheries*, Hon. James C. Pope; *Minister of Customs*, Hon. M. Bowell; *Minister of Inland Revenue*, Hon. G. Baby; *Speaker of the Senate*, Hon. D. L. Macpherson. **THE SPEAKERS.**—*Speaker of the Senate*, Hon. David Lewis Macpherson; *Speaker of the Commons*, Hon. Joseph Goderic Blanchet.

PROVINCE OF ONTARIO.

SEAT OF GOVERNMENT—TORONTO.

LIEUTENANT GOVERNOR—The Hon. John Beverley Robinson, Toronto. J. B. Robinson, jun., *Private Secretary*. **EXECUTIVE COUNCIL.**—*Attorney General*, Hon. Oliver Mowat; *Minister of Education*, Hon. Adam Crooks; *Commissioner of Crown Lands*, Hon. T. B. Pardee; *Commissioner of Public Works*, Hon. C. F. Fraser; *Treas. and Commis. of Agriculture*, Hon. S. C. Wood; *Secretary and Registrar*, Hon. A. S. Hardy.

SPEAKER OF THE ASSEMBLY—Hon. Charles Clark.

PROVINCE OF QUEBEC.

SEAT OF GOVERNMENT—QUEBEC.

LIEUTENANT GOVERNOR.—Hon. Theodore Robitaille. **EXECUTIVE COUNCIL.**—*Premier and Minister of Agriculture and Public Works*, Hon. J. A. Chapleau; *Treasurer*, Hon. J. G. Robertson; *Speaker Legislative Council*, Hon. J. J. Ross; *Attorney-General*, Hon. L. O. Loranger; *Solicitor-General*, Hon. W. W. Lynch; *Commissioner of Crown Lands*, Hon. E. J. Flynn; *Provincial Secretary*, Hon. E. T. Paquet.

THE SPEAKERS.—*Speaker of Legislative Council*, Hon. Henry Starnes; *Speaker of Legislative Assembly*, Hon. Arthur Turcotte.

THE OTHER PROVINCES.

LIEUT. GOVERNORS.—New Brunswick, Hon. Robert Duncan Wilmot, Fredericton; Nova Scotia, Hon. Adams George Archibald, Halifax; Prince Edward Island, Hon. T. Heath Haviland, Charlottetown; British Columbia, Hon. A. N. Richards, Victoria, V.I.; Manitoba, Hon. Joseph Cauchon, Fort Garry; Northwest Territories, Hon. David Laird, Battleford.

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ECLIPSES IN 1881.

During 1881 there will be two Eclipses of the Sun and two of the Moon.

First.—A partial Eclipse of the Sun, on May 27th. The Toronto time of first contact is 7 h. 17 m. p.m. This Eclipse will be partly visible in the Western portion of Canada.

Second.—A total Eclipse of the Moon on June 11th. The Toronto mean time of first contact with Penumbra 10 h. 57 m. Middle of totality, 0 h. 56 m. a.m. 12th. Last contact with Penumbra, 4 h. 14 m. a.m. 12th. This Eclipse will be visible throughout Canada.

Third.—An Annular Eclipse of the Sun, November 21st, Invisible in Canada.

Fourth.—A partial Eclipse of the Moon, December 5th. Invisible in Canada.

There will be a Transit of Mercury across the Sun's disc, on November 7th, Invisible in old Canada, but visible west of Lake Huron.

CHRONOLOGICAL CYCLES.—Dominical Letter, B; Epact, 30; Golden number, 1; Solar Cycle, 14; Roman Indiction, 9; Julian Period, 6594.

FIXED AND MOVABLE FESTIVALS.—Epiphany, January 6th; Septuagesima Sunday, February 13th; Quinquagesima—Shrove Sunday, February 27th; Ash Wednesday, March 2nd; First Sunday in Lent, March 6th; St. Patrick's Day, March 17th; Palm Sunday, April 10th; Good Friday, April 15th; Easter Sunday, April 17th; Low Sunday, April 24th; Rogation Sunday, May 22nd; Ascension Day, May 26th; Pentecost—Whit Sunday, June 5th; Trinity Sunday, June 12th; Corpus Christi, June 16th; St. John Baptiste, June 24th; St. Peter and St. Paul, June 29th; Michaelmas Day, September 29th; All Saint's Day, November 1st; First Sunday in Advent, November 27th; St. Andrew's Day, November 30th; St. Thomas' Day, December 21st; Christmas, December 25th.

MORNING AND EVENING STARS.

Mercury will be evening star about February 23rd, June 19th and October 15th; and morning star about April 7th, August 6th and November 24th,

Venus, evening star till May 3rd; morning star for rest of year.

Jupiter will be evening star till April 22nd; then morning star till November 13th; and evening star again for the rest of the year.

DECEMBER, 1879.

THE opening of the month was mild, the mercury ranging over Western Ontario from 40° to 50° in the shade. The weather continued mild until the 12th, when after the heavy rains of the two preceding days frost set in and "the spell of two weeks or a little more of cold weather" commenced. On the 15th the first sleighs made their appearance in Western Ontario. Though the snowfall was generally light, no drift occurred, and occasional flurries kept the sleighing in good condition till the end of the month. Two cold snaps occurred during this period, the first about the 21st, showing a minimum temperature at Galt of 6° below zero, and the second a couple of days after Christmas registering a minimum of about 3° above zero. Rain fell on the 24th to a depth of over an inch, and on the 29th the mercury stood at ten degrees above the freezing point. At Toronto the mean temperature of the month was $26^{\circ}.20$ —or nearly half a degree above the average of a long series of years. The highest temperature was 50° on the 10th, and the lowest 9° below zero on the 21st. Both rainfall and snowfall were greater than usual at Toronto, where rain fell on 7 days to a depth of 2.55 inches and snow on 17 days to a depth of 19 inches. The month was unusually cloudy. The highest temperature at Montreal was 48° , Pembroke 54° , Goderich 55° , Windsor 61° , and Hamilton 59° . The great lakes heated by the long duration of summer and temperature during the greater part of October of from 80° to 90° in the shade prevented in the Lake Region any approach to the cold dips felt elsewhere. While Goderich showed 3° below zero, and Windsor 6° below as their lowest, Winnipeg experienced the almost unparalleled cold for that district of $53^{\circ}.5$ below zero, Pembroke 39° below, Montreal 25° below, and Fredericton, N. B., $31^{\circ}.5$ below. While Ontario, particularly the Lake District, was rather warmer than usual, the North-West showed one of the coldest Decembers on record. Berlin, Prussia registered 12° below zero as early as the 10th, and for weeks, the Seine and Loire in France were covered with thick ice, and the snow lay 16 inches deep on the streets of Paris.

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JANUARY, 1880.

THIS month, like the previous one, corresponded with the predictions of Moses Oates, made the previous October, almost as closely as it could have done had the predictions been written at the close, instead of three months beforehand. New Year's day was bright and pleasant with a moderate thaw, but snow on the ground in most parts of peninsular Ontario. The 2nd of the month saw the snow vanish and the full commencement of a long period of mild weather. Snow and ice completely disappeared, buds formed and swelled and in some parts of the country opened into leaf, garden flowers looked as flourishing as in early April, steamboats ploughed the lakes, and the aspect of nature was not like that of the traditional Canadian winter. On the 15th the mercury in some parts of the peninsula did not rise above the freezing point, and during the remainder of the month, spells of moderate, but slightly thawing weather, alternated with warm weather. On the 20th the first snow of the month fell at Galt to a depth of nearly five inches. Rain fell the next day and on the 23rd an inch more of snow fell, bringing the total snowfall of the month up to $5\frac{1}{2}$ inches. Of course the snow almost immediately melted after falling. The rains were very evenly distributed between the 3rd and 30th. The rainfall at Toronto was 1.4 inches, or a little more than the average. The deficiency of snow was, however, great, and the month might, therefore, be called dryer than usual. The mean temperature was $32^{\circ}.7$ at Toronto, $33^{\circ}.6$ at Goderich, 32° at Woodstock, $35^{\circ}.4$ at Hamilton, $36^{\circ}.2$ at Windsor, 18° at Pembroke, and 23° at Montreal, and was probably the warmest January on record in Western Ontario. At Windsor and Hamilton, it will be observed, the month was warmer than the usual January of Milan, which is $33^{\circ}.2$, Turin $30^{\circ}.9$, Venice $35^{\circ}.3$ all in Italy, and St. Louis, Missouri, which is 32° . On the 20th the ice on Toronto Bay broke up for the season. In Europe the weather was in marked contrast with that of December, while the Maritime Provinces were warmer than usual, though not so much so as Ontario. Winnipeg, Manitoba, shows a mean temperature for the month of two-tenths of a degree above zero, or nearly three degrees above the average for a series of years. Montreal showed a maximum temperature of 45° , Pembroke $40^{\circ}.2$, Toronto $53^{\circ}.6$, Galt $58^{\circ}.6$, Hamilton $53^{\circ}.2$, Woodstock $57^{\circ}.4$, Goderich $57^{\circ}.3$, Windsor $59^{\circ}.7$, Winnipeg $39^{\circ}.9$, Fredericton, N.B., $45^{\circ}.9$, and Halifax 47° . Minimum temperatures were very high for the season in the lake region, being $20^{\circ}.2$ above zero at Windsor, $12^{\circ}.8$ at Hamilton, $11^{\circ}.2$ at Toronto, $10^{\circ}.5$ at Galt, $13^{\circ}.1$ at Woodstock, and $13^{\circ}.2$ at Goderich. Winnipeg registered 28° below zero, and Fredericton, N.B., $21^{\circ}.5$ below. The average highest daily at Hamilton and several other places was above 40° . At Galt only three days were wholly below the freezing point.



MOON'S PHASES.

FIRST QUARTER, 7th, 2.41 a.m.
 FULL MOON, - 15th, 6.16 a.m.

LAST QUARTER, 23rd, 3.20 a.m.
 NEW MOON, - 29th, 7.30 p.m.

APOGEE, 13th, 9.42 p.m.

PERIGEE, 10.42 p.m.

Day of Month	Day of Week.	SUN.				RECORD 1880 AND PREVIOUS YEAR.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	S	7	34	4	34	1863.—14° T.: '76, 67° Windsor: '80, thaw, sleighing	
2	S	7	34	4	35	Lowest temp. month Windsor 20°. 2: T. warm. [gone.	
3	M	7	34	4	36	Heavy rains: 1.4 in. at Granton.	
4	T	7	34	4	37		
5	W	7	34	4	38	Very windy.	
6	T	7	34	4	39	First Half of Jan., 1880, no snow or ice.	Month somewhat warmer
7	F	7	33	4	40	Average coldest day of the year.	than usual,
8	S	7	33	4	41		Broken weather,
9	S	7	33	4	42		rarely either cold or warm
10	M	7	33	4	43	Lowest tem. ever known Toronto, '59,—26°.5.	more than four or five days.
11	T	7	32	4	44	53°6, Toronto.	Precipitation in rain and snow heavier than usual.
12	W	7	32	4	45	59°7, Windsor.	Heavy snows northern Ontario and northern New York, also south of Georgian Bay
13	T	7	32	4	46		and not improbably south and east of Buffalo.
14	F	7	31	4	47	Buds well formed on the lilac, Toronto.	Three cold dips, 1st about Jan. 9th, 2nd about 15th and third in last week.
15	S	7	31	4	49	10th, 1877, Kalmar, Keewatin,—63°.	Sleighing in most parts of western Ontario, except probably the beginning of the month.
16	S	7	30	4	50		2nd part of month will likely be dryer than first part.
17	M	7	29	4	51		
18	T	7	28	4	52		
19	W	7	28	4	54		
20	T	7	27	4	55	Ice broken up in Toronto Bay.	
21	F	7	27	4	56	Gray birds numerous.	
22	S	7	26	4	58		
23	S	7	25	4	59		
24	M	7	25	5	00		
25	T	7	24	5	02		
26	W	7	22	5	03		
27	T	7	21	5	05		
28	F	7	20	5	06		
29	S	7	20	5	09	Lowest tem. of month 11°2, T.	
30	S	7	19	5	08	Wild geese and ducks numerous.	
31	M	1	18	5	10		

23rd, 3.20 a.m.
29th, 7.30 p.m.
0.42 p.m.

PROBABILITIES.

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rarely either
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more than four
or five days.
Precipitation
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snow heavier
than usual.
Heavy snows
Northern Ontario
Northern New York,
Georgian Bay
West of Buffalo.
10th, 2nd about
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of month will
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than first
part.

**HAGEYARD'S
PECTORAL
BALSAM.**

CURES
COUGHS, COLDS, HOARSENESS &
FOR SALE BY ALL DRUGGISTS & DEALERS.

MOSES OATES' WEATHER BOOK.

GALT SAFE WORKS.

GOLDIE & McCULLOCH,

GALT, ONTARIO, CANADA,

MANUFACTURERS OF

FIRE AND BURGLAR-PROOF

SAFES,

VAULTS, VAULT DOORS, ETC.

—FOR—

Banks, Registry Offices, Public and Private Buildings, Etc.

FIRST PRIZE.

We are also the largest manufacturers in the Dominion of
Steam Engines and Boilers, Water-Wheels,
Wood Working and Stave Machinery,
Wool Machinery, Flouring and Saw
Mills, Mill Stones, and Mill
Furnishings of every De-
scription.

Circulars Furnished on Application.

All Materials and Workmanship guaranteed.

GOLDIE & McCULLOCH, Galt, Ont.

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FEBRUARY, 1880.

THE first half of this month, as predicted by Moses Oates, was "colder than the latter half of January, but characterized by similar rapid alternations of thaw and frost." Snow fell in some parts in the beginning of the month, and the luxury of sleighing was indulged in for a few days. About the tenth the mercury bounded up to spring temperatures, and beyond occasional short relapses maintained the temperature of spring for the remainder of the month. Garden flowers again appeared in their spring dress, green leaves again appeared, the angler sat down in the warm sun and hooked fish in abundance, insects darted through the air as in summer, and navigation on the lakes fairly opened. Owing to the colder weather of the early part of the month the average temperature was lower than that of January. At Toronto the mean was $27^{\circ}.42$, or less than 5° warmer than usual. Goderich averaged $28^{\circ}.6$, Hamilton $29^{\circ}.7$, Windsor $33^{\circ}.5$, and Montreal $19^{\circ}.85$. Temperatures were recorded of $51^{\circ}.6$ at Toronto, $56^{\circ}.8$ at Hamilton, $51^{\circ}.2$ at Montreal, and $63^{\circ}.4$ at Windsor. Pembroke registered as its lowest for the month $28^{\circ}.3$ below zero, Montreal $17^{\circ}.5$ below zero, Toronto $3^{\circ}.3$ above zero, Hamilton $4^{\circ}.7$ above, Goderich $7^{\circ}.4$ above, and Windsor $8^{\circ}.5$ above. The first departure of a vessel from Toronto harbor was on the 26th. Spring birds were numerous towards the close of this month. Rain fell at Toronto on eight days to a depth of nearly an inch. The snowfall amounted to 5.3 inches.



MOON'S PHASES.

FIRST QUARTER, 5th, 7.35 p.m. | LAST QUARTER, 21st, 2.12 p.m.
 FULL MOON, - 14th, 1.06 a.m. | NEW MOON, - 28th, 6.14 a.m.
 APOGEE, 10th, 6.42 a.m. | PERIGEE, 20th, 4.42 a.m.

Day of Month	Day of Week	SUN.				RECORD 1880 AND PREVIOUS YEARS.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	T	7	17	5	11		
2	W	7	16	5	12		
3	T	7	14	5	14		
4	F	7	13	5	15		
5	S	7	12	5	16		
6	S	7	11	5	18		
7	M	7	10	5	19		
8	T	7	08	5	21		
9	W	7	07	5	22		
10	T	7	06	5	23		
11	F	7	04	5	25		
12	S	7	03	5	26		
13	S	7	02	5	27		
14	M	7	00	5	29		
15	T	6	59	5	30		
16	W	6	57	5	31		
17	T	6	56	5	33		
18	F	6	54	5	34		
19	S	6	53	5	35		
20	S	6	51	5	37		
21	M	6	50	5	38		
22	T	6	48	5	39		
23	W	6	47	5	41		
24	T	6	45	5	42		
25	F	6	43	5	43		
26	S	6	42	5	44		
27	S	6	40	5	46		
28	M	6	38	5	47		

This will be the cold month of the winter. Snow falls will be more equally distributed than in January, with a marked decrease in the quantity falling in northern Ontario and throughout New York. Considerable snow will fall moderately heavy, in Pennsylvania, southern Michigan, Ohio, s.-w. Ontario, and western New York. Rain on only two or three days in western Ontario. Highest temperature near 10th, 17th, and close of month; and possibly also, [on Toronto Bay. about the 1st. Look out for cold dips at any time but particularly around 4th, 8th and 21st.

Heaviest snow of season T. 5.3 inches.

Windsor: lowest of month 8.°5.

Lowest ther. of month T.: 3°3.

Ther. 51°6 Tor.

Very windy.

Row boats and sail boats out in numbers

Caterpillars about and robins, T.

First schooner with cargo left Toronto. Thunderstorm.

Windsor 63°4.

NO BETT
 DR
 Every C
 HOSIERY AND
 WOOL
 WOOLS A
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 21 d
 28 d

MOSES OATES' WEATHER BOOK.

WE KNOW OF
NO BETTER PLACE FOR MERCHANTS

—TO PURCHASE THEIR—

GENERAL
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Every Class of Staples.

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HABERDASHERY,

MANTLES AND MILLINERY GOODS,

WOOLS AND WOOL WORK, FANCY GOODS,

WITH ALL CLASSES OF

CARPETS AND HOUSE FURNISHINGS,

THAN

JNO. MACDONALD & Co.,

21 & 23 Wellington St., } TORONTO.
28 & 30 Front St., }

TRY THEM!

st, 2.12 p.m.
h, 6.14 a.m.
4.42 a.m.

PROBABILITIES.

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MOSES OATES' WEATHER BOOK.

WATSON,
—OF—
AYR,
THE
AGRICULTURAL IMPLEMENT
MANUFACTURER.

ESTABLISHED . . . 1847.

Has been awarded more GOLD, SILVER AND BRONZE MEDALS, from all parts of the world, than all other Canadian manufacturers.

MAKER OF THE FINEST ASSORTMENT IN CANADA.

SPECIALTIES:

Gleaner and Binder, Lion Reaper,
Humming Bird Reaper, Gem Mower,
Watson's New Dump Rake, Chilled Plows,
Steel Plows, Cast Plows,
Canadian Plows, Manitoba Plows,
American Plows, Spring Tooth Harrows.

FARMERS, IF THEY WANT THE BEST IN CANADA,
Should see WATSON, of Ayr.

DEALERS CAN DO NO BETTER THAN
See WATSON, of Ayr.

AGENTS WHO WANT TO BE SUCCESSFUL MUST
See WATSON, of Ayr.

New Agents wanted in every Township not now represented from Prince Edward Island to the Rocky Mountains. Address—

AYR AGRICULTURAL WORKS,
AYR, ONTARIO, CANADA.

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MARCH, 1880.

This month opened with mild, balmy weather, but after a day or two of exceptional warmth the weather changed very decidedly on the night of the 7th, and the remainder of the month, till the last few days, was as a whole cold, so much so as to reduce the mean temperature of the month to a little below the average of a long series of years. The snowfall varied much in different localities. In southern and south-western Ontario it was light and fell almost invariably in small quantities. At Toronto it amounted to 12.3 inches or 1.1 inch below the average, while through the Muskoka and Ottawa Districts as well as along the St. Lawrence heavy falls were reported. The rainfall was everywhere below the average, at Toronto amounting to only an inch. In southern Ontario the roads were alternately muddy and dusty. This month will long be famous for the ice-harvest excitement which prevailed in very many places. The open winter in the Eastern and Middle States caused an unusual demand from Canada, and the owners of the few convenient ponds on which six or eight inches of ice formed found their ice a source of undreamt of profit. Lake Simcoe and some smaller lakes also were profitable waters, and the railways were taxed to their utmost capacity to supply the demand for ice-trains.

The mean temperature of the month was $28^{\circ}.95$ at Toronto, $29^{\circ}.7$ at Hamilton, $27^{\circ}.2$ at Woodstock, $18^{\circ}.9$ at Pembroke, $22^{\circ}.4$ at Montreal, $19^{\circ}.4$ at Fredericton, N. B., and $24^{\circ}.2$ at Halifax. The highest temperatures at these places were Toronto, 31° , Fredericton, N. B., 45° , Montreal $49^{\circ}.6$, Pembroke $51^{\circ}.3$, Hamilton $58^{\circ}.8$, Woodstock $56^{\circ}.7$. The temperature in Western Ontario never fell to zero, the lowest at Toronto being $6^{\circ}.7$, Woodstock 6° , Hamilton, $8^{\circ}.2$. At Pembroke $13^{\circ}.6$ below was recorded, at Montreal $11^{\circ}.2$ below, at Fredericton $17^{\circ}.3$ below, and at Halifax zero. Thunderstorms occurred about the beginning of the month.



MOON'S PHASES.

FIRST QUARTER, 7th, 2.44 p.m. | LAST QUARTER, 22nd, 10.11 p.m.
 FULL MOON, - 15th, 5.19 p.m. | NEW MOON, - 29th, 5.14 p.m.
 APOGEE, 10th, 0.42 p.m. | PERIGEE, 25th, 5.42 p.m.

Day of Month	Day of Week.	SUN.				RECORD 1880 AND PREVIOUS YEARS.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	T	6	37	5	48		
2	W	6	35	5	50	ASH WEDNESDAY.	
3	T	6	33	5	51	1st schooner with cargo arrived at T. Robins and	
4	F	6	32	5	52	Thunderstorm.	[blue-birds numerous.
5	S	6	30	5	54		
6	S	6	28	5	55		
7	M	6	26	5	56		
8	T	6	25	5	57	Lowest tem. of month, T. 6°7.	<i>This month will probably not differ much from the mean of a series of years.</i>
9	W	6	23	5	58	Kincardine, 1878, 72°5.	<i>In first part heavy snows in most parts of Ontario, Michigan, and part of New York.</i>
10	T	6	21	5	59		<i>Snow falls very marked for number and heaviness.</i>
11	F	6	19	6	00		<i>Weather very sensibly warmer after St. Patrick's day, with, however, at least one snow fall about beginning of last week.</i>
12	S	6	18	6	01		<i>Cold dips probable in beginning of month and near the 20th. Sleighing in some districts for one or two weeks—probably for two weeks—or even a little longer.</i>
13	S	6	16	6	03	Very windy.	
14	M	6	14	6	05		
15	T	6	12	6	06		
16	W	6	10	6	07		
17	T	6	09	6	08	ST. PATRICK'S DAY.	
18	F	6	07	6	09		
19	S	6	05	6	11		
20	S	6	03	6	12		
21	M	6	01	6	13	Battleford, 1878, 75°.	
22	T	5	59	6	14		
23	W	5	57	6	16		
24	T	5	55	6	17		
25	F	5	54	6	18		
26	S	5	52	6	19		
27	S	5	51	6	20		
28	M	5	49	6	21		
29	T	5	47	6	23		
30	W	5	45	6	24		
31	T	5	43	6	25	Ther. 51°.9 T.	<i>Spring will open decidedly about close of month.</i>

BLIND DOCK BLOOD BITTERS

BURDOCK BLOOD BITTERS



The only Medicine that successfully purifies the Blood, acts upon the Liver, Bowels, Skin and Kidneys, while at the same time it allays Nervous Irritation, and strengthens the Debilitated System, perfectly and speedily curing Biliousness, Jaundice, Dyspepsia, Constipation, Headache, Rheumatism, Dropsy, Nervous and Gen-eral Debility, Female Complaints, Scrofula, Erysipelas, Salt Rheum, and every species of Chronic Disease arising from Disordered Liver, Kidneys, Stomach, Bowels or Blood.

THE BEST BLOOD PURIFYING TONIC IN THE WORLD.

Sample Bottle, 10c. T. MILBURN & CO., SOLE AGENTS, TORONTO. Regular Size, \$1.00

Mrs. Freeman's Worm Powder is a safe, sure and effectual destroyer of worm in children & adults. Price 25 cents or 5 for \$1.

Mrs. Freeman's New Domestic Dyes are perfect in every color. & of brightness and durability they have no equal. Price 15 cents per package.

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42 p.m.

ABILITIES.

Robins and numerous.

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MOSES OATES' WEATHER BOOK.

CANADA LAND PLASTER Co.

PARIS AND CAYUGA, ONT.

WHITE & GREY LAND PLASTER

FOR SALE

BY BULK, OR IN BARRELS OR BAGS.

Shipments by Rail made on Great Western and Grand Trunk Railway from Paris; on Hamilton and North-Western and Grand Trunk Railway from Caledonia; on Canada Southern and Grand Trunk Railway from Canfield; on Air Line from Cayuga; and by Schooner from our Wharf at the Mill on the Grand River, two and a half miles south of Cayuga.

OUR LAND PLASTER AND ROCK GYPSUM

Were awarded Diplomas at the Provincial Exhibition, Hamilton, 1880; at the Southern Counties Fair, St. Thomas; and at the Great Western Fair, held at London, besides First Prizes at Brantford and Guelph, and First Prize on Rock Gypsum at Toronto.

The mines of Grey Gypsum are all situated at Paris, and it has been from them that the largest portion of Land Plaster used in Western Ontario has been supplied during the last fifty years. The majority of farmers give this variety the preference because of its greater solubility and more speedy action on clover. This is on account of its being less crystallized than White Land Plaster, and for this reason was preferred at the Guelph Model Farm.

Our White Gypsum Mines and the Mills are situated about two and a half miles south of Cayuga, and were formerly owned by A. W. Thompson, Esq., of Mount Healy. They are admitted to be the best equipped on the Grand River as regards the mill tramways and appurtenances for producing White Land Plaster, and we call special attention to the superiority of our grinding which has never been equalled in Ontario.

Sold by Agents at all the principal Railway Stations, and also at the Mills at Paris and Cayuga.

Orders by mail to be addressed to the proprietors—

GILL, ALLAN & CO.,

P. O. Box 95, PARIS, ONT.

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APRIL, 1880.

The early commencement of agricultural operations, predicted by Moses Oates the previous fall, occurred, the ground being ready for the plow in some parts of the Province about the 1st of this month, though rainy weather caused a delay in most districts till a few days afterwards. The first half of the month was, as a whole, mild, but from the 22nd cold weather, heavy night frosts, flurries of snow, and cold rains prevailed. Heavy thunderstorms occurred in many localities a little after the middle of the month. The rainfall was above the average throughout Ontario, averaging an excess of a little more than an inch. On the 4th and 5th nearly three inches of rain fell at Pembroke on the Ottawa. At Toronto the rainfall was 3.12 inches or 0.69 inches above the average. Rain fell on four days and snow on three. Thunder and lightning occurred on five days. The mean temperature was higher than in April, 1879, but little or nothing above the average of a series of years. The mean at Hamilton was 44°.4, Toronto 41°.3, Woodstock 42°, Montreal 39°.8, Pembroke 37°.9, Fredericton, 36°.5 or 1°.2 below the average, Halifax 37°. In south-western Ontario the highest temperatures were between 70° and 80°: in eastern Ontario between 60° and 70°. Hamilton registered 75°, Toronto 65°, Pembroke 69°, Montreal 63°.4, Fredericton, N. B., 66°, and Halifax 62°. The lowest in Hamilton was 20°.5, in Toronto, 19°.6, Pembroke 12°, Montreal 10°, Fredericton N. B., 10°.7, and Halifax 18°. In the Maritime Provinces the month was colder than usual.

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MOON'S PHASES.

FIRST QUARTER, 6th, 10.36 a.m. | LAST QUARTER, 21st, 4.20 a.m.
 FULL MOON, - 14th, 6.32 a.m. | NEW MOON, - 28th, 5.06 a.m.
 APOGEE, 6th, 8.40 a.m. | PERIGEE, 19th, 6.40 a.m.

Day of Month	Day of Week.	SUN.				RECORD 1880 AND PREVIOUS YEARS.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	F	5	42	6	26		
2	S	5	40	6	27		
3	S	5	38	6	29		
4	M	5	36	6	30	Heavy rain: T. 0.9 in.	<i>A fine Spring month, unusually favorable for agricultural operations.</i>
5	T	5	34	6	31	Heavy rain.	
6	W	5	34	6	31	Heavy rain: Granton, 1.5 in. Pembroke, 2.9 in.	
7	T	5	33	6	32	Sudden wind and snow storm: T.	<i>Ploughing in southern Ontario and similar latitudes to east west very early.</i>
8	F	5	31	6	33		
9	S	5	29	6	35		<i>Little snow for the season and a fair number of April showers, with probably some unpleasant north-easters around middle of month.</i>
10	S	5	27	6	36	PALM SUNDAY.	
11	M	5	26	6	37	Swallows: T. Lowest storm of month 19°.6.	<i>Severe dips for the season not to be looked for at any time.</i>
12	T	5	24	6	38	Wrens: T.	
13	W	5	22	6	39	Red head wood-peckers: T.	
14	T	5	21	6	41	GOOD FRIDAY. Ther. 65°: T.	
15	F	5	19	6	42		
16	S	5	17	6	43	EASTER SUNDAY.	
17	S	5	16	6	44		
18	M	5	14	6	45	Frogs croaking at T.	
19	M	5	12	6	46		
20	T	5	11	6	48		
21	T	5	10	6	49		
22	F	5	09	6	50		
23	F	5	07	6	51		
24	S	5	06	6	52		
25	S	5	04	6	52		
26	S	5	03	6	54		
27	M	5	03	6	55		
28	M	5	01	6	55		
29	T	5	00	6	56		
30	T	4	58	6	57	Windiest day.	
	F	4	57	6	58		
	F	4	55	7	00		
	S	4	54	7	01		

A PART from on com there are oth ology is redu valuable aids one district c ments of the north and so mid-winter t to mid-winte southward v of a country In mid-sum and southwa more to a fe steadily adv Mexican fro Diego, the r and gradual position in t rain area do any given s some impor the norther than usual, sitions of s most north than usual, scientific b ture, but th and areas c change of p gation. H rents any c —it in all some indic Apart, h the phenon tion—may —to base tered port standing

POSSIBLE KEYS
TO
WEATHER FORECASTS.

A PART from the indications of the weather, the bearing of which on coming seasons are more or less understood by not a few, there are other indications which when the ground-work of meteorology is reduced to a few simple and universal laws, may prove valuable aids in forecasting the weather of a coming season, not for one district only, but for a whole hemisphere. Certain great movements of the atmosphere correspond with the apparent movement north and south of the sun. The trade winds move northward from mid-winter to mid-summer, and return southward from mid-summer to mid-winter. The polar area of rainfall moves northward and southward with the sun, a fact which, where the physical features of a country are favorable, as on the Pacific Coast, is very apparent. In mid-summer the southern verge of the polar rain area is in Oregon, and southward no rain has fallen for periods varying from a week or more to a few months. But as winter approaches the rainy verge steadily advances till San Francisco and finally San Diego, near the Mexican frontier, are both included in the great rain area. At San Diego, the rainy season is very short, for the area soon withdraws, and gradually its southern front retraces its path till its mid-summer position in the far north is again reached. The trade winds and rain area do not occupy the same latitudes in successive years at any given season. May not their positions, say in October, furnish some important clue to the probabilities of the coming winter? If the northern verge of the trade winds be farther north in the fall than usual, has the fact not something to do with the relative positions of storm-tracks, and may not a warmer winter than usual in most northern districts be expected? And if it be further south than usual, does not the expectation of a cold winter have some scientific basis? A decided opinion, *pro* or *con*, may yet be premature, but the position of the trade winds, in its relation to tracks and areas of a low and high barometric pressure, and of the interchange of polar and equatorial air, is well deserving of close investigation. Has the varying warmth and volume of warm ocean currents any connection with the position of the trade winds? It may—it in all probability has. And may not these currents furnish some indications of what a coming season will be?

Apart, however, from any conclusions which may be drawn from the phenomena—and which would of course be of general application—may it not be possible—the probabilities for one district given—to base on these local probabilities, the forecasts for widely scattered portions of the world. It is a well-known fact that notwithstanding the constant passage or development of low and high

st, 4.20 a.m.
th, 5.06 a.m.
6.40 a.m.

PROBABILITIES.

Spring month,
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Ploughing in
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Severe dips
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pressures over the world, that the average of pressure for a period of a month or more will be abnormally low over a certain district, and the pressure gradually shade off till it runs into surrounding equally permanent areas of high pressure. With high pressure the temperature is low, and when low pressure exists it is for the time warmer than usual for the latitude. These steady areas, like those of passing waves of pressures, have certain relations to each other, as, the distance between their centres, the direction of one from another, &c. Hence, if warm weather or low pressure prevails here, may we not look to certain other regions for similar or diametrically opposite conditions. Almost invariably when Iceland has a warmer winter than usual, Vienna has one colder than usual, and when Iceland is colder than usual, the temperature at Vienna is above the average. Vienna is south-east of Iceland, and at about the same distance from it as there usually is between the centre of a low and of a high pressure. A comparison of fourteen Novembers, which the writer has made between Toronto and Vienna, shows that in ten cases these places corresponded with each other in regard to deficiency or excess of heat, and in only two cases were they clearly opposite. Might not the full examination of records lead to the discovery that certain places, far apart, generally are alike in relation to their usual temperature, and other places almost invariably unlike. To fully examine the subject, meteorological stations would have to be established far to the north, and in many districts where there are none at present, while stationary vessels would have to dot the waters of the globe. Much is now being done to place the whole world under tribute to the science of meteorology, and the further extension of a system of simultaneous observations, at the rate of progress of the past few years, will soon accomplish all that is desired, and furnish data from which meteorologists may draw conclusions which will lead to very successful forecasts of coming seasons, not for one country only, but for the whole world.—M. O.

SINGULAR PHENOMENA IN BRITISH COLUMBIA.

B RITISH Columbia has a remarkable seasonal phenomenon, the sea-fog wave, apparently connected with the transition from the dry season to the wet season. It has not yet been fully examined by meteorologists. In 1879 it arrived at New Westminster on Sept. 21st: in 1880 on Oct. 22nd. Mr. Peele, the meteorological observer there, comments on it as follows:—"On the 22nd we had thick fog until 10.30 a.m., when a small blue patch of sky was seen in the west, and in 15 minutes not a sign of fog existed, except in the south and south-west, where a heavy bank of fog remained until 2 p.m., when it began to move inland rapidly, and the *annual sea-fog wave* again struck us, sending down the thermometer as it advanced." On October 26th he writes, "This year, so far, it has changed the whole character of the weather: we had a dry October, but since the wave came we have not had a fine day."

This month cloudy and ve wintry wind. registered th Montreal, 29° which are ren day advanced storm occurre above 70°. A and the warm the rainfall w showing an e north of Lake tained in Que parts of the N as in the state army worm in as a swarm of 4.025 inches. a fall of 8 in inches. At C and Windsor although rain temperature w Scotia and Pr of the month in the Eastern reached 100° Owen Sound were among t Montreal was N.B., 89° 7, 84° 4, and Wilton 33° 1, an ture of 47° 9, paratively high Toronto 58°, Windsor 65° 5 perature of M temperate zon Madrid 63° 1 Sicily, 64° 8, The European the warmest M age May equa Africa and Sm exceed Winds

MAY, 1880.

This month was a remarkable one. The morning of the 1st was cloudy and very cold, while flurries of snow were driven along on the wintry wind. The thermometer on this coldest day of the month, registered the exceedingly low temperature for May of 22°.9 at Montreal, 29°.4 at Windsor, and 27°.8 at Toronto; temperatures which are remarkable for a spring night with a cloudy sky. As the day advanced the summer season commenced. At night a thunderstorm occurred and the next day was a summer day with the mercury above 70°. A day or two after the mercury was ranging above 80° and the warm weather of the season had fully set in. In Ontario the rainfall was largely above the average, the south eastern district showing an excess of over an inch, and the central district, that north of Lake Ontario, an excess of 2½ inches. A slight excess obtained in Quebec and a slight deficiency in New Brunswick. In some parts of the New England States, and in Southern New York as well as in the states to the southward, the drought was extreme and the army worm in parts swept vegetation with almost as disastrous effect as a swarm of locusts. Rain fell in 15 days at Toronto to a depth of 4.025 inches, or 0.950 inches above the average. Pembroke showed a fall of 8 inches, Owen Sound of 5½ inches, and Presqu'île of 5¾ inches. At Cornwall the rainfall was only 1½ inches, at Goderich, and Windsor less than 4 inches, and at Montreal less than 3 inches, although rain fell at that place on 19 days. In Ontario the mean temperature was from 4 to 7 inches above the average. In Nova Scotia and Prince Edward Island it was below. Towards the close of the month a hot wave swept over the country and was felt severely in the Eastern States. New York temperatures approached or even reached 100° in the shade. In Ontario the heat was less marked, Owen Sound reporting 95° and Hamilton 92°, which temperatures were among the highest recorded in the province. The highest at Montreal was 85°.2, at Toronto 85°.7, Pembroke 91°.3, Fredericton, N.B., 89°.7, Halifax 88°, Goderich 85°.5, Cornwall 88°, Woodstock 84°.4, and Windsor 89°. The lowest at Goderich was 35°.4, at Hamilton 33°.1, and at Pembroke 27°. Halifax showed a mean temperature of 47°.9, Fredericton 52°.4, but eastward the mean was comparatively high. Montreal was 58°.8, Pembroke 58°.5, Cornwall 60°.1, Toronto 58°, Woodstock 62°.8, Goderich 62°.7, Hamilton 63°.5, and Windsor 65°.5. For purposes of comparison we give the mean temperature of May for a series of years at several places in the warmer temperate zones: Constantinople 61°.3, Smyrna 65.6, Algiers 66°.3, Madrid 63°.1, Cadiz 73°.7, Venice 63°.4, Rome 65°.3, Palermo, Sicily, 64°.8, Nice 62°.3, Naples 64°.8, Milan 63°.7, Trieste 63°.2. The European places cited, we need scarcely say, represent some of the warmest May temperatures in Europe, and none show an average May equal to May, 1880, at Windsor, while Algiers in North Africa and Smyrna in Syria, though on the level of the sea scarcely exceed Windsor which is 620 feet above it.



MOON'S PHASES.

FIRST QUARTER, 6th, 5.26 a.m. | LAST QUARTER, 20th, 9.49 a.m.
 FULL MOON, - 13th, 5.06 p.m. | NEW MOON, - 27th, 6.18 p.m.
 APOGEE, 4th, 3.40 p.m. | PERIGEE, 16th, 0.40 p.m.

Day of Month	Day of Week	SUN.				RECORD 1880 AND PREVIOUS YEARS.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	S	4	52	7	02	Light flurries of snow. Ther. lowest of month Toads: T.	[27°.8, T.
2	M	4	51	7	03		
3	T	4	50	7	05		
4	W	4	49	7	06		
5	T	4	47	7	07	Maple in flower: T.	<i>Rather far ahead for a minute forecast. Look out for frosts about the 10th and 24th. Month will probably be very changeable, with rather frequent low temperatures. Moderate rain storms, alternately with drought.</i>
6	F	4	45	7	09	Rain: Owen Sound 1.8 in.	
7	S	4	44	7	10	Plums in blossom: T.	
8	S	4	42	7	11	Humming birds: T.	
9	M	4	41	7	12	Humming birds: T.	
10	T	4	40	7	13		
11	W	4	39	7	14		
12	T	4	38	7	15	Peach in blossom: T. Orioles.	
13	F	4	36	7	16		
14	S	4	34	7	17		
15	S	4	33	7	18		
16	M	4	32	7	19	Lilac and flowering almond in flower: T.	
17	T	4	31	7	21		
18	W	4	30	7	22		
19	T	4	29	7	23		
20	F	4	28	7	24		
21	S	4	27	7	25		
22	S	4	26	7	26		
23	M	4	26	7	27		
24	T	4	25	7	28	QUEEN'S BIRTHDAY. Fire-flies: T.	
25	W	4	24	7	29	Hamilton: 91°.8. Owen Sound: 95°. Windsor: 89°.	
26	T	4	24	7	30	ASCENSION DAY. Ther. 85°.6: T.	
27	F	4	23	7	31		
28	S	4	23	7	31		
29	S	4	22	7	32		
30	M	4	22	7	33		
31	T	4	21	7	33	Rain 1.9 in.: Barrie. 2.2 in.: Pembroke.	

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MOSES OATES' WEATHER BOOK.

AMERICAN HOUSE, BERLIN, ONT.

One of the largest and best Hotels west of Toronto.

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In addition to my former make of yarns, which gave great satisfaction, I have much pleasure in directing the attention of the Wholesale Trade to my make of Four Fold Fingering Yarn which for make and quality cannot be excelled in the market. I would ask buyers to compare make and price before importing.

20th, 9.49 a.m.
27th, 6.18 p.m.
0.40 p.m.

PROBABILITIES.

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Month will
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quent low
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Moderate
T. rain
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alternately
with drought.

Windsor: 89°.

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SIGNS OF RAIN.

FORTY REASONS FOR NOT ACCEPTING AN INVITATION OF A FRIEND TO MAKE
AN EXCURSION WITH HIM.

1. The hollow winds begin to blow ;
2. The clouds look black, the glass is low,
3. The soot falls down, the spaniels sleep,
4. And spiders from their cobwebs peep.
5. Last night the sun went pale to bed,
6. The moon in halos hid her head ;
7. The boding shepherd heaves a sigh,
8. For see, a rainbow spans the sky !
9. The walls are damp, the ditches smell,
10. Closed is the pink-eyed pimpernel.
11. Hark how the chairs and tables crack !
12. Old Betty's nerves are on the rack ;
13. Loud quacks the duck, the peacocks cry,
14. The distant hills are seeming nigh.
15. How restless are the snorting swine !
16. The busy flies disturb the kine,
17. Low o'er the grass the swallow wings,
18. The cricket, too, how sharp he sings !
19. Puss on the hearth, with velvet paws,
20. Sits wiping o'er her whiskered jaws ;
21. Through the clear streams the fishes rise,
22. And nimbly catch the incautious flies.
23. The glow-worms numerous and light,
24. Illumed the dewy dell last night ;
25. At dusk the squalid toad was seen,
26. Hopping and crawling o'er the green ;
27. The whirling dust the wind obeys,
28. And in the rapid eddy plays ;
29. The frog has changed his yellow vest,
30. And in a russet coat is dressed.
31. Though June, the air is cold and still,
32. The mellow black-bird's voice is shrill ;
33. My dog, so altered in his taste,
34. Quits mutton bones, on grass to feast,
35. And see yon rooks, how odd their flight !
36. They imitate the gliding kite,
37. And seem precipitate to fall,
38. As if they felt the piercing ball.
39. 'Twill surely rain ; I see with sorrow,
40. Our jaunt must be put off to morrow.

DR. EDWARD JENNER.

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JUNE, 1880

This month was remarkably favorable to vegetation. The first half was marked with few extremes of either heat or cold. In the second half after a period of bright warm weather copious rains fell delaying the ingathering of the hay crops. Thunderstorms were very numerous in all parts of the country, and the month in Ontario was warmer than usual; the excess at Toronto, where the mean temperature was $65^{\circ}.4$, being nearly $3\frac{1}{2}$ degrees. In some of the warmer places the mean temperature was above 70° , Montreal was $66^{\circ}.5$, Cornwall $66^{\circ}.2$, Woodstock $68^{\circ}.4$. In the Maritime Provinces it was, on the whole, lower than usual. In the neighborhood of the Georgian Bay the rainfall was very slightly greater than the average of a series of years, but in the southern part of the Provinces nearly two inches more rain than usual fell. In Quebec, New Brunswick, and Nova Scotia the month was rather dry. Among the heaviest rainfalls recorded were Lucan $5\frac{3}{4}$ inches, Port Stanley 6.80 inches, Granton $5\frac{1}{2}$ and Stratford 5.8 inches. Wheat harvest commenced in some parts of Western Ontario before the close of the month. In the eastern townships the crops suffered seriously from drought. The highest temperature in Toronto was 91° , Cornwall, $88^{\circ}.7$, Pembroke 91° , Montreal $86^{\circ}.1$. Over the Province generally the highest did not exceed 92° , though in some parts it was a few degrees higher. The lowest at Toronto was $41^{\circ}.5$ on the morning of the 2nd.

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THE BEST FITTING BACK
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1, 4.00 p.m.
1, 8.46 p.m.
40 p.m.

ABILITIES.

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MOSES OATES' WEATHER BOOK.

SHURLY & DIETRICH,

GALT, ONTARIO,

MANUFACTURERS OF

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LANCE TOOTH SAW

IS THE

Most Popular Style in the Market,

AND THE

IMMENSE DEMAND IS INCREASING DAILY.

The mean average was exactly usual. There were numerous Western Ontario to building greater part but in the district than usual. New Brunswick inches more rain fell was

High temperature shade. Thermometer 69° 7, Corn Showery weather the 6th. The 11th and 11th fine, 18th fine, 20th wet, month, fine was large. and Montreal

JULY, 1880.

The mean temperature of this month was very slightly below the average west of Quebec, excepting at Montreal and Kingston, were it was exactly the average. East of Quebec it was a little warmer than usual. Thunderstorms, especially in the first and third weeks were numerous and destructive, particularly in some parts of Western Ontario, when the daily papers recorded great destruction to buildings, trees and crops by lightning and tornadoes. In the greater part of peninsular Ontario the rainfall was below the average, but in the district north of Lake Ontario it was over an inch greater than usual. Quebec and Nova Scotia were dryer than usual, and New Brunswick wetter. At Toronto 3.525 inches of rain or 0.336 inches more than usual fell. There the number of days on which rain fell was 16, or a third more than the usual number.

High temperatures were infrequent, rarely exceeding 90° in the shade. The mean at Toronto was 67°.63, Woodstock 71°.8, Montreal 69°.7, Cornwall 69°.6, Fredericton, N. B., 66°.9, Halifax 64°.8. Showery weather throughout this country prevailed from the 1st to the 6th. The 9th was very warm, with heavy thunderstorms, 10th and 11th fine, 12th thunderstorms, 15th thunderstorms, 16th fine, 18th fine, but thunderstorms in some places, 19th rainy at night, 20th wet, 21st to 25th fine, 25th thunderstorms, 27th to end of month, fine in Ontario, unsettled in Quebec. The harvest generally was large. At Beatrice, in Muskoka, and at Stratford, Pembroke, and Montreal the rainfall this month exceeded five inches.



MOON'S PHASES.

FIRST QUARTER, 4th, 11.58 a.m.	THIRD QUARTER, 18th, 0.15 a.m.
FULL MOON, - 11th, 8.55 a.m.	NEW MOON, - 26th, 0.01 a.m.
PERIGEE, 11th, 8.40 p.m.	APOGEE, 26th, 3.40 a.m.

Day of Month	Day of Week.	SUN.				RECORD 1880 AND PREVIOUS YEARS.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	F	4	22	7	45	DOMINION DAY.	<i>This month Moses Oates will leave to take care of itself.</i>
2	S	4	23	7	45		
3	S	4	24	7	45	1878, York Factory, Hudson's Bay, 106°.	<i>Don't know whether it will be colder or warmer than usual, but will be one or the other in a marked degree.</i>
4	M	4	24	7	45		
5	T	4	24	7	44	Ther. 86°.5 : T. Rain : Stratford, 2.5 in.	<i>Its rainfall or drought will probably be extreme.</i>
6	W	4	25	7	44		
7	T	4	26	7	43	Rain : Barrie, 1.34 in.	<i>Rust, however, need scarcely be feared.</i>
8	F	4	27	7	43		
9	S	4	28	7	42	1878, Hamilton, 100°.	<i>Wheat harvest will be later than usual.</i>
10	S	4	28	7	42		
11	M	4	29	7	42	Rain : Windsor, 1.1 in.	
12	T	4	30	7	41		
13	W	4	31	7	41	Spence's Bridge, B. C., 1877, 105°.	
14	T	4	32	7	40		
15	F	4	33	7	39	Lowest of month 48°.3 : Fort Macleod, N.-w Toronto, 1877, 109°.	
16	S	4	34	7	39		
17	S	4	35	7	38	Average hottest day of year. [ronto, 1877, 109°.	
18	M	4	36	7	37		
19	T	4	37	7	36	Highest July tem. at Hamilton, in 1868. 106°.3.	
20	W	4	38	7	35		
21	T	4	40	7	34		
22	F	4	41	7	33		
23	S	4	42	7	32		
24	S	4	43	7	31		
25	M	4	44	7	30		
26	T	4	45	7	29		
27	W	4	45	7	28		
28	T	4	46	7	27		
29	F	4	46	7	26		
30	S	4	47	7	26		
31	S	4	47	7	25		

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James

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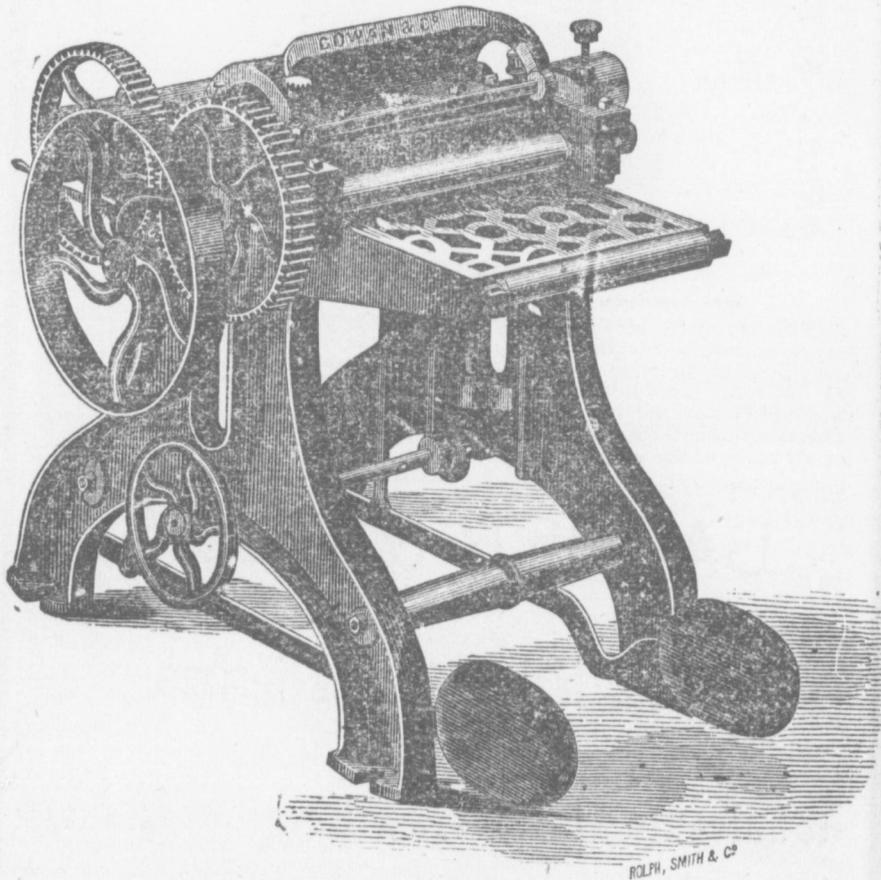
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as usual, at each place, heading the list in that class, thus sustaining the decisions of judges at all previous Exhibitions.

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COWAN & CO., GALT, ONT.

This month usual. Rain week of the r was very une Grand Trun comprising th northern sho Lake Ontario while betwee inches. Que At Port Dove

At Toronto the lowest 4- weather at th the Province some of the

On the aft Galt. Two in parallel li through an e it back again was develop westerly dire tive effects, extract from

Near Galt for twenty m hailstones in ness of $\frac{3}{4}$ of incessantly, of acres were hail like snow was but a few On Thursday was lying fr along the ro gathered and

AUGUST, 1880.

This month, though warmer than August 1879, was cooler than usual. Rainy days in Western Ontario were infrequent until the last week of the month when frequent and heavy rain fell. The rainfall was very unevenly distributed. In peninsular Ontario south of the Grand Trunk it was generally greater than usual, but the district comprising the peninsula north of that line and the eastern and northern shores of Georgian Bay were dryer than usual. North of Lake Ontario 4.39 inches of rain, or 2.61 inches more than usual fell, while between the Ottawa and St. Lawrence the rainfall was only 1.89 inches. Quebec and the Maritime Provinces were dryer than usual. At Port Dover $5\frac{1}{2}$ inches of rain fell, at Kingston only $\frac{1}{2}$ inch.

At Toronto the mean temperature was $66^{\circ}.9$, the highest $86^{\circ}9$ and the lowest 44° . At the beginning of the month and during the hot weather at the close 90° was reached or exceeded in various parts of the Province. At the middle of the month hoar frost occurred in some of the colder districts.

On the afternoon of the 11th a remarkable hail storm occurred near Galt. Two heavy clouds moving from the west over North Dumfries in parallel lines, but one in advance of the other, came into collision through an easterly surface wind catching the lower cloud and driving it back against the higher cloud. At the point of meeting the storm was developed and split into two, one of which followed a south-westerly direction and the other a south-easterly with most destructive effects. The Meteorological Review for August gives the following extract from a local paper regarding the storm:

Near Galt, "All the farms were deluged with rain; hail fell for twenty minutes, and such hail as Dumfries rarely knows. The hailstones in the central line of the storm were of the uniform thickness of $\frac{3}{4}$ of an inch. They were as clear as crystal and pelted down incessantly, till, in places, they lay in drifts two feet deep. Patches of acres were covered a foot deep; the road sides were covered with hail like snow drifts in winter . . . The total width of the storm was but a few miles; the heavy hail falling in a much narrower belt. On Thursday afternoon, twenty-four hours after the storm, the hail was lying from one to two feet deep over large patches of field and along the road." Five days later large masses of the ice crystal were gathered and brought into Galt.



MOON'S PHASES.

FIRST QUARTER, 2nd, 11.24 p.m. | THIRD QUARTER, 16th, 11.39 a.m.
 FULL MOON, - 9th, 3.49 p.m. | NEW MOON, - 24th, 3.27 a.m.
 PERIGEE, 9th, 5.40 a.m. | APOGEE, 22nd, 6.40 a.m.

Day of Month	Day of Week.	SUN.				RECORD 1880 AND PREVIOUS YEARS.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	M	4	48	7	24		
2	T	4	49	7	23		
3	W	4	50	7	21		
4	T	4	51	7	20		
5	F	4	53	7	18		
6	S	4	54	7	17		
7	S	4	55	7	16		
8	M	4	56	7	15		
9	T	4	57	7	14		
10	W	4	58	7	12		
11	T	5	00	7	11	Terrific hail storm near Galt.	
12	F	5	01	7	10		
13	S	5	03	7	08		
14	S	5	04	7	07		
15	M	5	05	7	06		
16	T	5	06	7	04	Lowest of month, 44°: T.	
17	W	5	07	7	03	Frost in some localities on 16th.	
18	T	5	08	7	02	Rain: Port Dover, 1.4 in.	
19	F	5	09	7	00		
20	S	5	10	6	58		
21	S	5	11	6	56		
22	M	5	13	6	54		
23	T	5	14	6	52		
24	W	5	15	6	50		
25	T	5	16	6	48		
26	F	5	17	6	46		
27	S	5	18	6	44		
28	S	5	19	6	42	Ther. 86°.9: T.	
29	M	5	20	6	40	Rain, 0.9: T.	
30	T	5	21	6	39		
31	W	5	22	6	38	Galt, 1879, 96°.1.	

This month will probably be several degrees warmer than usual—and unless July be very hot (which is unlikely) will be quite equal to July in temperature.

Dry weather most of time—with frost in some localities after 20th of month.

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SEPTEMBER, 1880.

September was a little warmer than usual throughout Ontario, Quebec and the Maritime Provinces, the latter provinces showing the greatest excess. At Toronto the mean was $60^{\circ}.22$, the highest $83^{\circ}.4$, and the lowest $35^{\circ}.5$. At Montreal the mean was 61° , the highest 85° , and the lowest $40^{\circ}.3$. Ninety degrees in the shade was reached at but a few places. The rainfall in peninsular Ontario was nearly an inch above the average, in Central Ontario about half an inch, and in Eastern Ontario a mere fraction in excess of the normal. Quebec had about an average of rain, and Nova Scotia and New Brunswick a slight excess. Parry Sound, several places in the Muskoka District, and Halifax had over five inches. The rainy days were pretty evenly distributed over the month. The first week was hot.

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MOON'S PHASES.

FIRST QUARTER, 1st, 8.44 a.m.
 FULL MOON, - 7th, 11.22 p.m.

THIRD QUARTER, 13th, 2.43 a.m.
 NEW MOON, - 23rd, 6.36 a.m.
 FIRST QUARTER, 30th, 4.30 p.m.

PERIGEE, 6th, 2.40 p.m.

APOGEE, 18th, 6.40 p.m.

Day of Month	Day of Week.	SUN.				RECORD 1880 AND PREVIOUS YEARS.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	T	5	23	6	37	Galt, 1879, 93°.1.	
2	F	5	24	6	33	Ther. 83°.4: T.	
3	S	5	25	6	31	Rain: Conestogo, 1.45 in. Rockcliffe, 1.5 in.	
4	S	5	26	6	29		
5	M	5	27	6	28		
6	T	5	29	6	27		
7	W	5	30	6	26	Severe shock of earthquake, Huntingdon, Que.	From 5th to 16th will probably
8	T	5	31	6	25		fine calm weather.
9	F	5	32	6	23		Month is rather
10	S	5	33	6	21		likely to be a little colder than average.
11	S	5	35	6	19		Unless the peculiar planetary combination to which several astronomers attach considerable importance should exercise a much greater influence on the weather than meteorologists now believe. Gales are likely to be more violent than usual in this month.
12	M	5	36	6	17		
13	T	5	37	6	15		
14	W	5	38	6	13		
15	T	5	39	6	11		
16	F	5	40	6	09		
17	S	5	42	6	07	Severe hail storm at Georgina.	
18	S	5	43	6	05		
19	M	5	44	6	03		
20	T	5	45	6	01	Swallow last seen: T.	
21	W	5	46	6	00		
22	T	5	47	5	59	First hoar frost of season: T.	
23	F	5	48	5	57		
24	S	5	49	5	55		
25	S	5	50	5	53		
26	M	5	51	5	51	Rain, 1.25 in.: T.	
27	T	5	52	5	49		
28	W	5	54	5	47		
29	T	5	55	5	45	Rain: Gravenhurst, 2.1 in.	
30	F	5	56	5	43	Lowest tem. of month, 35°.5: T., midnight.	

SEPTEMBER.

Sweet is the voice that calls
From babbling water falls,
In meadows where the downy seeds are flying;
And soft the breezes blow
And eddying come and go
In faded gardens where the rose is dying.

At eve cool shadows fall
Across the garden wall,
And on the clustered grapes to purple turning,
And pearly vapors lie
Along the eastern sky
Where the broad harvest moon is redly burning.

Ah, soon on field and hill
The wind shall whistle chill
And patriarch swallows call their flocks together,
To fly from frost and snow
And seek for lands where blow
The fairer blossoms of a balmier weather.

The cricket chirps all day.
"O fairest summer, stay!"
The squirrel eyes askance the chestnut browning;
The wild fowl fly afar,
Above the foamy bar,
And hasten southward ere the skies are frowning.

Now comes a fragrant breeze
Through the dark cedar trees,
And round about my temples fondly lingers,
In gentle playfulness,
Like to the soft caress
Bestowed in happier days by loving fingers.

Yet, though a sense of grief
Comes with the falling leaf,
And memory makes the summer doubly pleasant,
In all my Autumn dreams
A future summer gleams,
Passing the fairest glories of the present!

—GEORGE ARNOLD.



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6.36 a.m.
4.30 p.m.
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INDIAN SUMMER.

There is a time, just when the frost
Begins to pave old Winter's way,
When Autumn, in a reverie lost,
The mellow day-time dreams away ;

When Summer comes, in musing mind,
To gaze once more on hill and dell,
To mark how many sheaves they bind,
And see if all are ripened well.

With balmy breath she whispers low ;
The dying flowers look up and give
Their sweetest incense ere they go,
For her who made their beauties live.

She enters 'neath the woodland shade,
Her zephyrs lift the lingering leaf,
And bear it gently where are laid
The loved and lost ones of its grief.

At last, old Autumn, rising, takes
Again his scepter and his throne ;
With boisterous hand the tree he shakes,
Intent on gathering all his own.

Sweet Summer, sighing, flies the plain,
And waiting Winter, gaunt and grim,
Sees miser Autumn hoard his grain
And smiles to think it's all for him.

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OCTOBER, 1880.

This month in Ontario was about 2° below the average in temperature, rainier than usual and very stormy. The rainfall varied from an average of 3.33 inches in south-western Ontario, to 5.45 inches in Quebec. The Maritime Provinces were much dryer than usual and also a little warmer. Snow flurries occurred at many places before the 18th as predicted by Moses Oates: the first snow fell on the 18th in several places, while others had the first fall on the 22nd. The snow which commenced on the 22nd was extraordinarily heavy in some localities, Lindsay reporting 15 inches from the 22nd to the 24th, Gravenhurst in Muskoka, 13 inches on the 22nd and 23rd, and Beatrice 32 inches between the 19th and 24th. The close of the month was very fine. The mean temperature at Toronto was 45° , the highest $75^{\circ}.4$, and the lowest $26^{\circ}.2$. At Montreal the mean was $46^{\circ}.1$, the highest $77^{\circ}.1$, and the lowest $24^{\circ}.3$. Fredericton, N. B., had a mean of $45^{\circ}.1$, and Halifax of $48^{\circ}.7$. Early snows and cold weather occurred in Europe this month



MOON'S PHASES.

FULL MOON, - 7th, 3.41 a.m. | NEW MOON, - 22nd, 9.13 p.m.
 THIRD QUARTER, 14th, 9.08 p.m. | FIRST QUARTER, 30th, 11.24 p.m.
 PERIGEE, 4th, 4.40 p.m. | APOGEE, 30th, 11.40 a.m.
 PERIGEE, 31st, 0.40 p.m.

Day of Month	Day of Week	SUN.				RECORD 1880 AND PREVIOUS YEARS.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	S	5	57	5	42		
2	S	5	58	5	40		
3	M	5	59	5	38	Thunderstorm: T., 1880.	[Pembroke, 2.1 in.
4	T	6	00	5	36	Rain, 0.960: T., 1880.	Rain: Saugene, 1.6 in.
5	W	6	01	5	35		
6	T	6	03	5	33	Windsor, 1879, 89°.3.	Snowfall will be light; first very heavy
7	F	6	04	5	31		frost not far from 8th of month, and
8	S	6	05	5	29	1st snow: Utah.	first snow—light—
9	S	6	06	5	27	1870. 1st snow: New Mexico.	about 18th.
10	M	6	08	5	25	1879. Ther. 90°.3: Galt plateau.	
11	T	6	09	5	23	Ther. 75°.4: T., 1880.	Rather colder than usual is the probability for this month.
12	W	6	10	5	22		
13	T	6	11	5	20	Thin ice: T., 1880.	
14	F	6	13	5	19		
15	S	6	14	5	18	1880. 1st snow: Kansas and Iowa.	
16	S	6	15	5	16	1880. 1st snow: Mich., Ill., Wis., Missouri.	
17	M	6	16	5	14	1880. 1st snow: New York, Ohio.	
18	T	6	17	5	13	First measurable snow: T., 1880, & Ont.	
19	W	6	19	5	11	1880. 1st snow: Mass. & Va.	
20	T	6	20	5	09	17th. Western Ontario: Wheat 30 in. long, 1879.	
21	F	6	21	5	08		
22	S	6	22	5	06	First snow storm of season, 1880.	A fine month—with a well-marked Indian Summer
23	S	6	24	5	04		and
24	M	6	25	5	03	1879. Lowest tem. of month, 21°.0: T.	greater average daily range of temperature than is usual.
25	T	6	27	5	01		
26	W	6	28	5	00		
27	T	6	30	4	58		
28	F	6	31	4	56	Ther. 26°.2: T., 1880.	
29	S	6	32	4	55		
30	S	6	33	4	54		
31	M	6	34	4	53	First snow on ground: Galt.	

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NOVEMBER, 1880.

This month will long be remembered as a remarkable one for cold weather and terrible loss of life and property through disasters on the great lakes. The month opened with fine weather, which was however, soon succeeded by heavy and frequent rain. On the 11th the clouds broke, and for several days fine weather moderately cool prevailed. Then a cold wave advanced from the west, showing 20° below zero at Cheyenne, temperatures at or below zero in northern Texas, frost at Galveston on the Gulf of Mexico, 4° below zero at Cleveland, Ohio, and temperatures in peninsular Ontario from below zero to 10 and 20° above. The cold gradually increased and 4° above was registered in Toronto on the 21st, when the bay became covered with ice. This freezing over is the earliest on record. The Erie and Canadian canals also closed, the Erie with an immense number of boats and 7,000,000 bushels of wheat en route to New York. The ocean steamship Peruvian was obliged to winter at Sorel, and 128 boats were frozen in between Quebec and Montreal. Several hundred were frozen in on the upper lakes, and navigation at most of the important lake ports was entirely closed. The cold spell, though greatly moderated, continued during the remainder of the month. The storms which preceded and accompanied the cold, resulted in scores of wrecks and in the total loss, with all on board, of several steamers and sailing vessels. Very cold weather also set in in several parts of Europe and on the 26th the Danube was closed by ice. With one exception this month was the coldest since the establishment of Toronto observatory in 1841.

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MOON'S PHASES.

FULL MOON, - 5th, 8.45 p.m. | NEW MOON, - 21st, 11.03 a.m.
 THIRD QUARTER, 13th, 5.43 p.m. | FIRST QUARTER, 23rd, 9.40 a.m.
 APOGEE, 13th, 8.40 a.m. | PERIGEE, 25th, 9.40 a.m.

Day of Month	Day of Week	SUN.				RECORD FOR 1879.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	T	6	36	4	52	ALL SAINTS' DAY. Red River, Manitoba, frozen over. 5 in. snow fell: T.	
2	W	6	38	4	51		
3	T	6	39	4	49		
4	F	6	40	4	48		
5	S	6	42	4	46		<i>Not improbably a warm and steady month, with a considerable rainfall, and little snow cold weather at close of month is likely.</i>
6	S	6	43	4	45		
7	M	6	44	4	44		
8	T	6	46	4	43	Ther. 64°.2; Galt.	
9	W	6	47	4	42	Ther. 64°.0: T. 65°.7: Galt.	
10	T	6	48	4	40		
11	F	6	50	4	39	Thunderstorm: Galt, ther. 64°; Windsor, 71°.	
12	S	6	51	4	38	Rain: T., 1.1 in.: P. Dover, 1.4 in.; Stratford, [1.3 in. Ther. 63°, Galt.	
13	S	6	52	4	37	Cool weather, 1880.	
14	M	6	53	4	36	Thunderstorm: T. 3 do., Galt. Ther. 62°, G.	
15	T	6	55	4	35	Ingersoll: Rain 1.6 in.	
16	W	6	56	4	35	Cheyenne: 16° below zero, 1880, & sleighing at G.	
17	T	6	57	4	34	1880. Ther. below zero in N. Texas.	
18	F	6	59	4	33	1880. Ther. 16°.: T. Cleveland, O. 4°.	
19	S	7	00	4	32	Hundreds of vessels frozen in on lakes, rivers and	
20	S	7	01	4	31	Lowest: T., 1880, 4°4. Very cold. [canals, 1880.	
21	M	7	02	4	30	Ther. 3°.8: T., 1879. Very cold. T. Bay frozen 1880.	
22	T	7	04	4	30	7,000,000 bush. grain frozen in on Erie Canal, 1880.	
23	W	7	05	4	29	Sleighing at Galt, 1879. Milder, 1880.	
24	T	7	06	4	29	Sleighing at Galt, 1879. Milder, T., 1880.	
25	F	7	08	4	28	Cold, 1880.	
26	S	7	09	4	28		
27	S	7	10	4	27		
28	M	7	11	4	27	Ther. 55°: Galt.	
29	T	7	12	4	26		
30	W	7	13	4	26	ST. ANDREWS' DAY.	

NO!

No sun—no moon!
No morn—no noon—
No dawn—no dusk—no proper time of day—
No sky—no earthly view—
No distance looking blue—
No road—no street—no “t’other side the way”—
No end to any Row—
No indications where the Crescents go—
No top to any steeple—
No recognitions of familiar people—
No courtesies for showing ‘em—
No knowing ‘em!
No travelling at all—no locomotion,
No inkling of the way—no notion—
“No go”—by land or ocean—
No mail—no post—
No news from any foreign coast—
No park—no ring—no afternoon gentility—
No company—no nobility—
No warmth—no cheerfulness, no healthful ease,
No comfortable feel in any member—
No shine, no butter-flies, no bees,
No fruits, no flowers, no leaves, no birds,
November!

THOMAS HOOD.

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MOON'S PHASES.

FULL MOON, - 5th, 11.56 a.m. | NEW MOON, - 20th 11.49 p.m.
 THIRD QUARTER, 13th, 2.47 p.m. | FIRST QUARTER, 27th, 3.24 p.m.
 APOGEE, 10th, 4.40 a.m. | PERIGEE, 22nd, 11.40 p.m.

Day of Month	Day of Week	SUN.				RECORD FOR 1879.	PROBABILITIES.
		Rises.		Sets.			
		h	m	h	m		
1	T	7	14	4	25	Galt, 44°.	
2	F	7	14	4	24	Galt, 45°. Rain. Windsor, snow.	<i>Likely to be a considerably</i>
3	S	7	15	4	24	Trees covered with ice: Galt. Ther. 37°. Rain.	
4	S	7	16	4	24	Galt, 33°.	
5	M	7	17	4	24	Galt, 39°.3. Windsor, 61°.1.	<i>colder month than usual.</i>
6	T	7	18	4	24	Rain 1.05 in. Pembroke. Ther. Galt, 51°.	<i>Frosts very steady—</i>
7	W	7	19	4	24	Galt, 47°.	<i>and a few very low dips—among the lowest in the past</i>
8	T	7	20	4	23	Rain: Granton, 106 in. 50°.1: T. Galt, 55°. Hamilton, 58°.6.	<i>years.</i>
9	F	7	20	4	23	Galt, 43°. Rain. Pembroke, 54°.	<i>Beware of frost bites</i>
10	S	7	21	4	23	Colder weather commenced. Galt, 23°. Snow. forty	<i>around Christmas time and pile high the hearth.</i>
11	S	7	22	4	24	Galt, 32°. Snow, 2.25 in.	
12	M	7	23	4	24	Galt, 33°. Snow.	
13	T	7	23	4	24	Sleighting at inland places. Snow, Galt, 2.75 in.	
14	W	7	24	4	24	Flurries of snow: Galt.	
15	T	7	24	4	24	Flurries of snow: Galt.	
16	F	7	27	4	24	Flurries of snow, Galt.	
17	S	7	28	4	25	Lowest of month: T., -8°.9. 4 in. snow fell. One	<i>sudden but brief break in the weather is likely just after the cold snap near Christmas.</i>
18	S	7	29	4	25	Windiest day: Galt, 36°.5. Snow and rain.	
19	M	7	30	4	25	Snow: Galt.	
20	T	7	31	4	26	Galt 35°.3. Rain 1.1 in.	
21	W	7	32	4	26	CHRISTMAS.	
22	T	7	32	4	27	Snow: Galt.	
23	F	7	33	4	27	Snow: Galt. Windsor, -6°.5. Lowest of month.	
24	S	7	33	4	28	Galt 35°.3. Rain 1.1 in.	
25	S	7	33	4	28	CHRISTMAS.	
26	M	7	33	4	29	Snow: Galt.	
27	T	7	33	4	29	Snow: Galt. Windsor, -6°.5. Lowest of month.	
28	W	7	33	4	30	Galt, 42°. Rain.	
29	T	7	33	4	31	Galt, 42°. Rain.	
30	F	7	34	4	32	Galt, 42°. Rain.	
31	S	7	34	4	33	Ther. 71°: Hamilton, 1875. Pembroke, 1879, -39°.0.	



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MEMORANDA.

Lined area for writing memoranda, consisting of multiple horizontal lines within a rectangular border.

MEMORANDA.

A large rectangular frame containing 25 horizontal lines for writing. The lines are evenly spaced and extend across most of the width of the frame. There are small decorative marks at the bottom left and bottom right corners of the frame.

A vertical rectangular frame on the right side of the page, containing 15 horizontal lines for writing. The lines are evenly spaced and extend across the width of the frame.

MEMORANDA.

A series of horizontal lines for writing, consisting of solid top and bottom lines with a dotted midline, repeated down the page.

Partial view of a lined page on the left side of the notebook, showing the same solid-top-bottom and dotted-midline format.

MEMORANDA.

A large rectangular frame containing 20 horizontal lines for writing, each consisting of a solid top line and a dotted bottom line.

A vertical rectangular frame on the right side of the page, containing 15 horizontal lines for writing, each consisting of a solid top line and a dotted bottom line.

MEMORANDA.

A series of horizontal lines for writing, consisting of 20 rows. Each row is defined by a solid top line and a dotted bottom line.

MEMORANDA.

Lined writing area for memoranda.

Partial view of a lined writing area on the adjacent page.

MEMORANDA.

Lined writing area for memoranda.



MEMORANDA.

Lined writing area with 20 horizontal lines.

Partial view of a lined writing area on the adjacent page.

MEMORANDA.

A large rectangular frame containing 25 horizontal lines for writing, with a double-line border.

A partial view of a similar writing frame on the left page of the notebook, showing the right edge of the frame and the right side of the lines.

MEMORANDA.

A large rectangular frame containing 20 horizontal lines for writing, arranged in pairs of solid and dotted lines.

A smaller rectangular frame on the right page, also containing 20 horizontal lines for writing, arranged in pairs of solid and dotted lines.

MEMORANDA.

A series of horizontal lines for writing, consisting of solid top and bottom lines with a dotted midline, forming approximately 20 rows.

MEMORANDA.

Lined writing area with horizontal ruling lines.

Partial view of a lined writing area on the adjacent page.

MEMORANDA.

A series of horizontal lines for writing, enclosed in a rectangular border.

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MOSES OATES' FORECASTS.

IN making my predictions for the following winter and spring, the chief reliance is placed on the character of the months of September and October. During these months the changes of the wind are carefully noted, the absence or presence of great heat during periods of low barometer and the temperature of periods of high barometer, the duration and intensity of warm and cold spells, the duration of dry and wet periods, the presence or absence of marked extremes of temperature, &c., &c., all of which are found of great service in forming an opinion of the relative position of the northerly verge of the trade winds and the degree of disturbance affecting the general flow of the polar and equatorial atmospheric currents. This flow and counter-flow has been long admitted by meteorologists, and is often popularly supposed to cause the "polar" and "tropical" waves of newspaper literature, a supposition which, though possessing an element of truth, is generally ill-founded, for rarely in any one "wave" does polar air move as far southward as our latitudes. In addition to the weather phenomena of the Autumn, the records of previous years are utilized, though they are not always necessary. Thus in October, 1878, I was able from the weather phenomena of that and the previous month to forecast the leading features, the changes and the approximate time of these changes of weather, for the whole succeeding winter and spring, and the forecast was fulfilled to the letter, though the records of previous years were scarcely consulted. Again, in October, 1879, the indications of the peculiar phenomena of the weather of September and October were so distinct that with little reference to the records of previous years, I had no hesitation, except in regard to the latter half of February, in making a bold, singular and detailed prediction for the next eight months. The extraordinary character of the whole season was a severe test of the theories on which my forecasts were based; but apparently justified them, for up till the middle of February the temperature, rainfall, snowfall, commencement and close of each change of weather corresponded closely with the October predictions. Strange to say, I was unable even in the beginning of February to express any more decided opinion of the latter half of that month than I expressed in the previous fall, when the balance of probabilities seemed equally inclined to a warm

half month or one slightly colder than usual. I chose the latter, after much hesitation, and made my first erroneous forecast. With the exception of a slight failure in regard to an anticipated heavy snowfall in early March, the remainder of my forecast proved correct.

In August I resumed forecasting, and the hot and rainy spell of the close of August and beginning of September—with the day of maximum heat, were predicted early in August—and a few weeks afterwards the general weather till the middle of November was outlined—the periods of warm and cold weather, of fine and wet, the unusual prevalence of snow flurries in the first half of October, the approximate date of the first snow storm, the fine Indian summer weather which closed October and lasted through the first days of November, and the wet which followed. It is scarcely to be hoped that so large a measure of success will attend my predictions in future. Meteorology is yet in its infancy, the data at the command of private students limited, and the liability to draw false conclusions so great, that I can not expect exemption from occasional great mistakes. These mistakes, which are, no doubt, very unpalatable at the time, will, however, only lead to a closer study of their causes, and possibly the acquirement of some knowledge which may prevent many similar ones thereafter.

THE COMING WINTER AND SPRING.

In attempting this fall a forecast of the coming winter and spring, I have had much greater difficulty than on former occasions. The weather has been unmarked by extremes, very irregular, and altogether of a character with the indications of which I am comparatively unfamiliar. A clear, decided, and unhesitating forecast I cannot therefore give, and will not be at all surprised if a much greater proportion than usual of my predictions should be unfulfilled.

The general character of the coming season appears quite distinct. The winter will set in early, will over most of the country be attended with heavy snowfalls and more sleighing than usual. The snowfalls of Muskoka, the counties of Bruce, Grey and Simcoe, and adjoining districts, the Ottawa valley and the Province of Quebec, possibly excepting the almost uninhabited northern districts, will have very heavy snows. I likewise expect an unusual snowfall in the neighborhood of Buffalo, and in the higher districts of New York and Pennsylvania. The mean temperature of the winter will, in the lake region, be neither unusually low nor unusually high, but will be an approximation to the mean between the winter of 1878-9 and 1879-80, that is—very nearly the average of a long series of years. But though the winter will not be milder than usual, and will contain some rather prolonged spells of very cold weather, it will be broken by decidedly mild weather. Where to place this

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Nov. 15

mild weather, I am not clear, though the month of January seems to me the most probable period for most of it. In the Maritime Provinces, the winter will, I think, be somewhat warmer than usual. April in Ontario and Western New York will be almost certainly a fine and moderately warm spring month.

IMPRESSIONS REGARDING THE WINTER.

Now as to the second-class impressions of the coming weather—impressions to which I attach less importance. The cold weather which will occur this month, and constitute an early winter, will continue until the beginning of December; when, probably in the neighborhood of the 5th, a rapid thaw will take place. That thaw which will be of brief duration will be followed by cold weather lasting a few days. Then a second brief and moderate thaw, a short cold spell, and just at the middle of the month, or a day or two before, a decidedly warm spell, followed by a few days of moderate cold, then heavy snow in most parts and a very sharp spell. At Christmas sleighing will be universal, the weather probably moderately cold but very close to a cold dip. After Christmas, I think it probable, that although alternating between short periods of cold and moderate weather, there will be a gradual increase in warmth till a few days after the New Year, with snow pretty general north of the 44th parallel and snow and rain southwards. January will probably have a pretty heavy precipitation, the relative proportion of snow and rain ranging according to the usual winter climate, but in South-western Ontario and Western New York I look for one or two heavy falls of rain. The slight difference of January from the mean will probably be in excess of warmth, while February's slight difference will probably be on the side of cold. March in its early part will be snowy: its latter part characterized by the passage of numerous low and high barometric pressures, with consequent warmer weather. To April I have already referred. In regard to May, my impressions are somewhat vague, but it seems probable that the month will have nearly an average of rainfall, and probably be a little colder than usual. Of disagreeable weather in June I have some fear, and will not be surprised should the month, or a considerable portion of it, be cold, with injurious frosts pretty general. and even a fall of snow in some parts of Quebec, Northern New York, and the highest lands in northern Ontario and in the Nipissing District. The lower part of the Ottawa Valley will see no snow that month.

The predictions given in the calendar pages for the remainder of the year, have but a very small degree of probability in their favor. I may also state that the fixing of dates of certain weather, even a month in advance, is extremely hazardous, and not much to be depended upon.

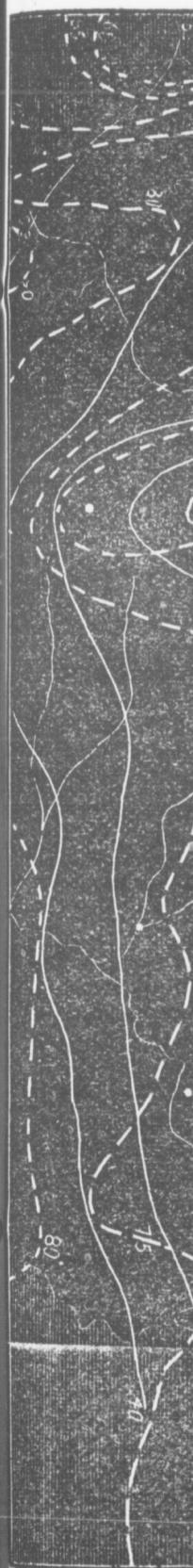
MOSES OATES.

Nov. 15th, 1880.

OUR WEATHER MAP.

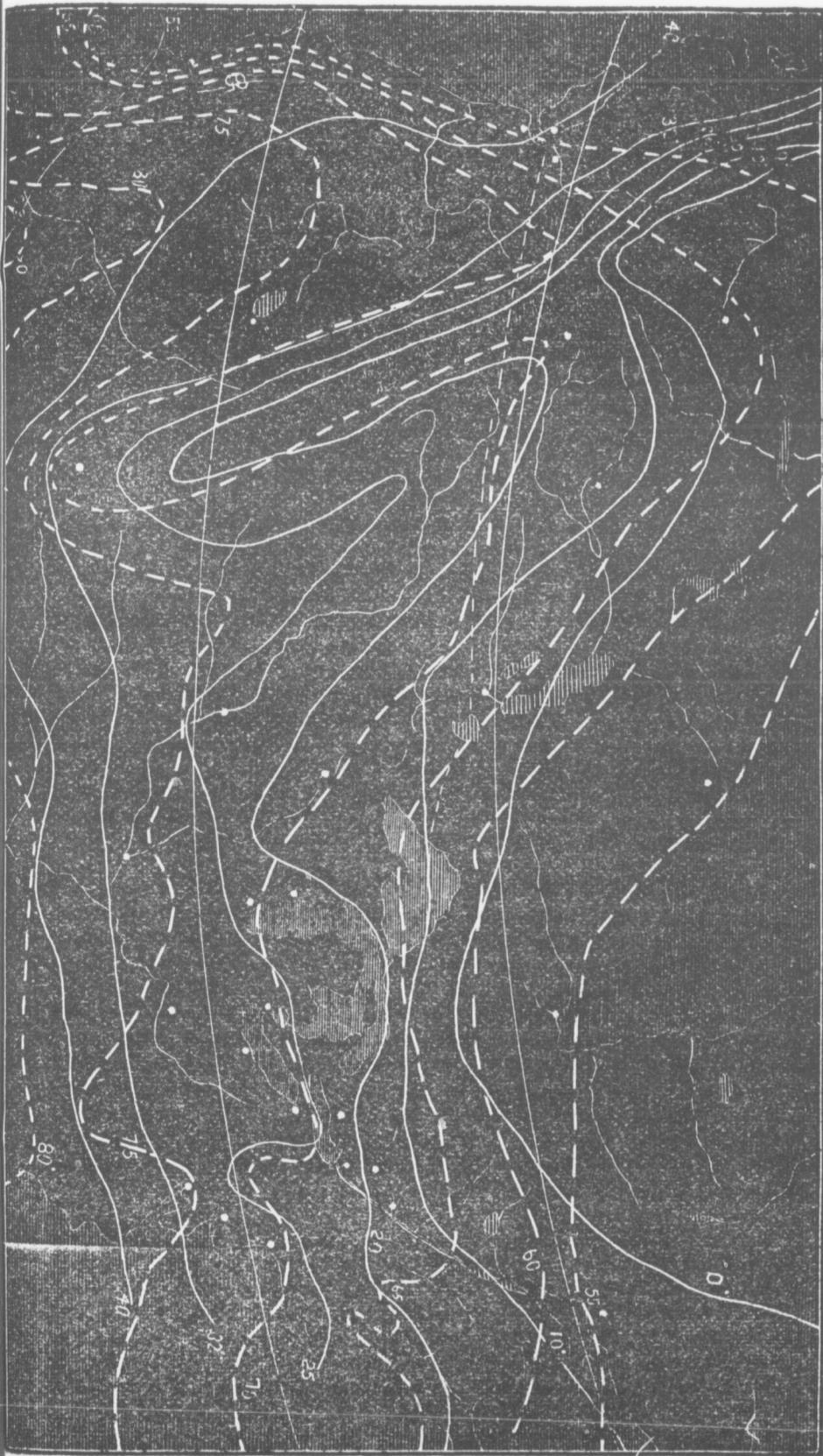
ON the map of a large portion of the continent given on another page, a sufficient number of the winter and summer isothermals of the best portion of this continent are shown to indicate the general temperature of its various districts. The isothermals for the three winter months—December, January and February—are shown by unbroken lines; the isothermals for the three summer months—June, July and August—by the broken lines. It is impossible to show on a small map the exceptions to the general sweep of these lines. As so much depends on local influences many places north or south of these lines have a higher or lower temperature than their position in regard to the lines would indicate. The south shore of Lake Superior, at places, has a winter temperature of 19° , while south of it the mean falls to near zero. Almost in the winter line of 25° shown on the map, a small portion of Michigan shows a temperature several degrees colder than indicated by the line; another similar area of cold is found in central Iowa, around which so, as to form complete curves, isothermals could be drawn to represent an increase outwards of 6 or 8 degrees in the mean heat. Yet although portions of that district are colder and others hotter than indicated on the map, the line indicates the general temperature of the state. Owing to the paucity of the number of stations in the Rocky Mountain region and in the country north of the 49th parallel, as well as to the short periods of observation at some of the reporting stations, it is difficult to place the isothermals where they ought to be, but from the evidence at present attainable, I think the isothermals shown on the accompanying map are approximately correct.

The influence of the lake region has been referred to elsewhere, as well as the increase of warmth towards the west. These facts are shown by the isothermals. The Rocky Mountains turn the isothermals far to the south, but the effect is merely local. On the other side of the mountains the curves resume the general direction as if no mountains had interfered. The Pacific coast isothermals will be found interesting. The remarkable northward trend of the winter lines of heat, and the equally remarkable southward trend of the summer lines, together with the extreme contrasts presented within a few hundred miles, make the study of the Pacific coast climate one of peculiar interest. The summer line of 60 , which crosses the mouth of the St. Lawrence and passes north of Lake Athabasca, descends through California to a hundred miles or more south of San Francisco, leaving that city on its cooler side. The line of 70° , that of southern Austria, northern Italy, southern France, northern Spain, New York, Lake Erie and the Upper Missouri is found as far south as Los Angeles in southern California, yet only a short distance east, the neighborhood of Fort Yuma, on the Colorado River, has a mean summer of 90° , and in summer is probably, for its latitude, the hottest place on the globe. As Fort Miller, on the San Joaquin River, a short distance from San Francisco, which has a summer mean of only 57° , the mean temperature of summer is no less than 85° . Other peculiarities of the climate of the central part of the continent present themselves in the map.



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THE CLIMATE OF CANADA.

WITH the progress of our Dominion, the idea that Canada has a hyperborean climate, and that during the long winter the mercury is below zero for months at a time, is gradually disappearing, but even yet the most grossly exaggerated opinions of the severity of its colder months are entertained by many even intelligent people. Old Canada is rapidly becoming warmer to the British mind, and, no doubt, after a time, will be thought quite as hospitable as Germany, and new Canada, which, owing to the monopoly loving policy of the Hudson Bay Company, was considered a howling wilderness where the cries of the northern wolf mingled with the desolate howling of the icy winds over the stunted pine woods and desolate coasts, is beginning to assume in the eyes of the world the appearance of a vast and fertile land, dotted with the richest luxuriance of the prairie, and capable of becoming the granary of the world and the home of happy millions.

FEATURES OF THE CLIMATE.

With so vast an expanse, stretching from the latitude of Rome to that of Spitzbergen or nearly 2400 miles from north to south, and over as many degrees of longitude as there are between London and Calcutta, a great variety of climate exists in the Dominion, and the summers vary in different parts from the sub-tropical warmth of that season in Northern Italy to the almost winter coolness of Nova Zembla, and the winter from the mildness of Constantinople to the rigor of Northern Greenland. Yet, though there is so great a variety, the climate over the greater part, owing to the physical features of the continent, has the distinguishing feature of great extremes of heat and cold. The widening of the continent towards the Arctic regions allows the development of intense cold in winter, a cold almost unmitigated by the warmth of the Pacific winds which are almost excluded from the great inland area by the that immense barrier, the Rocky Mountains. On the other hand when winter is driven northward to the polar seas, the vast and low lying interior—adjoining without any barrier the great plain of the United States—admits the warmth and moisture of the tropical Gulf of Mexico to sustain the continental heat of the Mississippi and Canadian plain—the greatest plain on the face of the earth.

COMPARISONS WITH THE OLD WORLD.

As in the northern part of the old world which, as might be expected, it does not quite equal in its extreme of winter cold—the

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eastern side of the continent is very cold, the height of land north of Lake Superior, in lat. 48° , being like the Amour River in the same latitude in Eastern Asia and as cold, on the average, as North Cape, in latitude 72° , while on the western side the annual isotherm of 50° , attains its highest latitude at Vancouver ten degrees further north than on the east side, thus resembling the old world climate where that isotherm passes through Britain on the west, in lat 53° and through northern China on the east, in lat. 43° . The greater area of Northern Asia accounts for the greater cold of winter and the generally greater heat of summer which there exists. The general direction of the isothermals of the year across the continent is W. N. W.—at least from the 77th meridian to the Rocky Mountains. The summer isotherms show a more northerly direction than this, and the winter isotherms a less northerly course. The explanation of this northwestward trending of the lines of equal heat is found in the fact that the western coast is washed by the Kuro Siwo, or Japan stream, the gulf stream of the Pacific, and by a great ocean, over which the great westerly air currents of our latitudes are constantly blowing, and bearing the warmth of the Pacific far into the interior of the continent. Though the eastern side of the continent has its ocean, it has no prevailing wind from the sea; hence its coldness.

WARMER TOWARDS THE WEST.

In consequence of the north-westerly trending of the isotherms, the summer of the northern shore of the Gulf of St. Lawrence is found near the Arctic circle on the Mackenzie River; the summer of Quebec—further south than Paris, France—on the Peace River, and the summer of south-western Ontario as far north as the parallel of 49° on the plains of the far west, and in the interior of British Columbia. The winter lines do not show contrasts so decided. The maritime parts of eastern Canada have their winters modified by the Atlantic, while a little further inland the open waters of the Great Lakes exercise so ameliorating an influence that the winter isotherms which cross the Province of Ontario reach their lowest latitudes in the Mississippi Valley. But yet the contrasts are very marked. The mean winter temperature of Quebec is found on the Saskatchewan, without the snow and dampness of Quebec; the winter of Belleville is found in the Fort MacLeod country due west from Winnipeg; Sitka, in Alaska, has a winter climate warmer than Baltimore, Maryland, and Esquimalt in British Columbia, than Richmond, Virginia. The winter of the North-West is even practically milder than these comparisons would indicate, for the dry air of the great plains renders a temperature of zero quite as endurable as 20° above in Ontario and Quebec. Comparisons with the old world in the same latitudes are not unfavorable to Canada, if east be compared with east and west with west. Peking has as cold a winter as Hamilton, three degrees further north; and the winter climate of France and England is found in British Columbia. The winter of Roumania is found in Western Ontario, the winter of Central Russia on the Saskatchewan, with less sensible cold and less storm, however, and the

winter of that future granary of the old world, Western Siberia, in that rival granary, the Peace River country. The summer of Austria and France is found in Ontario and Quebec, in Manitoba, the Saskatchewan and the interior of British Columbia, and the English summer, so far as temperature is concerned, far to the north along the Peace and Mackenzie Rivers, and also along the British Columbian coast.

THE RAINFALL OF CANADA.

The rainfall of Canada is irregular, quite as much so as in Europe. The Pacific coast has an enormous rainfall, distributed over the whole year, but heaviest in the winter months. In fact, no other part of the Northern temperate zone rivals, in extent, its areas of heavy rainfall, though small districts in Norway, Portugal and the Alps equal it in quantity. The winds of the Northern Pacific, laden with moisture and blowing in the latitudes of the constant polar rain area, find a huge barrier in the Rocky Mountains of British Columbia and Alaska to their advance over the continent, and pour down no less than 80 inches of water along the whole coast from the Aleutian Islands to Vancouver, a distance of 1600 miles, and even 90 inches in the neighborhood of Sitka. From the coast line inwards the rainfall rapidly diminishes. The broken character of the mountain ranges, however, permits some of the moisture of the Pacific winds to penetrate to the interior, and scatter twenty to twenty-five inches of rain over the great plains of the northwest. Here the precipitation occurs principally in summer, the snowfall of winter being so light as to permit of cattle grazing through most of the country. Just as the Pacific rains begin to decrease, a new influence is brought to bear. From the Southwest come the deflected rains more or less intimately connected with the trade winds. The rains from the Gulf of Mexico after showering 60 inches on the lower Mississippi, advance towards the Northeast and supply the lake region and St. Lawrence with a rainfall, evenly distributed throughout the year, of from 30 to 36 inches. This influence is felt in the Maritime Provinces, where the rainfall is further increased by the local influence of the Atlantic and of the West India storms which sweep up the coast. Canada, as a whole, is well supplied with rain, the more northerly portions in the region of winter rains by the Pacific Ocean, and the more southerly provinces along the St. Lawrence, the Gulf of St. Lawrence and the lakes, by the Gulf of Mexico. Only to the far north is the rainfall deficient, and in only one district—near the Yukon River is there little or no rainfall. The heaviest snows occur in Quebec and in the mountainous regions of British Columbia.

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BRITISH COLUMBIA.

WASHED by the warm waters and bathed in the warm winds of the Pacific, British Columbia has a mildness of climate which lends an additional charm to the unrivalled grandeur of its scenery. Almost from the very verge of the Pacific the mountains tower, and mountain after mountain rises till the prairies of the North-West are reached. The consequent elevation of most of the country tends to make the climate cold, but running thirty or forty miles into the heart of this mountain mass are deep fiords which carry the warmth of the Pacific far inland, while the river valleys also, aid the upper currents in conveying to the interior the mildness of the sea. With so much variety in altitude and physical features, the climate must, of course, vary very much. Vancouver, "the pearl of the Pacific," has a cool British summer, and a winter milder than London, England—the latter season averaging 40°, and the former 60°. Here, some years, flowers bloom in January, and no snow falls except on the high land during the whole winter. Figs grow in the open air, and the myrtle flourishes. The coast of the mainland is a little colder in winter and warmer in summer than Vancouver. As in Vancouver the rains are heavy, except in summer, and magnificent forests of the Douglas pine luxuriate on the mountain slopes in the abundant moisture. This part of British Columbia is fitted to be the fruit-grower's paradise, and no doubt on the opening of the North-West, the British Columbians will find fruit-growing an important and profitable industry. Beyond the Cascade range the climate changes: the rain, intercepted by these mountains, falls but sparingly, and vegetation has not the rich green of the coast. This, however, is the bunch grass country, where on the hill slopes and plateaus, the finest beef in the world is produced. The winters here are sometimes very cold, though generally they are moderate but very changeable. Winter begins in November and ends in February or early in March. Summer advances rapidly, and April is almost as warm as a Toronto May. June, July and August are hot, the thermometer sometimes rising for days together to above 100° in the shade. The summer nights, in the clear health-giving air of this region, are, however, comparatively cool and pleasant. Further towards the Rockies the climate varies between moderate and very severe winters, and hot and cool summers—the determining cause of these variations being altitude, the neighborhood or absence of high, cold plateaus, and the degree of openness to Pacific influences. Rainfall varies very much over almost the whole of British Columbia, even in places only a few miles apart, though the distinction between the east and west sides of the Cascade range is everywhere noticeable. The eastern side of Vancouver, sheltered by the mountains, has a much lighter rainfall than the west, and is therefore better suited for agriculture. Esquimalt, on this side, has a rainfall not greater than that of Ontario. Spence's Bridge, on the Thompson, and beyond the Cascade Range, has rarely ten inches in the year. A comparison of mean temperature of a series of five years will illustrate the two leading varieties of climate in this Province, so far as temperature is

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concerned. For comparison we also give the monthly temperatures of Greenwich, England, for three years.

	Esquimalt.	Spence's Bridge.	Greenwich, Eng.
January	37.4	17.8	35.5
February	41.0	30.4	37.4
March.....	42.8	37.2	44.6
April	48.2	50.6	46.4
May.....	52.3	58.6	54.1
June	56.5	64.4	58.5
July	59.6	70.2	59.6
August	58.3	67.9	62.7
September.....	53.6	59.8	58.0
October.....	49.1	49.6	47.4
November.....	44.1	31.5	42.9
December.....	41.9	29.3	40.4
	48.73	47.3	48.96.

THE CLIMATE OF THE NORTH-WEST.

THE vast fertile area which stretches westward a thousand miles and more from the Red River of the north, and over 800 miles along its western border to the north forms a vast triangle over which a remarkable similarity of climate prevails. The summer in the far north is only a few degrees cooler than in the south, and wheat grows equally well over the whole stretch of country between the 49th and 60th parallels. The fact of latitude making so little difference in heat is accounted for by the slope northward of the great plain east of the Rockies. In the middle latitudes of the United States this plain has an average elevation of 5,000 feet. When Canadian territory is reached the level is about 2,000, and near the Peace River it is only one thousand. Of course the heat of the more southerly portions of this plain is modified so much as to prevent the contrast with the north which might be expected from the difference of latitude. The winter is everywhere cold, the cold increasing from the Fort Macleod country eastward and northward. In Manitoba and in the Peace River country the winter is almost without thaws, and a clear sky overhead, a brilliant sun, a dry, bracing air, make that season much more enjoyable than might be expected

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from the degree of cold. Dr. Hagarty, a physician in Manitoba, says, that after coming into the house from half a day's driving in a temperature 20 to 30 degrees below zero, he is able to sit down and at once commence writing, a feat which he never performed in Ontario at 15 or 20 above zero. In the south-western part of this triangle, while the wonderful clearness of the skies does not diminish, the winters are warmer and so changeable that in some parts sleighing is precarious. At Fort McLeod the thermometer may range between 60° above zero and 15 or 20° below in any one winter month, and may change from a zero temperature to a thaw within five hours. The character of successive winters also varies, and the mean temperature of any month in one winter may be thirty degrees higher than the same month in the following or preceding winter. February, 1876, averaged there 10°.8, and February, 1877, 35°.6, a greater range in two years than Toronto has known in forty. Here, of course, snow does not lie. Towards Battleford, 350 miles north-east, the characteristics of the Fort McLeod climate become modified, but are still marked. Extremes of cold are occasionally greater than ever known in Winnipeg, but the mean temperature is higher. Snow lies all winter. Away to the north, along the Peace and Mackenzie, the winter is more severe than in Manitoba, but is but very little longer than in the latter Province. With singular uniformity winter sets in about the 5th of November over the entire country, and closes about the 1st of April. The heat of May advances vegetation rapidly, and the summers vary from 62° to 69° in mean temperature. Autumn is everywhere early, September is a rapid decline from August, and October has a temperature as low as the first half of November in Ontario. November is a winter month. In this rapid decline of the temperature of Autumn, the north-west resembles similar latitudes in Russia. Over a vast area the snowfall is so light that cattle graze all winter, brushing the snow aside to reach the dry prairie grass below. The shelter of the lee of a barn at night suffices to keep these animals in good condition, so dry is the atmosphere and so steady the frost. Hence stock raising is likely to be an important industry in time. Grain growing here finds its most favorable conditions, except in localities visited by severe summer frosts. The cold of winter penetrates the ground to a depth of six and seven feet, and though the surface thaws to a depth of a foot or two immediately on the opening of spring, the sprouting grain is supplied with moisture when most necessary, by the thawing soil below, which is not free from frost till summer is fairly in. The area of land fit for settlement in the whole north-west is estimated at 200,000,000 acres. Of this it is safe to conclude that 150,000,000 have a climate in a high degree favorable to agriculture.

As an illustration of the fact that the temperature increases in the northern plains towards the west, we give the following figures for Fort Macleod, at the foot of the Rocky Mountains, Winnipeg in Manitoba, and Battleford on the Saskatchewan. The temperature for Winnipeg is the mean of five years, that for Fort Macleod is the

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mean for nearly three years. The Battleford temperatures cover a shorter period.

	Fort Macleod.	Winnipeg.	Battleford.
January.....	19.4	5.0	2.5
February.....	25.7	3.3	16.2
March.....	24.7	13.2	19.0
April.....	40.45	34.4	41.2
May.....	52.8	51.7	50.9
June.....	61.1	60.3	59.2
July.....	68.1	67.2	65.0
August.....	64.3	64.3	68.2
September.....	54.65	52.7	46.9
October.....	40.9	37.4	33.2
November.....	27.2	18.5	19.8
December.....	25.8	6.8	11.0
	42.1	34.6	36.1

THE CLIMATE OF ONTARIO.

ONTARIO, from its southern latitude and great lakes, is not only the most favored portion of Canada, but is one of the most favored on the continent. Its most southerly part lies in the latitude of Rome, and the whole of its settled part lies south of the northern boundaries of Italy. Although it lies in that part of the continent in which the isotherms should descend furthest south, the influence of the great lakes so greatly counteracts the natural tendency to cold that the regularity of the isothermal sweep is disturbed, and these lines cross the province several degrees northward of their normal position. The influence of the great lakes is felt in a marked degree in winter. The winter isothermal of 25°, which descends to lat. 41° in Pennsylvania, turns sharply northward to Lake Ontario, and sweeping across the Ontario peninsula on the 43rd parallel, descends beyond the Mississippi in northwestern Missouri to the 40th parallel. The winter line of 20° is turned by the lakes as far north as the straits of Mackinac; in fact the winter is throughout the whole lake region several degrees warmer than in the same latitudes on the Mississippi. The heat of summer is also moderated

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by the lakes, so that the summer is several degrees cooler than the Mississippi district in the same latitude. The lakes also have a great effect in rendering the sudden changes of temperature less rapid and less extreme than over the most of the continent. A change of forty degrees within twenty-four hours is not uncommon over a large part of the continent. Texas changes suddenly from the summer heat of 80° to the hard frost of 18° above zero. At some places on the plains west of the Mississippi a change of forty degrees in twenty-four hours occurs from twenty to sixty times in a year. The lake region is much less liable to such trying changes. Kingston and Toronto only shew so great a change once in several years. In the mean temperature of the year the differences of the Ontario climate are comparatively large. On Lake Erie a mean temperature of 49° is reached, while on the Upper Ottawa the mean is as low as 39° , although the difference in latitude is only four degrees, or less than 300 miles. The difference in winter is more remarkable. The county of Essex, on Lake Erie, is as much warmer in winter than Ottawa, as Memphis, Tennessee, is warmer than Essex, although the difference between the two Canadian districts named is only three degrees, while Memphis is seven degrees further south than Essex. The summer, however, is almost uniform over the whole settled part of the country. In April in eastern Ontario warm weather sets in, and from that time till October the temperature is quite as high as in most parts of southwestern Ontario, and vegetation is wonderfully rapid and luxuriant. Almost everywhere July averages 70° in the shade, and a maximum of 95° of shade heat is attained, as high an average annual maximum as that of Philadelphia, St. Louis or New Orleans, and higher than that of Charleston, South Carolina.

The duration and character of the winter season is very different in different parts. In eastern Ontario winter sets in in November and ends in the beginning of April. Snow lies several feet deep, and sleighing lasts with few or no interruptions for four months. The opening of winter becomes later towards the south-west, and near Lake Erie does not set in till December. The ground in winter is generally almost bare, and sleighing lasts only a couple of weeks. The Ottawa winter is very cold, but steady, bright and bracing. The peninsular winter is shorter and warmer, but wetter and variable. Along the Ottawa the mercury falls to at least 30° below zero every winter. At Toronto its average lowest in the year is 12° below. At some points on Lake Huron it usually falls little or not at all below zero. While eastern Ontario rarely reaches 50° in the shade during the three midwinter months, the south-west shows occasional temperatures of from 60° to 70° , and the coldest year on record in Ontario closed with a day on which 71° in the shade was reached.

A very general opinion is entertained that the Canadian summer, if warmer, is shorter than the British summer. This opinion, however, is not justified by the facts. On the contrary, the summer season in Ontario is longer than not only the British summer, but

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quite as long as the summers of most parts of Germany, Austria and France. As an indication of the warmth and length of the Ontario summer, the following figures will be sufficient. The means given for the Ontario stations are for the five years 1874-8 inclusive :

	May.	June.	July.	August.	Sept.
Paris.....	58.1	62.7	65.6	65.3	60.1
Berlin.....	56.6	63.4	65.8	64.5	58.4
Leipsic.....	54.0	59.6	62.1	59.0	57.7
Vienna.....	62.1	67.5	70.7	70.0	61.9
London.....	53.5	58.7	62.4	62.1	57.5
Edinburgh.....	50.3	56.0	58.7	56.8	53.4
Toronto.....	52.6	62.8	69.0	68.0	59.7
Hamilton.....	55.5	66.4	73.6	71.3	62.5
Windsor.....	58.1	68.2	73.0	71.1	63.4
Goderich..	52.9	64.3	69.2	68.7	61.2

From the above table it will be seen that at two of the Canadian stations given, September is warmer than July at either London or Edinburgh, while in May Windsor is only about half a degree colder than July in Edinburgh. Though in May Vienna is warmer than Windsor, in June, July, August and September Windsor is warmer than the Austrian capital. But apart from records of temperature, the products of the country are convincing testimony to the merits of the climate. The grape grows well almost everywhere, and vineyards are becoming plentiful in the south-western part of the province; even the far-famed Catawba wine being an article of Ontario production. In the Niagara district, the Lake Erie district, and on the shores of Lake Huron the peach grows in abundance, as well as the apricot, quince and nectarine, while the fig, with a little protection in winter, will ripen in the open air. Cucumbers, watermelons, tomatoes, capsicums, the egg-plant and other tropical or semi-tropical vegetables are found in abundance in most parts of the province. Maize grows to a height of fifteen feet, and in some counties yields eighty bushels to the acre, and even the beautiful tulip tree of the south grows in the forests of south-western Ontario. The winter ranges from a mean of 10° above zero to a mean of 28°. Toronto has an average winter temperature of 24. The climate of south-western Ontario finds its European analogy, summer and winter, in Roumania, while the east and north-east of the province resembles Central Russia, having, however, a warmer summer.

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THE CLIMATES OF THE TEMPERATE ZONE.

THE simplest manner of conveying a clear idea of the relative warmth of the various countries of the earth is by drawing isothermals, or lines of equal heat. To one who has paid no attention to the comparison of climates, a first examination of a map crossed by these lines will create surprise and upset many preconceived opinions.

THE LINE OF 60°.

The line along which the average temperature of the year is 60°—*i.e.* the heat of an Ontario September—crosses China eastward but little north of the 30th parallel, skirts the base of the Himalayas, crosses the Euphrates, and reaching Damascus in Syria, runs northwest to the northern part of Ægean sea. Still continuing its course towards higher latitudes, it crosses the south of Turkey, the Adriatic, Italy a little north of Rome, the coast of southern France, Central Spain, and reaches the Atlantic near Lisbon in Portugal. After crossing the Atlantic, it strikes land again in North Carolina, 300 miles further south than Lisbon. Inclining to a more southerly course it crosses the Mississippi near Memphis, then south-westerly it goes, reaching its most southerly point in the northern hemisphere, on the upper Rio Grande, at lat. 30°. Then having crossed the Rockies, it trends to the north-west, through California, to latitude 40, whence returning straight south it passes into the Pacific near Los Angeles. It thus varies from the latitude of New Orleans to that of Toronto, its extreme points being the Rio Grande and Leghorn, Italy.

THE LINE OF 50°

as the annual mean, approaches Pekin in China, crosses the Caspian and Black Seas, and skirts Lake Erie—all in its middle latitudes. Its most extreme points are near Sante Fe, New Mexico, in lat. 35°. Ireland in lat. 53° and Vancouver's Island in lat. 51°, thus showing a range of nearly 1300 English miles from north to south.

THE LINE OF 32°

annual temperature, is, however, a much more irregular one, and far more surprising. That temperature is, owing to the coldness of the Manitoban winter, little below the mean temperature of Winnipeg. Its course from Manitoba eastward is along the height of land north of Lake Superior, then north-easterly, across Labrador, off Cape Farewell in Greenland, north-east of Iceland, across the Arctic Circle to within a few miles of Spitzbergen. This great north-easterward sweep, carries it from lat. 48° to lat. 75°, or more than 1800 miles to the north. After a bend towards the east the line descends south-westerly across the Northern Ocean and through

Norway to near lat. 60°. Then it resumes its easterly course, passing across the Gulf of Bothnia, and skirting the White Sea. Across the great plain of Russia it descends to the Urals near lat. 50°, then takes a westerly direction till in the valley of the Amour River, in the northern borders of the Chinese Empire, it attains a latitude the same as occupied by it north of Lake Superior. Again the northerly sweep is resumed, and the line crosses Kamschatka to Alaska, and passes north of the 60th parallel, when again it descends south-east back to Lake Winnipeg.

The Gulf Stream, and prevalent south-westerly winds from the sea, explain the remarkable disregard of latitude shown by the line 32° in making Iceland and Northern Europe as warm as regions far to the southward in Eastern America and in Asia. The Kuro-Siwo or Japan Stream—the Gulf Stream of the Pacific, with the south-west ocean winds explain the comparative warmth of Alaska and the far North-West, and the fact that Sitka is as warm on the whole as Montreal. These streams scarcely affect the continents to the west of them, which they almost wash; the west winds, carrying the warmth to the eastward.

CHANGES OF THE WIND.

Storms in the region of the great lakes rarely, if ever, come from the east. They generally come from the south-west, west and north-west. As the front of a storm is passing over us, an easterly wind sets in, and is shortly accompanied by low clouds which bring rain or snow. When the central line of the storm is passed, a westerly wind prevails. If the centre of the storm is passing over us, the wind will blow from south-east to east till a lull occurs and the rain falls straight down. This lull will be succeeded by north-westerly to westerly winds. If a place be in the southern part of a storm area, the wind will back from south-east to west, and except in the coldest weather will not be accompanied by snow. In the northern part of a storm the wind changes from east by north to north west, and in moderate or cold weather is accompanied by snow. Along the track of the storm centre, rain, snow or sleet, or all of them, will fall according to the prevailing temperature. The wind blows towards a storm centre at an angle of 45 degrees, and rarely or never direct. When a storm is passing, neither snow nor rain will fall when the wind is north of north-east. From north-east by south to south-west is the wet semi-circle. Thunderstorms are not included in this allusion to storms, as they are merely local incidents of the weather.

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In a corner building i more life and the Dominion greatest advan the farmer wh mercial world sown harvest " young proba by the constar face seems to of a whole co summer day. well in fact th not acknowle than himself. the daily sto having till on Weather Offi and consequ which are at as the weath storms, and c try to the no ances not un of coming s Probs whose north of it a indications o on the mor Nevertheless verified in ov ington warn

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YOUNG PROBS.

HOW THE DAILY FORECASTS ARE MADE.

IN a corner of University Park, Toronto, stands a modest looking building in which is carried on a work which annually saves more life and property than any institution, or dozen institutions, in the Dominion, and which promises to do its part in one of the greatest advances of modern times—an advance which will inform the farmer what crops to sow in each recurring spring, and the commercial world what prospects to look for as the result of the yet unsown harvest. The building referred to is the headquarters of "young probabilities," a young and amiable personage, who, judging by the constantly happy, almost merry, expression of his unwrinkled face seems to feel the task of keeping his eye on the winds and waves of a whole continent to be little more than the pastime of a languid summer day. But, nevertheless, the task is well performed—so well in fact that "Old Probs" at Washington often feels, if he does not acknowledge, that his younger brother up north is wider awake than himself. "Young Probs" has been but a few years at work—the daily storm warnings for the Lakes and Maritime Provinces having till only half a decade back been furnished by the Washington Weather Office. He has not the means—owing to a lack of money and consequently of more widely distributed reporting stations—which are at hand at Washington, to trace as fully and as frequently as the weather man at that city, the progress and development of storms, and owing to the proximity of an almost uninhabited country to the north and north-west in which great atmospheric disturbances not unfrequently originate, his duty of giving early warnings of coming storms is sometimes more arduous than that of Old Probs whose country is netted with telegraph wires, and has to the north of it at least a fringe of settled country from which to obtain indications of approaching northern storms long before they burst on the more southern region over which his responsibility lies. Nevertheless, the storm warnings issued by the Toronto Office are verified in over ninety per cent. or a little oftener than the Washington warnings.

HOW THE PREDICTIONS ARE MADE.

The explanations given a reporter of a Toronto newspaper who called at the Observatory about the middle of November, by Lieut. Gordon, the Deputy Superintendent of the Canadian Meteorological Service, will convey to the reader a tolerably clear idea of how forecasts are made.

"All storms," said Mr. Gordon, "invariably travel in an easterly direction, the exceptions to this rule being so very rare that we take very little, if any, cognizance of them. Storms rising in Wyoming Territory, for instance, always make for the Atlantic, and by communicating with the different stations we can track them on a chart quite accurately. In addition to their easterly motion, they have a

rotatory motion, the wind blowing from all points of the compass at different places, and still being part of one and the same storm. For example, a storm may, when it first strikes Toronto, blow from the south, and when it has nearly passed over, supposing it to take three days to do so, the wind may be from the north, and yet it is the same storm travelling from the west to the east; and the wind in storms always veers round the compass in a contrary direction to the hands on a watch. For the purpose of predicting the weather we have maps of the continent, three of which are used every day, or one for every set of observations despatched to us. This map, showing the reporter a map marked at different points with arrows and curved lines, "is the one we used for this morning's (Tuesday) observations, and you can see by it that at seven o'clock this morning the lowest pressure throughout the whole continent was a little north of Toronto. In the Maritime Provinces and to the east, the barometer is stationary, and in Wyoming Territory and to the west the pressure is highest. Observation and experience have taught us that with an area of low pressure in the centre, bounded on the east by a stationary barometer, and on the west by an area of high pressure, the high pressure will force the low pressure over to the east and take its place.

"Then we are going to have fine weather?" said the reporter.

"It doesn't follow. Our last despatches inform us that there is a storm, or an area of low pressure developing in Texas, and that storm may travel rapidly in a north-eastern direction, and slip in between our present area of low pressure, and the one high pressure travelling east from Wyoming Territory, and if it does we shall have another storm before we have fine weather: we are now watching the development of that storm in Texas with care. Occasionally in the winter, storms travel over the Dominion that developed in the Peace River district, and then travelled over the North-West. These storms are dry and very cold, but most of the storms which pass over Toronto, develop in the Gulf of Mexico, and to the west of the Rocky Mountains."

"Then you predict the weather entirely from information received from different points by telegraph?"

"Entirely so. The information consists of the atmospheric pressure as shown by the readings of the barometer, the temperature of the air, the relative humidity, the velocity of the wind, and the direction from which it is blowing, the state of the sky, whether cloudy or clear, the quantity and kind of cloud and the direction of motion, and the amount of rain or snow, if any, which has fallen since the last report. As soon as we get this information it is entered on the maps prepared for the purpose. The map is then examined by the officer whose duty it is to make out the probabilities and issue the warnings. In order to do this satisfactorily it is necessary, not only that he should know such laws as have been already established relative to the movements of atmospheric disturbances, but he must also be familiar with a long series of previous weather charts, so that he may be able to supplement the

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conclusions drawn from theory, by a practical knowledge of what has followed similar conditions on previous occasions, and thus tell at a glance what conditions are likely to follow during the twenty-four hours following."

"Do you ever get mistaken?"

"Not often. Here is a weather chart prepared some time ago, and this blue line represents the track of a storm. You observe it originated west of the Rocky Mountains, and travelled almost due east until near Lake Michigan. Then the storm did what so rarely happens, it backed to the west again and then started once more for the east, passing over Canada to the north of Toronto and south of Hudson's Bay. When we found the storm following the usual course of storms, and rapidly nearing the lake district, we ordered up the drums, but, backing as it did, it was carried to the north of the lakes, and then some people charge us with fooling them. It is hard to satisfy all people. For example, take our very last reports received. The drums are up now and the wind is only blowing ten miles an hour at Toronto, but at Port Stanley it is blowing thirty-six miles an hour, which is a gale. All storms have a calm or comparatively calm centre, round which they revolve. This calm centre travels with them. Here are the charts of the great storm a week ago last Sunday which passed over Lake Ontario and wasn't felt on Lake Michigan. Look at the readings for Saturday night. There to the east at Kingston the wind is registered as blowing 40 miles an hour, at Toronto at the same time it is only 8 miles an hour, and at the west end of Lake Erie at the same time it is 44 miles an hour. Just at this time the calm centre was right over this locality. At 3 a.m. on Sunday our self-registering anemometer showed the velocity of the wind to be 55 miles an hour: at 4 a.m. it was 55½ miles an hour, and at 6 a.m. 55 miles, and then it gradually decreased. Another matter in connection with storms and these calm centres is this, when the calm centre has passed over a locality and the wind commences again, it always blows hardest and the barometer commences to rise. The barometer never rises until the centre of a storm has passed, and this was precisely what happened in the great storm on the 9th of November. Early Sunday morning the storm centre moved east and the wind increased again, and just then the barometer began to rise."

THE METEOROLOGICAL OBSERVATORY.

The building in which "Young Probs." works out the intimations which are telegraphed to all the lake, river and Maritime ports, as well as to hundreds of the inland towns and villages is occupied principally by the staff of the Meteorological office, and is devoted to the copying and compilation of the reports received from nearly one hundred and fifty places in Canada, including stations in New-

MOSES OATES' WEATHER BOOK.

foundland on the east, Vancouver's Island on the west, and along the Arctic circle in the north. These reports are of great use in determining the climate of every part of Canada, and in furnishing material from which meteorologists may deduce important scientific conclusions. In another building a hundred feet off, the magnetic observatory is situated, and in or near it the meteorological instruments necessary to determine the temperature and barometric pressure of the air, the force and direction of the wind, the rainfall, &c. To one who has not seen the observatory these instruments will appear a most surprising novelty. The readings of the thermometer and barometer are not made at stated hours, and by the eyes of an observer, but are photographed on a slowly moving piece of paper. The curved line which divides the black and white parts of the paper shows the temperature at every instant of the day, and the slightest variations and the precise instant of their occurrence is thus known. The exceedingly well adjusted magnetic instruments in this, one of the very oldest as well as best equipped observatories in the world, are too complex for description in a popular work. So delicate are they that any of the staff who enter the rooms in which they are placed, on solid stone pillars, must first remove any iron or steel he may have on his person, lest the magnetic needles might be deflected. Iron is tabooed in their vicinity, the very stoves being of copper. Deflections of microscopic extent are recorded on the photographic paper by these instruments. On the tower above the building is noticeable a structure, the highest part of which bears a vane to show the direction of the wind. A few inches lower down extend from a rod several minor rods, at the end of which are placed metal saucers, or half globes, concave on one side. These, except in the calmest weather, hop round and round the vane in a lively manner. Connected with the vane, but away down below in the building self recording instruments trace on paper the exact direction and velocity of the wind at the every instant of the day. The velocity at any instant or the total number of miles travelled by the wind per hour or per day is thus shown. Many other objects of interest and many peculiarities of the observatory might be mentioned which would be of interest to the reader, but space forbids

THE METEOROLOGICAL STAFF.

In addition to the able Superintendent, Chas. Carpmæl, Esq., a brilliant mathematician whose record at Cambridge was amongst the best known there, and his able Deputy, Lieut. Gordon, there are eleven gentlemen employed in the Observatory Buildings. Some of these have been there for over twenty-five years and are yet pursuing their arduous task with a diligence and interest which the public neither knows nor appreciates. Their salaries are ridiculously small for the work which they perform, work which requires a special aptitude and which not one man in a thousand, no matter how highly educated, could perform. Yet, notwithstanding the utterly inadequate remuneration received, they labor on—the devotees of science—and will labor on at the same small pay till the end of the chapter. When in

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the more enlightened days when the value of their labours will be felt by every man's pocket as well as mind, the public will awake, as it has done too late in many past instances, to a sense of the real greatness of this unassuming but most civil branch of the civil service. While the weather service of the United States has half a million dollars per annum voted it, and the weather services of some European countries are well provided for, the Government allowance to our service is only \$37,000, an amount nearly all of which is expended for telegraphy, printing, and other expenses connected with the outside duties of the service. There are also about a hundred and fifty observers scattered over the Dominion, only a small number of whom receive any remuneration for their labors. An increase of even \$13,000 in the grant to the service would furnish fuller and earlier storm warnings to the country, vastly extend the work of the service, allow the heads of the departments some relief from the commonest routine duties and a little time to study meteorology. It would be money well spent and the Government would do well to spend it.—M. O.

WEATHER MAPS.

WEATHER maps, of which three are prepared every day from the telegrams alluded to by Lieut. Gordon, are interesting studies. At times the continent shows three or four areas of low barometer and a corresponding number of high areas, though the usual number shown on the maps is generally not more than two of each class. Supposing the centre of a low area to be over Toronto, with a barometric reading there of 28.2 inches, which is considered unusually low even in great storms, around this centre will extend an irregular line enclosing an oval space. Along this line, which may run through Woodstock, Barrie, Peterborough, Port Hope, Rochester and Buffalo, the barometer will mark 28.3 inches. A second line will surround the first one showing where the barometer is 28.4 inches. Then line will succeed line, each one showing a barometric column a tenth of an inch higher than the line nearer Toronto, until the lines no longer make a complete enclosure, but stray off to form one of the outside lines of some far distant high or low pressure. While the centre of the low pressure or "cyclone," as it is frequently termed by some meteorologists, may be at Toronto, a similar low area may be in Texas and another in British Columbia, and between these low areas and beyond them towards or over an ocean will be centres of high barometer, marking over 30 inches, surrounded by lines marking each tenth of an inch of lower pressure and enclosing generally very irregular areas.

In America the average distance between centres of low and high pressure is about 1200 inches, and consequently when a low area is

in the Atlantic States it frequently happens that a high pressure will rest on the Mississippi Valley with a low pressure in its rear on the Pacific coast. So high pressure succeeds low pressure moving towards the east and resembling the crest of a wave of the sea sweeping on with a hollow in front and another to the rear. But barometric lines are not the only peculiarity of these maps. The temperature is also marked down at each station which appears on the map, and varies very much in the different quarters of a low pressure, but is high compared with the surrounding areas of high pressure. The rainfall is also marked, and the direction and velocity of the wind. The direction of the wind is shewn by arrows. These arrows never, or rarely, point directly towards the centre of a low barometric area, but incline at an angle of about 45 degrees towards the centre. The succession of arrows on each of barometric lines shows a spiral movement towards the storm centre the in a direction opposite to the revolution of the hands of a watch. For instance when a storm centre is over Toronto, the arrow at Rochester will point north-east, at Port Hope north-west, at Barrie towards the south-west, and at Woodstock south-east. In the summer time, the winds of barometric storms are affected by the tendency to sea breezes by day and land breezes by night along the lake-shore. While in low areas the direction of the wind is towards the storm centre, in high pressures it is the reverse, the air flowing out in every direction from the centre of the high pressure. The distance between the barometric lines varies much: it may be close on one side of the storm and very distant on the other. The smaller the distance the greater will the velocity of the wind be—a fact which is apparent on examining the records of wind velocity marked on the maps. A study of the maps will also show the interesting fact that Texas is the birth-place or is near the birth-place of many of our storms, and that in British Columbia or the Saskatchewan Valley very many storms are first noticed. The extension of telegraphic communication to stationary vessels on the Pacific and in the tropical waters between North and South America would probably show that many of these storms originate beyond the district where they first become known to "Probabilities." The maps will also show that whether storms appear in Texas, in the great plain of the Mississippi, in California, in British Columbia or in the North-West, they almost invariably move to the great lakes before striking the Atlantic.

SUNSETS AS INDICATIONS OF WEATHER.—The characteristics of the sky at sunset, as indicative of fair or fine weather for the succeeding twenty-four hours, have been observed continuously for a long time by hundreds of meteorological observers on this continent. Out of 4,116 observations made at 134 different places, 19 were reported doubtful. Of the remainder, 3,472 or 84.4 per cent., were followed by the expected weather. Close observation of sunsets would be of great advantage to agriculturists.



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AGRICULTURAL COMMISSION.

THE CLIMATE OF ONTARIO.

AT a Session of the Ontario Agricultural Commission, held in the Parliament Buildings, at Toronto, last October, Moses Oates gave the following evidence:—

To MR. DYMOND.—I have given considerable attention to meteorology for about 14 years, and am an observer of the meteorological service. My attention has been chiefly directed to the temperature of various districts, variation of temperature, rainfall, snowfall, and the causes of these. There is no peculiarity in the Ontario climate, except that there is not the same difference here between high and low lands with respect to rainfall that there is in Europe, where high lands, as a rule, have a much greater rainfall than low lands.

FRUIT GROWING DISTRICTS.

In fruit growing countries sunshine and rainfall have a greater effect upon the quality of fruit than the mean temperature the year. The vine flourishes best where there is a great deal of sunshine, and where the rainfall is not great during the season of vegetation. Moisture, combined with heat, is injurious to the grape. I am not aware what is the difference with respect to other fruits between a rainy and a sunshiny district, although I have no doubt there is a difference. The peach and the grape are cultivated largely in the Niagara district, on account of its high temperature and comparative exemption from low extremes. That district is generally from three to four degrees warmer than the north shore of Lake Ontario in the neighborhood of Toronto, and frequently in the middle of the day, is ten or fifteen degrees warmer. This is partly owing to the fact that there the south-west wind passes over land, while the south-west wind coming to Toronto passes over the cooler surface of Lake Ontario. The country between Lake St. Clair and Lake Erie is, in my opinion, superior in many respects to the Niagara district for the production of wine, owing to its smaller rainfall and greater heat, its warmer springs and longer season of vegetation. Many parts of the shores of Lake Huron are also very suitable for fruit culture. The extremes of temperature are fewer there than in either the neighborhood of Windsor or in the Niagara peninsula.

MOSES OATES' WEATHER BOOK.

There are instances found in the meteorological reports in which the thermometer has descended to over ten degrees below zero in Hamilton, when in the Huron district it was not below zero. There is a difference of at least two degrees in autumn in favor of Goderich over Toronto, although there is very little difference in the latitude.

THE EFFECT OF SWAMPY LANDS.

At Kincardine the mercury very rarely falls below zero. Swampy lands affect the temperature very much. Dundas, for instance, is under the influence of two peculiarities affecting temperature. It is in a deep valley, and the cold air from the surrounding plateau rushes into it, but possibly a more important factor in producing its low temperature is a swamp in its neighborhood, causing in the one year, for which I have a comparison, two degrees lower temperature than the annual mean of Hamilton. Stratford has also swamp, and it is slightly lower in temperature than it would be in normal conditions. Newmarket has a large swamp in its vicinity which produces an abnormal deficiency in heat. Its distance from Toronto is about the same as that of Brampton and its height above the sea certainly no greater, yet while the latter averages only a fraction of a degree lower than Toronto, Newmarket's temperature is two or three degrees lower. Newmarket shows a lower summer temperature than almost any other station in Ontario, and this is owing to the large swamp in its neighborhood. The following figures for 1876 will illustrate the peculiar temperature of Newmarket:

MEAN TEMPERATURE 1876.

	APR.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.
Toronto	38.°2	51.°5	65.°5	68.°8	70.°2	57.°5	42.°8
Newmarket.....	35. 8	50. 9	63. 9	68. 1	68. 4	55. 9	41. 1
Brampton	37. 3	52. 7	69. 3	70. 8	72. 2	56. 1	42. 6

LOWEST TEMPERATURES 1876.

Toronto.....	17.°0	30.°4	44.°2	46.°2	45.°0	38.°5	23.°0
Newmarket....	-1. 0	25. 2	42. 0	37. 2	34. 0	32. 0	15. 4
Brampton.....	12. 0	33. 0	51. 0	54. 0	52. 0	41. 0	24. 0

To MR. BYRNE.—The water in swamps being very shallow, it heats very quickly and evaporates very rapidly, and thus produces coolness. Deep water has not that effect. Of course swampy lands are more liable to be affected by early and late frosts than drained lands. I attribute the extraordinary prevalence of summer frosts in the neighborhood of Newmarket entirely to the swamps, which chill the atmosphere for miles around.

The report for 1878, the latest issued, shows a greater difference in the mean temperature of Newmarket as compared with either Toronto or Brampton than the figures above given. Other places in the neighborhood of swamps might also be cited, to show the great effect of wet lands in reducing the temperature.

MOSES OATES' WEATHER BOOK.

To MR. DYMOND.—The fitfulness of frosts is due to the varying character of the soil, and its vegetation, the presence of even slight hills and hollows, the nearness to or distance from forests or swamps, &c. A district bordering on a large body of water like a lake is often exempt from frosts to which interior districts are liable. I don't think small lakes two or three miles in length have nearly so much effect in ameliorating the climate, owing to their shallowness. In North Gwillimbury, which lies on Lake Simcoe, the minimum temperature of some months of summer is generally very high—very often as high as 55 or 60, when Windsor is only 45 or 50 deg. Very much depends on purely local causes, as the character of the soil, depressions or ridges of land, matters which should be studied by agriculturists.

EUROPEAN COMPARISONS.

The climate of Ontario—the South-Western part—corresponds very closely, not with Norway, Sweden, or Russia, as has been represented, but with Roumania. Roumania is more its counterpart, both as regards summer and winter heat, than any other country in Europe. The mean temperature along a line drawn from the Danube through Bucharest to Moscow corresponds very closely at all seasons with the climate of Ontario on a line drawn from Windsor to Pembroke on the Ottawa, Pembroke, however, having a warmer summer than Moscow. Hungary, again, has a climate corresponding in its mean temperature to the South-Western part of Ontario, known as the Lake Erie and the Niagara District and produces some of the finest wines in the world—wines that rival the very best wines of France. There are very few stations, out of 200 or more, the reports of which I have looked over, in Germany and Austria, which show a higher temperature in summer than some parts of the Province of Ontario. Many parts of Northern Italy, at similar elevations to Ontario stations, show a temperature in mid-winter only six or seven degrees higher than Southern Ontario, and a summer temperature very nearly the same. The growth of the vine is very successful in all the countries I have named—Roumania, Bulgaria, Southern Russia, Hungary, and Northern Italy, and so far as climatic conditions are concerned, there is no reason why Southern Ontario should not rival the best wine districts in the world in many classes of wines. We have a longer duration of summer temperature than most parts of the Rhine. Windsor has had a temperature during the five years, 1874 to 1878, inclusive, of 63½ deg. in September, and 73 deg. in July, the heat of which latter month at Windsor is very little lower than its temperature at Oran in Africa, at Marseilles in the south of France, and only a few degrees lower than at Jerusalem and several other places in Syria.

To MR. BROWN.—For at least three decades after 1841 the average snowfall steadily increased and the number of days on which snow fell also greatly increased. The average depth of snow on the ground at one time has, I think, been diminished. The rainfall in the second and third quarters of the year decreased till 1871, but lately, I think, the rainfall in this part of Ontario has been increas-

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ing in these quarters—that is, during the last six or seven years. The causes of this increase are probably not due to anything peculiar to the Province, but have their origin outside of the earth. A peculiarity of the Province in the distribution of its precipitation is that the district east of Lake Huron and north of the Grand Trunk Railway shows a snowfall very much greater than the country lying south of the Grand Trunk. For instance, Windsor in 1879 shows a snowfall in January of five and a half inches, Kincardine of forty and a half inches, and Owen Sound of forty-three inches. The total snowfall at Windsor in that year was thirty-two inches, while at Kincardine it was 154 inches, and at Owen Sound 159 inches. What falls as rain over South-Western Ontario often falls as snow over these high lands. Parry Sound is not affected so largely in the same way. The explanation of the difference I have mentioned is that the westerly winds passing over Lake Huron take up a large amount of moisture, which, coming in contact with the colder land east of Lake Huron, is condensed into snow, and occasionally the north-west winds in that section of country bring a fall of six or eight inches of snow, while south in the neighborhood of Galt and Brantford no snow whatever falls. I think meteorology can be made useful to agriculture by the temporary establishment of a number of stations, especially near swamps, on high and low levels close to each other, and on different soils. Farmers could keep records themselves, and give the results of their observations on the effects of different soils and altitudes to the public. With respect to forecasting the weather, I am of opinion that before many years, the weather bureaus will be able to forecast the leading features of the coming seasons almost as accurately as they now do the weather twenty-four hours in advance, and thus be of great service to the agriculturist. The effect upon temperature of the clearing of forests is generally thought to be an increase of extremes of temperatures and a decrease of rainfall. In the north of Italy at one time the forests were cut down over large districts, and the result was that maize could not be grown successfully, owing both to the decrease of the rainfall and the greater extremes of temperature; but when the trees were replanted, the cultivation of maize was again successfully prosecuted.

To MR. MALCOLM.—The clearing of forests does not prevent frosts so much as the draining of swamps and marshy lands. Drainage is the real secret of improving the temperature of a district. I believe the draining of a swamp will moderate the climate for many miles around it.



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DATES OF CERTAIN PERIODIC EVENTS
AT TORONTO.

	Latest Snow.	Earliest Snow.	Latest Hoar Frost.	Earliest Hoar Frost.	Navigation Opened.	Navigation Closed.
1840	Apr. 27	Oct. 9	May	Sept.	Mar. 23	Dec. 6
1841	" 20	" 16	"	Oct.	Apr. 12	" 18
1842	" 8	Nov. 10	"	Sept.	Mar. 17	" 18
1843	" 18	Oct. 17	June 1	Oct.	Apr. 23	" 13
1844	" 1	" 19	May	Sept.	" 23	" 18
1845	" 8	" 15	"	Oct.	" 23	" 3
1846	Mar. 30	" 17	"	Sept.	" 8	" 15
1847	Apr. 1	" 14	"	" 29	" 19	" 26
1848	" 18	Nov. 7	"	" 15	Mar. 31	" 25
1849	"	Oct. 30	"	"	" 29	" 26
1850	May. 20	Nov. 16	" 10	"	Apr. 3	" 15
1851	"	Oct. 25	"	"	Mar. 24	" 13
1852	" 20	Nov. 11	"	" 13	Apr. 17	Jan. 5
1853	" 10	Oct. 25	" 20	" 12	Mar. 31	Dec. 19
1854	Apr. 29	" 16	" 11	" 19	Apr. 8	" 2
1855	May 8	" 12	" 9	" 28	" 16	" 18
1856	" 30	" 30	" 31	" 22	" 19	" 8
1857	" 10	" 28	June 5	" 21	Mar. 30	Nov. 25
1858	Apr. 25	" 8	" 14	" 18	" 27	Dec. 24
1859	June 4	" 19	" 11	" 6	Jan. 27	" 28
1860	Apr. 25	Sept. 25	May 2	" 21	Mar. 15	" 14
1861	May 6	Oct. 24	" 30	" 22	" 29	Nov. 27
1862	Apr. 23	" 25	June 20	Aug. 30	Feb. 28	Dec. 20
1863	May 5	Nov. 8	" 4	" 26	" 14	" 16
1864	Apr. 13	Oct. 8	" 7	Sept. 17	Mar. 2	" 16
1865	" 23	" 26	" 11	" 12	Apr. 1	" 17
1866	" 26	" 31	" 1	" 15	" 2	" 15
1867	May 2	Nov. 4	May 27	" 11	Mar. 27	" 11
1868	Apr. 23	Oct. 16	" 9	" 17	Apr. 1	" 11
1869	May 1	" 18	June 6	Aug. 31	" 1	" 8
1870	Apr. 5	Nov. 10	May 13	" 27	" 1	" 22
1871	" 12	Oct. 17	June 16	Sept. 18	Mar. 13	Nov. 30
1873	" 25	Oct. 20	May 30	" 11	Apr. 2	" 27
1874	" 29	" 13	" 19	" 11	Mar.	Dec. 27
1875	May 2	" 17	" 19	" 11	Apr. 13	Nov. 29
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1876	Apr. 30	" 7	" 23	Oct. 1	Mar. 12	Dec. 1
1877	Mar. 31	Nov. 5	" 24	Sept. 18	" 1	Jan. 2
1878	" 28	"	" 16	" 22	" 6	Dec. 2½
1879	Apr. 30	Oct. 24	June 7	" 10	" 18	" 17
1880	May 1	" 18	" 2	" 22	Jan. 20	"

WEATHER PROGNOSTICS.

PRACTICAL HINTS TO EVERYBODY.

If mists rise in low ground and soon vanish, expect fair weather.

If mists rise to the hill-tops, expect rain in a day or two.

A black mist indicates coming wet, because the blackness is owing to dense clouds which overshadow it, and such clouds will supply the wet.

When the stars look bigger than usual, and pale and dull and without rays, this undoubtedly indicates that the clouds are condensing into rain, which will very soon fall.

The appearance of two or three rainbows indicates fair weather for the present, but settled and heavy rains in two or three days' time.

A red and lowering sky at sunrise indicates a wet day.

A grey morning indicates a fine day.

A red sunset indicates a fine day to-morrow.

A grey sunset indicates wet. These four popular sayings take the form of rhyme :—

“ Evening red and morning grey,
Set the traveller on his way;
Evening grey and morning red,
Bring down rain upon his head.”

A yellow sunset indicates wet.

Three successive mornings of hoar-frost in the autumn and spring are generally followed by a continued rain.

If the sun at rising appears enlarged there will shortly be sudden and sharp showers, if in summer; but in winter settled and moderate weather.

A ruddy sunset, especially if small horizontal lines of clouds lie as shoals of fish about the horizon, betokens windy weather.

If the sun set behind a straight skirting of cloud, be sure of wind from the point where the sun is setting.

If it set behind a rugged, rocky, or mixed bank of clouds, very stormy, wet, or showery will be the morrow.

If it set in a general sheet of haziness of a dusky or leaden hue, bad weather is near.

When setting in part clear, but among curly locks of thin cloud, like tufts of hair or the strippings of goose quills, expect fog or rain next morning.

A very clear sunset, of a pale gold colour, is a sign of fine weather, if there be a calm and dewy evening with it.

A clear orange-coloured sunset foretells a very fine day to follow, and more surely if with a rising barometer and a calm dewy evening.

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A clear sky, and sun setting in a well-defined form, without dazzling the eye, and a deep salmon-colour, foreshows a brilliant and very hot day to succeed.

The same appearance with a cream-coloured haze on the horizon, is also a sign of fine hot weather; but in this case the sun becomes deep red just before he disappears.

The same appearance at sunset in winter is attended by the *sharpest frost of the season.*

If small clouds increase expect much rain.

If large clouds decrease expect fair weather.

Soft looking or delicate clouds foretell fine weather, with moderate or light breezes; hard-edged, oily looking clouds, wind. A dark blue sky is windy. A light bright blue sky, moderate fine weather.

Generally the *softer* clouds look, the less wind, but perhaps more rain may be expected; and the *harder*, more "greasy," rolled, tufted, ragged, the stronger the coming wind will prove.

A bright, yellow sky at sunset presages wind; a pale yellow, wet; and a greenish, sickly looking color, wind and rain. The clouds come in tint. After fine weather, the first signs of change are usually light streaks, curls, wisps, or mottled patches of white distant clouds, which increase, and are followed by an overcasting of murky vapour that finally grows into cloudiness.

Usually, the higher and more distant such clouds seem to be, the more gradual but general the coming change of weather will prove.

Cirrus clouds—mare's tails—if their fibres point upward, indicate rain; if downward, fine weather, winds or drought.

If cirrus clouds form during fine weather, with a falling barometer, it is almost sure to rain.

Cumulus—or sugar loaf—clouds in fine weather, indicate its continuance. If they are fleecy and sail against the wind, they indicate rain; but if their outline is very hard and they sail with the wind expect fine weather.

If the clouds look dusky, or of a tarnish silver color, and move slowly, it is a sign of hail. If there be a mixture of blue in them, the hail will be small; if very yellow the hail will be large.



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