STONYHURST COLLEGE

OBSERVATORY.

RESULTS

OF

METEOROLOGICAL AND MAGNETICAL OBSERVATIONS.

1878.

MANRESA PRESS, ROEHAMPTON.

1879.

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INTRODUCTION.

THE daily routine work of the year in meteorology, astronomy, and terrestrial magnetism includes all that was carried on in preceding years, and in addition an agricultural report is now sent weekly to the Meteorological Office of the Board of Trade.

The meteorological phenomena, which occur only occasionally, have, in this year's report, been collected together in a single form, instead of being scattered in remarks throughout the separate months.

It has been found necessary to reprint all the Rainfall observations of the last thirty years, in order to make the series complete and uniform. Every figure has been recomputed from the original entries, and the most probable corrections applied for all changes of gauge or measure.

The reduction of the meteorological observations taken at Kerguelen Island, in the South Indian Ocean, during the transit of Venus Expedition, mentioned in the report of 1877, has been completed, and, at the request of the Council of the Meteorological Office, a discussion of the *Challenger* observations, in 1874, and of the *Erebus* and *Terror* observations, in 1840, has been added, in order to make the report on the climate of Kerguelen as complete as possible. The three series of results, two representing the summer, and the third the winter of Kerguelen, have been forwarded to the Meteorological Office for publication.

The daily magnetic curves, which consist of photograpic traces of every change in the value of the Declination and of the Horizontal and Vertical Components of the Intensity since the year 1868, have been tabulated up to date, and it is hoped that the complete reduction of this long series of hourly measures will progress steadily.

A great addition to the astronomical equipment of the observatory has lately been made by the purchase of a large

automatic spectroscope. Daily experiments are being made with this instrument, in order to discover what additions or alterations will tend to render it more efficient for the work proposed, which is, in the first place, to keep, as far as weather permits, a daily record of the number, shape, and position of the prominences of the chromosphere. The full description of the instrument will be deferred until the report of 1879, when a summary of the work done can be subjoined to the instrumental details.

The object glass of the large equatoreal has returned from the factory of Messrs. Troughton and Simms, and the repolishing has much improved the definition.

The barograph, thermograph, electrograph, forwarded to the Zi-Ka-Wei observatory near Shanghai, arrived at their destination with most of the mercury tubes broken. These accidents were most probably due to the transshipment at Marseilles. A second set of tubes were packed with the greatest care, and most kindly forwarded by Mr. R. H. Scott, of the Meteorological Office. These all reached Zi-Ka-Wei in perfect preservation.

The director of the Manila Observatory spent some time during this year at Stonyhurst, in order to study the instruments and methods of observation. He has since returned to his observatory, and a splendid standard astronomical clock, by Isaac, has just been sent to him, and also a transit-theodolite, of Simms. Some magnetic and astronomical instruments had already been sent out to this distant station by the director of the Stonyhurst Observatory, and yearly reports of the meteorological observations taken at the Manila Observatory have been published since 1870.

Before undertaking a series of magnetic and meteorological observations in connection with the new missions in the South of Central Africa, one of the Jesuit missionaries paid a visit to the observatory of Stonyhurst, and he was then supplied with a dip circle of Dover, and a chronometer from Isaac, which had both been previously tested at the observatory.

S. J. PERRY.

Stonyhurst Observatory.

Lat. 53° 50′ 40″ N. Long. 9m. 52s. 68. W. Height of the Barometer above the sea, 381 ft.

METEOROLOGICAL REPORT.

January, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·666	29·411
Highest ,, on the 31st	30·226	30·004
Lowest ,, on the 24th	28·990	28·551
Range of Barometer Readings	1·236	1·453
Highest Reading of a Max. Therm. on the 20th	53·3	51·8
Lowest Reading of a Min. Therm. on the 31st	23·0	21·1
Range of Thermometer Readings	30·3	30·7
Mean of all the Highest Readings	44·5	42·5
Mean of all the Lowest	34·2	33·3
Mean Daily Range	10·3	9·2
Deduced Monthly Mean (from Mean of Max. and Min.)	39·2	37·7
Mean Temperature from dry bulb	39·7	37·9
Adopted Mean Temperature	39·5	37·8
Mean Temperature of Evaporation	38·2	36·4
Mean Temperature of Dew Point	36·5	34·4
Mean elastic force of Vapour	0·217 in	0·201 in
Mean weight of Vapour in a cubic foot of air	2·5gr	2·3gr
Mean additional weight required for saturation	0·3gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·90	0·86
Mean weight of a cubic foot of air	550·7gr	547·9gr
Fall of Rain	5·124 in	4·296 in
Number of days on which Rain fell	21	21·2
Amount of Evaporation	0·318 in	0·813 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	2	2	0	0	3	10	12	2
Mean Velocity in miles per hour	14·2	5·3	0	0	3·8	10·7	13·9	9·9
Total No. of miles for each Direction	681	255	0	0	272	2563	3991	474

The total number of miles registered during the month was 8236.

The max. Velocity of the wind was 37 miles per hour; direction W. on the 23rd at 6 p.m. and 9 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)	7·4
In the month of January, the highest reading of the Barometer during 31 years, was on the 8th, in 1859, and was	30·310
The lowest ,, ,, 15th, 1865	27·939
The highest Temperature ,, 7th, 1877	59·9
The lowest ,, ,, 13th, 1867	9·2
The highest adopted mean temperature of the month, 1875	42·5
The lowest ,, ,, 1871	32·0

The Barometer readings for the month were high, and the range small. The Thermometer was somewhat above the mean of previous years; as was also the Rainfall. The prevailing wind was W. by S.

February, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·779	29·499
Highest ,, on the 21st	30.180	30·089
Lowest ,, on the 27th	29·184	28·691
Range of Barometer Readings	0·996	1·398
Highest Reading of a Max. Therm. on the 17th	57·9	51·6
Lowest Reading of a Min. Therm. on the 2nd	27·2	22·7
Range of Thermometer Readings	30·7	28·9
Mean of all the Highest Readings	46·4	44·1
Mean of all the Lowest	34·6	34·0
Mean Daily Range	11·8	10·1
Deduced Monthly Mean (from Mean of Max. and Min.)	40·1	38·7
Mean Temperature from dry bulb	40·8	38·7
Adopted Mean Temperature	40·5	38·7
Mean Temperature of Evaporation	39·2	36·8
Mean Temperature of Dew Point	37·6	35·0
Mean elastic force of Vapour	0·225 in	0·199 in
Mean weight of Vapour in a cubic foot of air	2·6 gr	2·4 gr
Mean additional weight required for saturation	0·3 gr	0·4 gr
Mean degree of Humidity (saturation 1·00)	0·90	0·87
Mean weight of a cubic foot of air	551·6 gr	548·5 gr
Fall of Rain	2·123 in	3·695 in
Number of days on which Rain fell	20	17·8
Amount of Evaporation	0·440 in	0·817 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	1	2	1	0	7	12	4	1
Mean Velocity in miles per hour	1.8	7·0	9·0	0	11·0	6·7	10·7	2·8
Total No. of miles for each Direction	42	336	215	0	1846	1939	1024	67

The total number of miles registered during the month was 5469.

The max. Velocity of the wind was 30 miles per hour; direction S. on the 17th at 1 p.m. and on the 20th at 4 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·4
In the month of February, the highest reading of the Barometer during 31 years, was on the 11th, in 1849, and was			30·452
The lowest	,,	,, 6th, 1867	28·208
The highest Temperature		,, 8th, 1877	58·3
The lowest	,,	,, 1st, 1855	10·1
The highest adopted mean temperature of the month, 1869			44·0
The lowest	,,	,, 1855	28·6

The Mercury stood high both in Barometer and Thermometer, and the Rainfall was small. S.W. was the most prevalent wind of the month.

March, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·617	29·453
Highest ,, on the 16th	30·263	30·067
Lowest ,, on the 31st	28·758	28·693
Range of Barometer Readings	1·505	1·374
Highest Reading of a Max. Therm. on the 19th	57·1	56·5
Lowest Reading of a Min. Therm. on the 25th	22·1	23·2
Range of Thermometer Readings	35·0	33·3
Mean of all the Highest Readings	47·5	46·9
Mean of all the Lowest	32·3	34·5
Mean Daily Range	15·2	12·4
Deduced Monthly Mean (from Mean of Max. and Min.)	38·9	39·7
Mean Temperature from dry bulb	41·3	40·0
Adopted Mean Temperature	40·1	39·9
Mean Temperature of Evaporation	37·9	38·0
Mean Temperature of Dew Point	35·1	35·5
Mean elastic force of Vapour	0·204 in	0·206 in
Mean weight of Vapour in a cubic foot of air	2·4 gr	2·4 gr
Mean additional weight required for saturation	0·5 gr	0·5 gr
Mean degree of Humidity (saturation 1·00)	0·83	0·85
Mean weight of a cubic foot of air	547·5 gr	546·2 gr
Fall of Rain	2·694 in	3·145 in
Number of days on which Rain fell	13	18·1
Amount of Evaporation	1·328 in	1·671 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	1	4	1	0	1	5	13	6
Mean Velocity in miles per hour	9·9	8·3	10·9	0	3·8	19·4	13·8	10·5
Total No. of miles for each direction	237	792	262	0	90	2332	4298	1512

The total number of miles registered during the month was 9523.

The max. Velocity of the wind was 39 miles per hour; direction W. on the 7th at 2 and 5 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...				7·3
In the month of March, the highest reading of the Barometer during 31 years, was on the 6th, in 1852, and was				30·401
The lowest	,,	,,	31st, 1860	28·199
The highest Temperature		,,	25th, 1871	68·0
The lowest	,,	,,	4th, 1866	14·5
The highest adopted mean temperature of the month, 1871				44·0
The lowest	,,	,,	1855	35·6

Barometer rather high this month, and Thermometer scarcely at all in excess of the mean value. Rainfall light, and wind W. by S.

April, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·409	29·487
Highest ,, on the 27th	29·810	29·963
Lowest ,, on the 1st	28·618	28·766
Range of Barometer Readings	1·192	1·197
Highest Reading of a Max. Therm. on the 29th	64·9	67·3
Lowest Reading of a Min. Therm. on the 6th	28·0	28·8
Range of Thermometer Readings	36·9	38·5
Mean of all the Highest Readings	56·7	54·2
Mean of all the Lowest	37·6	38·4
Mean Daily Range	19·1	15·8
Deduced Monthly Mean (from Mean of Max. and Min.)	45·7	44·8
Mean Temperature from dry bulb	46·5	44·9
Adopted Mean Temperature	46·1	44·9
Mean Temperature of Evaporation	43·3	42·0
Mean Temperature of Dew Point	40·1	39·0
Mean elastic force of Vapour	0·249 in	0·238 in
Mean weight of Vapour in a cubic foot of air	2·9gr	2·7gr
Mean additional weight required for saturation	0·7gr	0·7gr
Mean degree of Humidity (saturation 1·00)	0·81	0·81
Mean weight of a cubic foot of air	538·5gr	541·5gr
Fall of Rain	1·666 in	2·399 in
Number of days on which Rain fell	13	15·3
Amount of Evaporation	1·762	2·674 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	8	8	1	1	3	8	1
Mean Velocity in miles per hour	0	12·7	10·6	14·2	4·0	6·2	11·9	5·3
Total No. of miles for each Direction	0	2430	2033	341	97	446	2286	127

The total number of miles registered during the month was 7760.

The max. Velocity of the wind was 35 miles per hour; direction W. on the 1st at 2 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			6·1
In the month of April, the highest reading of the Barometer during 31 years, was on the	22nd,	in 1855, and was	30·191
The lowest ,,	,,	20th, 1868	28·358
The highest Temperature ,,		14th, 1852	74·1
The lowest ,,	,,	12th, 1862	24·7
The highest adopted mean temperature of the month, 1865			48·5
The lowest ,,	,,	1841	40·8

Both Barometer and Thermometer differed but slightly from the means for this month. The Rainfall was very light, and E.N.E. the prevalent wind.

May, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·312	29·519
Highest ,, on the 29th	29·760	29·939
Lowest ,, on the 23rd	28·828	28·961
Range of Barometer Readings	0·932	0·978
Highest Reading of a Max. Therm. on the 12th	69·8	72·0
Lowest Reading of a Min. Therm. on the 20th	34·2	31·4
Range of Thermometer Readings	35·6	40·6
Mean of all the Highest Readings	61·8	59·7
Mean of all the Lowest	43·4	42·3
Mean Daily Range	18·4	17·4
Deduced Monthly Mean (from Mean of Max. and Min.)	50·9	49·3
Mean Temperature from dry bulb	50·9	49·7
Adopted Mean Temperature	50·9	49·5
Mean Temperature of Evaporation	48·2	46·3
Mean Temperature of Dew Point	45·4	43·0
Mean elastic force of Vapour	0·304 in	0·278 in
Mean weight of Vapour in a cubic foot of air	3·5gr	3·2gr
Mean additional weight required for saturation	0·7gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·82	0·77
Mean weight of a cubic foot of air	531·3gr	536·7gr
Fall of Rain	4·663 in	2·483 in
Number of days on which Rain fell	21	15·3
Amount of Evaporation	3·801 in	3·610 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	7	4	0	4	8	8	0
Mean Velocity in miles per hour	0	9·1	10·4	0	10·3	12·3	10·0	0
Total No. of miles for each Direction	0	1528	1001	0	993	2361	1929	0

The total number of miles registered during the month was 7812.

The max. Velocity of the wind was 31 miles per hour; direction S. on on the 15th at 11 a.m., and S.W. by W. on the 19th at 5 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·7
In the month of May, the highest reading of the Barometer during 31 years, was on the 22nd, in 1855, and was			30·124
The lowest	,,	,, 28th, 1877	28·559
The highest Temperature		,, 19th, 1864	82·5
The lowest	,,	,, 4th, 1855	23·5
The highest adopted mean temperature of the month, 1848			55·1
The lowest	,,	,, 1855	45·0

The Barometer this month was low, and the Thermometer agreed very closely with the mean. The Rainfall was very considerably above the average for May, and this was due principally to the heavy showers at the middle of the month. The wind was S.W. by W.

June, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·490	29·528
Highest ,, on the 6th & 22nd	29·764	29·900
Lowest ,, on the 11th	28·842	29·004
Range of Barometer Readings	0·922	0·896
Highest Reading of a Max. Therm. on the 27th	87·2	77·1
Lowest Reading of a Min. Therm. on the 5th	40·0	39·2
Range of Thermometer Readings	47·2	37·9
Mean of all the Highest Readings	67·9	65·3
Mean of all the Lowest	48·5	48·1
Mean Daily Range	19·4	17·2
Deduced Monthly Mean (from Mean of Max. and Min.)	56·4	54·9
Mean Temperature from dry bulb	56·5	54·8
Adopted Mean Temperature	56·5	54·9
Mean Temperature of Evaporation	53·6	52·2
Mean Temperature of Dew Point	50·9	49·0
Mean elastic force of Vapour	0·374 in	0·359 in
Mean weight of Vapour in a cubic foot of air	4·2gr	3·9gr
Mean additional weight required for saturation	0·9gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·82	0·79
Mean weight of a cubic foot of air	528·4gr	530·9gr
Fall of Rain	3·375 in	3·743 in
Number of Days on which Rain fell	15	17·2
Amount of Evaporation	3·355 in	3·792 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	3	7	11	5	1	3	0	0
Mean Velocity in miles per hour	4·3	5·0	6·1	8·4	13·3	13·7	0	0
Total No. of miles for each Direction	308	844	1607	1013	319	983	0	0

The total number of miles registered during the month was 5074.

The max. Velocity of the wind was 24 miles per hour; direction S.W. by W. on the 10th at 2 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...				7·1
In the month of June, the highest reading of the Barometer during 31 years, was on the	15th,	in	1874, and was	30·219
The lowest ,,	,,		12th, 1862	28·632
The highest Temperature	,,		27th, 1878	87·2
The lowest ,,	,,		30th, 1856	34·2
The highest adopted mean temperature of the month,			1858	59·0
The lowest ,,	,		1856 and 1860	52·2

During this month the Mean Temperature was somewhat higher than usual, but the Atmospheric Pressure and the Rainfall differed but little from their mean value. The Wind was generally from the East.

The temperature recorded on the 27th was the highest shade temperature ever observed at Stonyhurst in the month of June; the next highest was that of 84°·6 on the 28th in 1857. Higher readings have however been observed in July and in August.

July, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·610	29·515
Highest ,, on the 31st	30·092	29·888
Lowest ,, on the 25th	29·236	29·009
Range of Barometer Readings	0·856	0·879
Highest Reading of a Max. Therm. on the 20th	85·5	79·1
Lowest Reading of a Min. Therm. on the 30th	44·4	42·1
Range of Thermometer Readings	41·1	37·0
Mean of all the Highest Readings	70·9	68·2
Mean of all the Lowest	53·2	51·1
Mean Daily Range	17·7	17·1
Deduced Monthly Mean (from Mean of Max. and Min.)	60·2	57·8
Mean Temperature from dry bulb	60·0	58·1
Adopted Mean Temperature	60·1	58·0
Mean Temperature of Evaporation	56·8	55·2
Mean Temperature of Dew Point	53·9	52·6
Mean elastic force of Vapour	0·416 in	0·397 in
Mean weight of Vapour in a cubic foot of air	4·6gr	4·5gr
Mean additional weight required for saturation	1·2gr	1·0gr
Mean degree of Humidity (saturation 1·00)	0·80	0·82
Mean weight of a cubic foot of air	526·6gr	527·1gr
Fall of Rain	1·198 in	3·982 in
Number of days on which Rain fell	13	17·0
Amount of Evaporation	3·630 in	4·122 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	2	5	5	0	0	2	15	2
Mean Velocity in miles per hour	4·8	6·6	5·9	0	0	6·8	10·9	5·6
Total No. of miles for each Direction	232	794	705	0	0	327	3915	268

The total number of miles registered during the month was 6241.

The max. Velocity of the wind was 29 miles per hour; direction W. on the 5th, at 1 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	7·3
In the month of July, the highest reading of the Barometer during 31 years, was on the 24th, in 1868, and was	30·112
The lowest ,, ,, 15th, 1877	28·564
The highest Temperature ,, 22nd, 1873	88·2
The lowest ,, ,, 1st, 1857	36·0
The highest adopted mean temperature of the month, 1852	63·0
The lowest ,, ,, ,, 1851 and 1853	55·5

The Mercury stood high in both Barometer and Thermometer during the greater part of the month, and the Rainfall was exceedingly small. The wind was West.

August, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·305	29·489
Highest ,, on the 1st	29·926	29·890
Lowest ,, on the 14th	28·848	28·955
Range of Barometer Readings	1·078	0·935
Highest Reading of a Max. Therm. on the 2nd	78·0	77·1
Lowest Reading of a Min. Therm. on the 25th	46·1	41·6
Range of Thermometer Readings	31·9	35·5
Mean of all the Highest Readings	69·8	67·2
Mean of all the Lowest	52·7	50·9
Mean Daily Range	17·1	16·3
Deduced Monthly Mean (from Mean of Max. and Min.)	59·6	57·4
Mean Temperature from dry bulb	59·5	57·6
Adopted Mean Temperature	59·6	57·5
Mean Temperature of Evaporation	56·7	54·8
Mean Temperature of Dew Point	54·2	52·3
Mean elastic force of Vapour	0·420 in	0·394 in
Mean weight of Vapour in a cubic foot of air	4·7gr	4·3gr
Mean additional weight required for saturation	1·0gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·83	0·83
Mean weight of a cubic foot of air	521·4gr	527·1 gr
Fall of Rain	7·052 in	4·931 in
Number of days on which Rain fell	25	19·7
Amount of Evaporation	4·295 in	3·462 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	1	9	4	3	6	4	3	0
Mean Velocity in miles per hour	5·5	5·5	8·1	10·6	13·9	7·5	3·4	0
Total No. of miles for each Direction	132	1160	775	761	1996	716	247	0

The total number of miles registered during the month was 5787.

The max. Velocity of the wind was 25 miles per hour; direction S. on the 12th, at 1 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·1
In the month of August, the highest reading of the Barometer during 31 years, was on the 21st, in 1874, and was			30·114
The lowest	,,	,, 31st, 1876	28·555
The highest Temperature	,,	2nd, 1868	88·0
The lowest	,,	,, 21st, 1864 & 1869	36·0
The highest adopted mean temperature of the month, 1857			61·0
The lowest	,,	,, 1848	52·5

The Barometer was very low, and the Thermometer higher than usual. Rain was frequent, and many of the falls very heavy. Much of the wind came from the South.

September, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·492	29·504
Highest ,, on the 10th	29·837	30·038
Lowest ,, on the 15th	28·892	28·864
Range of Barometer Readings	0·945	1·174
Highest Reading of a Max. Therm. on the 5th	71·9	72·1
Lowest Reading of a Min. Therm. on the 23rd	34·9	36·8
Range of Thermometer Readings	37·0	35·3
Mean of all the Highest Readings	63·3	62·3
Mean of all the Lowest	47·7	47·1
Mean Daily Range	15·6	15·2
Deduced Monthly Mean (from Mean of Max. and Min.)	54·2	53·4
Mean Temperature from dry bulb	54·9	54·0
Adopted Mean Temperature	54·6	53·7
Mean Temperature of Evaporation	51·9	51·1
Mean Temperature of Dew Point	49·3	48·5
Mean elastic force of Vapour	0·361 in	0·342 in
Mean weight of Vapour in a cubic foot of air	4·0gr	3·8gr
Mean additional weight required for saturation	0·8gr	0·8gr
Mean degree of Humidity (saturation 1·00)	0·82	0·82
Mean weight of a cubic foot of air	530·4gr	531·6gr
Fall of Rain	6·329 in	4·700 in
Number of days on which Rain fell	18	18·5
Amount of Evaporation	4·626 in	2·360 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	2	1	0	0	2	14	10	1
Mean Velocity in miles per hour	2·1	4·1	0	0	20·7	10·1	7·4	4·8
Total No. of miles for each Direction	100	98	0	0	994	3396	1771	116

The total number of miles registered during the month was 6475.

The max. Velocity of the wind was 43 miles per hour; direction S.S.E. on the 15th, at 3 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...				7·2
In the month of September, the highest reading of the Barometer during 31 years, was on the 15th, in 1851, and was				30·274
The lowest	,,	,,	22nd, 1863	28·371
The highest Temperature		,,	6th, 1868	85·0
The lowest	,,	,,	6th, 1855	30·7
The highest adopted mean temperature of the month,			1865	59·1
The lowest	,,	,,	1863	50·9

Average temperature and atmospheric pressure, but heavy rain. Direction of wind S.W. by W.

October, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·271	29·400
Highest ,, on the 2nd	29·878	29·981
Lowest ,, on the 10th	28·500	28·652
Range of Barometer Readings	1·378	1·329
Highest Reading of a Max. Therm. on the 5th	69·2	64·7
Lowest Reading of a Min. Therm. on the 31st	27·8	29·9
Range of Thermometer Readings	41·4	34·8
Mean of all the Highest Readings	56·0	54·8
Mean of all the Lowest	44·1	42·4
Mean Daily Range	11·9	12·4
Deduced Monthly Mean (from Mean of Max. and Min.)	49·1	47·6
Mean Temperature from dry bulb	49·7	48·2
Adopted Mean Temperature	49·4	47·9
Mean Temperature of Evaporation	47·0	45·8
Mean Temperature of Dew Point	44·4	43·4
Mean elastic force of Vapour	0·293 in	0·283 in
Mean weight of Vapour in a cubic foot of air	3·4gr	3·2gr
Mean additional weight required for saturation	0·7gr	0·6gr
Mean degree of Humidity (saturation 1·00)	0·84	0·85
Mean weight of a cubic foot of air	532·2gr	535·9gr
Fall of Rain	5·451 in	5·408 in
Number of days on which Rain fell	24	21·7
Amount of Evaporation	1·858 in	1·603 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	1	1	3	2	10	6	5	3
Mean Velocity in miles per hour	4·8	3·8	7·9	7·1	11·4	9·5	16·9	8·5
Total No. of miles for each Direction	115	92	566	341	2735	1363	2027	615

The total number of miles registered during the month was 7854.

The max. Velocity of the wind was 39 miles per hour; direction S. on the 9th at 2 p.m., and W. on the 10th at 9 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·8
In the month of October, the highest reading of the Barometer during 31 years, was on the 6th, in 1877, and was			30·282
The lowest	,,	,, 19th, 1862	28·139
The highest Temperature	,,	9th, 1869	72·8
The lowest	,,	,, 21st, 1859	25·2
The highest adopted mean temperature of the month, 1861 and 1876			51·6
The lowest	,,	,, 1850	44·8

Barometer low and Thermometer rather high. Rainfall almost identical with the mean. Wind from S. to W.

November, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·348	29·446
Highest ,, on the 19th	30·058	30·056
Lowest ,, on the 10th	28·704	28·588
Range of Barometer Readings	1·354	1·468
Highest Reading of a Max. Therm. on the 18th	50·0	55·3
Lowest Reading of a Min. Therm. on the 11th	25·8	25·5
Range of Thermometer Readings	24·2	29·8
Mean of all the Highest Readings	43·4	46·8
Mean of all the Lowest	33·0	36·2
Mean Daily Range	10·4	10·6
Deduced Monthly Mean (from Mean of Max. and Min.)	37·8	41·1
Mean Temperature from dry bulb	37·2	41·2
Adopted Mean Temperature	37·5	41·2
Mean Temperature of Evaporation	35·4	38·8
Mean Temperature of Dew Point	32·5	37·5
Mean elastic force of Vapour	0·185 in	0·224 in
Mean weight of Vapour in a cubic foot of air	2·1 gr	2·6 gr
Mean additional weight required for saturation	0·5 gr	0·4 gr
Mean degree of Humidity (saturation 1·00)	0·83	0·87
Mean weight of a cubic foot of air	547·1 gr	544·5 gr
Fall of Rain	3·797 in	4·336 in
Number of days on which Rain fell	17	19·2
Amount of Evaporation	1·356 in	1·301 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	8	1	0	0	3	3	3	12
Mean Velocity in miles per hour	5·1	2·0	0	0	4·3	5·0	11·9	10·7
Total No. of miles for each Direction	978	49	0	0	309	361	856	3086

The total number of miles registered during the month was 5639.

The max. Velocity of the wind was 29 miles per hour; direction N.W. on the 15th at 6 p.m., and on the 16th at 2 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·6
In the month of November, the highest reading of the Barometer during 31 years, was on the 12th, in 1857, and was			30·350
The lowest	,,	,, 1st, 1859	28·007
The highest Temperature		,, 6th, 1872	61·9
The lowest	,,	,, 17th, 1861	19·1
The highest adopted mean temperature of the month, 1877.....			44·2
The lowest	,,	,, 1851.....	36·7

Temperature very low. Barometer and Rainfall both a little below the average for the month. Wind N.W.

December, 1878.

Results of Observations taken during the month.		Mean for the last 31 years.
Mean Reading of the Barometer	29·255	29·437
Highest ,, on the 4th	29·916	30·047
Lowest ,, on the 18th	28·570	28·601
Range of Barometer Readings	1·346	1·446
Highest Reading of a Max. Therm. on the 31st	50·5	52·8
Lowest Reading of a Min. Therm. on the 24th	13·1	20·5
Range of Thermometer Readings	37·4	32·3
Mean of all the Highest Readings	36·9	43·2
Mean of all the Lowest	24·3	33·6
Mean Daily Range	12·6	9·6
Deduced Monthly Mean (from Mean of Max. and Min.)	30·6	38·4
Mean Temperature from dry bulb	30·0	39·0
Adopted Mean Temperature	30·3	38·7
Mean Temperature of Evaporation	28·9	37·6
Mean Temperature of Dew Point	24·8	35·6
Mean elastic force of Vapour	0·134 in	0·211 in
Mean weight of Vapour in a cubic foot of air	1·6gr	2·4gr
Mean additional weight required for saturation	0·4gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·79	0·88
Mean weight of a cubic foot of air	553·8gr	547·0gr
Fall of Rain	2·041 in	4·277 in
Number of days on which Rain fell	16	20·5
Amount of Evaporation	1·049 in	0·915 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	5	7	0	0	0	3	7	9
Mean Velocity in miles per hour	4·7	3·9	0	0	0	15·2	5·5	7·7
Total No. of miles for each Direction	564	654	0	0	0	1094	920	1653

The total number of miles registered during the month was 4885.

The max. Velocity of the wind was 39 miles per hour; direction S.W. on the 31st at 10 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	7·3
In the month of December, the highest reading of the Barometer during 31 years, was on the 22nd, in 1849, and was	30·376
The lowest ,, ,, 5th, 1876	28·028
The highest Temperature ,, 9th, 1876	58·1
The lowest ,, ,, 24th, 1860	6·7
The highest adopted mean temperature of the month, 1857	44·6
The lowest ,, ,, 1878	30·3

The Barometer was much below the mean, and the adopted monthly temperature almost 2° lower than freezing point. This mean temperature is 0°·7 Fah. lower than any previously recorded for December, that of 1874 having been 31°·0; but the adopted mean temperature for February, 1855, was 28°·6. The Rainfall was considerably less than half the mean value for the month. The general direction of the wind was from N.W. to S.W., and none came from the points between E. and S.

Summary of the Observations

FOR 1878.

		Mean for the last 31 years.
Mean Reading of the Barometer	29·463	29·477
Highest ,, on March 16th	30·263	30·279
Lowest ,, on October 10th	28·500	28·273
Range of Barometer Readings	1·763	2·006
Highest Reading of a Max. Therm. on June 27th	87·2	81·9
Lowest Reading of a Min. Therm. on December 24th	13·1	15·9
Range of Thermometer Readings	74·1	66·0
Mean of all the Highest Readings	55·4	54·7
Mean of all the Lowest	40·5	41·0
Mean Daily Range	14·9	13·7
Deduced Yearly Mean (from Mean of Max. and Min.)	46·9	46·8
Mean Temperature of dry bulb	47·3	47·0
Adopted Mean Temperature	47·1	47·0
Mean Temperature of Evaporation	44·8	44·7
Mean Temperature of Dew Point	42·1	42·2
Mean elastic force of Vapour	0·282 in	0·277 in
Mean weight of Vapour in a cubic foot of air	3·2gr	3·2gr
Mean additional weight required for saturation	0·7gr	0·7gr
Mean degree of Humidity (saturation 1·00)	0·83	0·84
Mean weight of a cubic foot of air	538·3gr	538·6gr
Total Fall of Rain in the Year	45·365 in	47·432 in
Number of days per Month on which Rain fell	18·0	18·5
Amount of Evaporation	27·818 in	27·260 in

The Maximum monthly mean height of the Barometer was in March 1854, and was	29·861
The Minimum ,, ,, in December 1868, and was	28·984
The Maximum yearly mean height of the Barometer was in 1858, and was	29·544
The Minimum ,, ,, ,, ,, in 1866, and was	29·389

The greatest monthly range of the Barometer was in November, 1859, and was		2·290
The least ,, ,,	in July, 1852, and was	0·505
In 1859, on November 1st, at 1 p.m, the Barometer stood at 28·035, and on November 2nd, at 1 p.m., it stood at 29·263, this was the greatest range of the Barometer, in 24 hours, and was		1·228
The highest reading of the Barometer, during 30 years, was on February 11th, 1849, and on March 4th, 1854, and was		30·452
The lowest ,, ,,	on July 22nd, 1873, and was	27·939
Extreme range		2·513
The highest temperature was on July 15th, 1868, and was		88·2
The lowest ,, ,,	December 24th, 1860	6·7
The highest adopted mean temperature of a month, July 1868		62·4
The lowest ,, ,,	February, 1855	28·6
The highest adopted mean temperature of a year, 1868		49·1
The lowest ,, ,, ,, ,,	1855	44·6
The greatest monthly mean weight of vapour, in a cubic foot of air	July, 1852	5·1
The least ,, ,, ,,	February, 1855	1·4
The greatest fall of rain in a month, was in October, 1870, and was		13·437 in
The least ,, ,,	May, 1853, and May, 1859	0·3
The heaviest fall in 24 hours was on November 16th, 1866		3.514
The greatest number of days on which rain fell in one month	July, 1861, December, 1868	31
The least ,, ,,	March, 1852	3

The Rainfall of the year has been from 2 to 3 inches below the annual depth, and the extreme range of temperature 8° Fah. greater than the average of previous years.

The prolonged frost of December and the cold of November have not made any perceptible change in the adopted mean temperature of the year, because in all the preceding months the mean temperature has invariably been in excess of that of former years.

DATES OF OCCASIONAL PHENOMENA.

1878.	Frost.	Hoar frost only.	Snow.	Hail.	Heavy Rain.
January	2, 6—12, 17, 23—31		24, 25, 28	23, 24	21
February	1—3, 5—12, 14, 18, 19		13	12, 13	28
March	8, 9, 11—15, 21—31		2, 23—25, 28, 29, 31		
April	1—6, 8, 25, 26		1	1 (soft)	
May			19	15, 21	13—16, 19, 27
June					9
July					10
August					3, 4, 7, 14, 16, 25, 27, 31
September				16	15, 18
October	1, 27—29, 31	2		25, 28	6, 8, 21, 22, 28
November	1—3, 5, 6, 8, 9, 11—14, 18—31	4, 7	2, 8, 9, 11, 24, 30	8 (soft)	8, 10
December	1—3, 5—29, 31	4	12, 13, 16, 18, 21	18, 31	

1878.	Fog.	Lightning.	Thunder.	Lunar Halo.	Solar Halo.
January	18	26			
February	4, 8, 9, 12, 14, 24			12, 16	
March		24		13	
April	4—6, 18, 28		3		
May	2	14, 18, 27	11, 13—15, 18, 27, 28		
June	17	8, 9	8, 9, 11, 27		
July	4, 8, 13, 19, 28		24		
August	1, 19	7, 27, 29, 30	6, 16, 27, 30		
September	5, 6, 27	19	19		
October		25	22, 25	3, 11, 13, 14	
November	20, 21, 25, 26	1		3	3, 19
December	4, 11	19		4, 6, 8, 10	

AGRICULTURAL NOTES.

JANUARY.—During the first part of the month the weather was mild, and a few early flowers were in blossom in shady parts of the gardens. But the latter part of the month was cold, with sharp frost, which retarded the growth of early onions. Ploughing for oats commenced on the last day of the month.

FEBRUARY.—The first half of the month was cold and frosty, and vegetation was generally thrown back. During the last half of the month the weather was milder, with slight showers of rain. Ploughing was carried on during the greater part of the month.

MARCH.—This month was cold, with sharp frost towards the end of the month. Oats were sown by the middle of the month in most places. Grass looked very late, being parched and withered from want of moisture. There was a little ploughing for green crops.

APRIL.—Although the first few days were frosty, the greater part of this month was fine and very favourable for ploughing. Potatoes were sown about the middle of the month, and a few of the other green crops were got in later. Still things were looking late, and grass had scarcely begun to grow.

MAY.—This month was more favourable for agriculture, the greater part of the month being mild and wet. Grass much improved. Green crops all in the ground before the middle of the month. Stone fruit and currants looked very promising, but apples and pears, it was feared, would be very scarce. The heavy showers in the middle of the month destroyed the blossom of some of the fruit trees.

JUNE.—Grass cut on the 17th. Weather during the greater part of the month fine. Stone fruit, with the exception of apricots, looked well. A good quantity of hay was housed. Although the quantity was not so great as last year, yet it was of fair average and of very good quality. Potatoes looked well, and there was no sign of disease among them.

JULY.—Nearly all the hay was got in. Green crops retarded for want of rain. Wheat looking very well. Oats thin. A good crop of currants was gathered. Strawberries were only a light crop. Gooseberries did not promise to be abundant. Peas not quite up to the average, and apples very scarce.

AUGUST.—This month was very wet. The rain did good to green crops generally, which were looking much better. No wheat or oats cut yet. Oats looking very bad. Pears gathered in the early part of the month. They are about the average quantity, but small in size. Apples and gooseberries were got in by the end of the month. There is a fair quantity of gooseberries, but the crop of apples is a very poor one.

SEPTEMBER.—Wheat was first cut on the 16th, but owing to the heavy rain during the latter part of the month, was not all got in by the end of the month. No oats were got in, and in some places they have entirely failed. Green crops were looking very well, especially potatoes.

OCTOBER.—The last of the wheat was got in early in the month. Oats were cut on the 3rd, and housed towards the 15th. The wheat is an excellent crop, both as to quantity and quality; but oats are poor and below average quantity. A few potatoes were lifted.

NOVEMBER.—The greater part of this month was very cold and frosty. Wheat was sown early in the month. All the green crops housed. Potatoes are very good, very little disease among them, and the quantity is much above the average. Turnips are also good, and fully up to average quantity. Beet and mangel are also of fair average.

DECEMBER.—Very cold with sharp frost, and agricultural operations all stopped on that account.

OBSERVATIONS OF CROPS AND FLOWERS IN 1878.

GRAIN, ETC.					GREEN CROPS.				FLOWERS.	
Name.	When sown.	In Flower.	In Ear.	When cut.	Name.	When sown.	Above grnd.	Stored.	Name.	In Flower.
Wheat	Nov. 5th	June 10th	June 24th	Sep. 16th	Potatoes	Ap. 16th	May 20th	Nov.	Anemone	Ap. 2nd
Oats	Mar. 17th	June 10th	June 20th	Oct. 3rd.	Turnips.	May 15th	May 12th	Nov.	Wild Hyacinth	Ap. 18th
Beans	Feb. 4th			July	Swedes	May 15th	May 15th	Nov.	Daisy	Jan. 4th
Peas	Feb. 6th			June	Beet	May 15th	June 2nd	Nov.	Renunculus	Feb. 20th
					Mangel	May 15th	May 20th	Nov.	Meadow Sweet	May 23rd
					Onions	Mar. 20th	Ap. 15th	Sep. 16th	Crocus	Feb. 23rd
									Primrose	Mar. 9th
									Wood Violet	Ap. 16th

OBSERVATIONS OF TREES AND SHRUBS IN 1878.

FOREST TREES, ETC.				FRUIT TREES, ETC.			SHRUBS.		
Name.	In Bud.	In Leaf.	Divested of Leaves.	Name.	In Blossom.	Ripe.	Name.	In Blossom.	Divested of Leaves.
Field Elm			Oct. 21st	Apple	May 13th	Aug. 25th	Lilac	May 21st	Oct. 30th
Oak	Ap. 24th	May 16th	Oct. 21st	Pear	Ap. 10th	Aug. 10th	Privet	May 12th	Oct. 30th
Lime	Ap. 2nd	Ap. 30th	Oct. 10th	Cherry	Ap. 13th	July 8th	Honeysuckle	July 22nd	Oct. 26th
Sycamore	Mar. 25th	Ap. 18th	Oct. 15th	Peach	Ap. 14th	none	Syringa	May 19th	Nov. 1st
Horse Chesnut	Ap. 4th	Ap. 20th	Oct. 20th	Red Currant	Ap. 20th	July 20th	Laburnum	May 28th	Nov. 9th
Plane	Mar. 25th	Ap. 16th	Oct. 18th	Black Currant	Ap. 25th	July 20th	Red Flowering Currant	Mar. 11th	Nov. 10th
Hawthorn	Mar. 19th	Ap. 4th	Nov. 2nd	White Currant	Ap. 22nd	July 20th			
Hazel	Mar. 20th	Ap. 10th	Oct. 25th	Strawberry	May 22nd	June 30th			
Ash	May 10th	June 2nd	Oct. 20th	Gooseberry	Ap. 15th	Aug. 25th			
Poplar	Ap. 25th	May 18th	Oct. 20th (about)	Damson	Ap. 17th	Sept.-Oct.			
Beech	Ap. 19th	May 15th	Nov. 8th	Plum	Ap. 14th	Sept. 5th			

OBSERVATIONS OF UPPER CLOUDS (CIRRUS).

Date.	G. M. T.	Cloud Direction.	Wind. Direction.	Wind. Force 0—12.
January 24	11.30 a.m.	N.W.	W.	1
,, 26	8 a.m.	N. by W.	N.W.	1
,, ,,	4 p.m.	N.N.W.	W.	0
,, 28	9 a.m.	W.S.W.	W.	2
,, 31	8 a.m.	N.E.	N.E.	0
,, ,,	10 a.m.	N.E.	N.E.	0
February 11	8 a.m.	E. by N.	S.W.	1
,, 17	3 p.m.	N. by W.	S.	5
,, 19	Noon.	S.S.W.	S.	2
,, ,,	2 p.m.	S.S.W.	S.	3
,, ,,	4 p.m.	S. by W.	S.W.	1
March 8	9 a.m.	N.N.W.	W.	3
,, 10	11 a.m.	N.N.W.	W.	3
,, 12	9 a.m.	N.N.E.	N. by E.	1
,, ,,	10 a.m.	N.N.W.	N.E.	1
,, ,,	11 a.m.	N.N.W.	N.E.	1
,, ,,	Noon.	N. by W.	E.	0
,, 13	5.30 p.m.	N.N.E.	N. by E.	1
,, 14	10 a.m.	N.N.E.	N.E.	0
,, 18	6 p.m.	N.	S.E.	2
,, 19	Noon.	N.W.	N.N.W.	1
,, ,,	4 p.m.	N.N.W.	W.	2
,, 21	11 a.m.	W. by N.	W.	5
,, 23	8 a.m.	W.N.W.	N.W.	2
,, ,,	9 a.m.	N.N.W.	N.W.	3
,, ,,	10 a.m.	N. by W.	N.W.	2
,, 24	10 a.m.	N.W.	S.W.	2
,, 29	8 a.m.	S.S.W.	N.E.	4
,, ,,	9 a.m.	S.S.W.	N.E.	3
,, ,,	3 p.m.	S.S.W.	N.	3
April 2	6 p.m.	W.S.W.	W.	4
,, 7	6.30 p.m.	W. by S.	E.	2
,, 8	10 a.m.	S. by E.	E.	4
,, ,,	Noon.	S.S.E.	E.	5
,, ,,	2 p.m.	E.	E.	5
,, ,,	4 p.m.	E.	E.	5
,, 12	9 a.m.	N.W.	N.N.E.	1
,, 29	Noon.	S. by W.	E.	3
May 3	4 p.m.	S.W. by W.	W.	2
,, 17	7 p.m.	S.S.W.	S.W.	3
,, 18	7 p.m.	S.S.W.	S.W.	3
,, 20	9.30 a.m.	W.S.W.	W.	3
June 18	5.30 p.m.	S.S.W.	W.	1
,, 29	4 p.m.	E. by S.	E.N.E.	2

OBSERVATIONS OF UPPER CLOUDS (*Continued*).

Date.	G. M. T.	Cloud Direction.	Wind. Direction.	Wind. Force 0—12.
July 9	4 p.m.	S. by W.	W.	3
,, 13	6 p.m.	N. by W.	W.	3
,, 14	4.30 p.m.	N.W.	W.	3
,, 15	7 p.m.	N. by W.	N.W.	1
,, 17	9 a.m.	N.W. by W.	W.S.W.	2
,, ,,	3 p.m.	N.W.	W. by S.	2
,, ,,	4 p.m.	W.N.W.	W.	2
,, 19	9 a.m.	S.W. by W.	S.W.	1
,, ,,	10 a.m.	S.W. by W.	S.W.	1
,, ,,	5.30 p.m.	S.S.W.	W. by S.	1
,, 26	3 p.m.	W.	W. by S.	2
,, ,,	4 p.m.	W.N.W.	W. by N.	2
,, 29	7 p.m.	N.N.E.	N. by E.	1
August 12	6 p.m.	W.N.W.	S.W.	2
,, 25	8 p.m.	N.W.	W.S.W.	0
,, 26	8 a.m.	S.W.	N.N.W.	0
September 2	6 p.m.	W.	S.W.	1
,, 3	7 a.m.	W. by S.	S.S.W.	1
,, 7	9.30 a.m.	S.W. by W.	S.W. by S.	0
,, 9	8 a.m.	W.	S.S.W.	1
,, ,,	9 a.m.	S. by W.	S.W. by S.	1
,, ,,	10 a.m.	N.W.	S.W.	2
,, ,,	2 p.m.	N.W.	W.S.W.	2
,, ,,	4 p.m.	N.W. by W.	W. by S.	2
,, ,,	6 p.m.	W.	W.S.W.	1
,, 13	5 p.m.	W. by N.	S.W.	2
,, ,,	6 p.m.	N.W.	S.W.byW.	1
,, 18	8.30 a.m.	S.W.	S.W.byW.	4
,, 24	6 p.m.	N. by E.	W. by S.	1
October 3	4 p.m.	W. by N.	W.S.W.	2
,, 13	4.45 p.m.	W.S.W.	S. by W.	2
,, 18	8.30 a.m.	E.S.E.	N.E. by E.	1
,, ,,	9 a.m.	S.S.E.	N.E. by E.	0
,, 26	9 a.m.	W.S.W.	N. by E.	1
,, ,,	10 a.m.	W. by S.	N. by E.	1
,, 28	9 a.m.	N.E. by N.	W. by S.	2
,, ,,	2 p.m.	N.E.	W.	7
November 3	10 a.m.	N.E.	N.	0
,, 7	10 a.m.	N.N.W.	N.W.	1
,, 28	3 p.m.	W.	N.E.	3
December 8	9 a.m.	N.W. by W.	N.	1
,, ,,	10 a.m.	E.N.E.	N.	2
,, 11	9 a.m.	E. by N.	N.	1

RAINFALL

OF THE 30 YEARS BETWEEN 1848 AND 1877.

FOR several years the monthly Rainfall, printed in the reports of Stonyhurst Observatory, was given only to the nearest tenth of an inch, and consequently in the table drawn up in 1870 no quantity less than a tenth is entered. At present the use of three places of decimals, when rain is measured in inches, is generally adopted, and therefore, as our registers enable us to supply the correct amount, I have thought it well to give a complete table to the nearest thousandth of an inch for the last 30 years. The monthly results in this fuller form will be more convenient for future reference. Two tables of the number of days on which rain fell are inserted for the sake of comparison with other stations, as both methods of computing this number are in common use, and give results that are occasionally rather wide apart.

In drawing the curves of the annual variation, the absolute amount of Rain, or the number of days on which rain has fallen, is marked on the first broken line, and the line underneath is obtained from numbers which are the means of five successive values of the line above. From these curves it is obvious that the Rainfall has been on the increase both in frequency and amount for the last 20 years. The number of days on which rain fell in a single year since 1859, has only twice been below the average for the 30 years, but the annual amount is not so constant. In both curves we find the minimum Rainfall coinciding with the first minimum sun-spot year of the period, but there appears to be no further evidence of an eleven year period, but rather of one that extends over a much greater number of years.

The yearly range is very marked, having only one inflexion: the maximum occurring in October, and the minimum in April and May. In June and July the rainy days are not numerous, but the falls are heavy, particularly in July. October is considerably in excess both in amount and in number of days. May has the lightest fall, and the fewest days of Rain, but differs little from April.

A few notes on the instruments used, and on the corrections applied, during the past 30 years will serve to connect the tables of this report with any data previously printed. The Rainfall observations were commenced at Stonyhurst in August, 1845, a Crosley self-registering gauge of 100 inches area being used until January, 1849. During the year 1848 the rain was also measured by a cylindrical gauge of 37·809 inches area, and, after a year's comparison of the two gauges, the Crosley instrument was discarded on account of its defective working. From February, 1857, down to the present year, another cylindrical gauge, whose receiving area is 99·401 inches, has been in constant use. In the present table the reading for July, 1848, is the only one obtained from the Crosley gauge.

The cylindrical gauge now in use was made with the greatest care, the rim of gun-metal being so truly turned that no difference in the diameters can be detected by the most accurate measurement. The glass rod which measures the diameter is preserved in the Observatory, and is precisely 11·250 inches in length, which makes the collecting area 99·401 square inches. The diameter of this gauge was also determined lately quite independently of the glass rod, and led to identically the same result. As our graduated glass measure is made for a surface of 100 square inches, the amounts so measured require an addition of 6 per thousand. From 1848 to 1868 the measure used required a minus correction of 1 in 20, on account of the defective graduation of the measure.

The Rain gauge stands at a distance of 60 feet from any trees or buildings, and is due South of the Observatory erected in the centre of the College garden. From 1848 until December 11, 1874, the observations were taken at 9 a.m. and 9 p.m., but since the latter date the gauge is emptied at 10 a.m., and the amount entered for the previous day.

The whole of the figures in the subjoined tables have been recomputed from the original journals, and no correction has been applied that was not obviously demanded either by the known errors of the gauge or measure, or by mistakes in copying and in applying corrections.

CORRECTED TABLE OF RAINFALL FOR 30 YEARS.

Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly fall.	Monthly fall.
1848	1·805	8·882	3·496	2·185	1·710	7·125	4·035	6·650	3·437	4·934	4·560	3·848	52·667	4·389
1849	7·020	3·747	1·167	1·357	1·903	2·247	7·125	6·388	4·264	4·303	5·471	3·138	48·130	4·011
1850	3·668	6·318	1·462	4·071	1·784	3·092	4·358	5·775	2·434	4·876	7·187	2·871	47·896	3·991
1851	5·862	3·315	3·433	1·141	1·382	5·403	5·398	5·565	1·895	6·189	2·261	2·259	44·103	3·675
1852	8·147	7·692	0·352	0·478	2·679	3·648	3·277	5·373	4·393	5·803	6·316	8·211	56·369	4·697
1853	4·636	1·210	1·608	3·514	0·281	4·335	6·924	2·930	3·956	3·907	3·157	0·760	37·218	3·120
1854	3·584	4·131	1·815	1·082	2·552	2·769	2·431	4·210	4·750	3·958	4·513	8·288	44·083	3·674
1855	1·205	0·833	2.977	2·577	1·852	4·849	4·653	3·135	1·629	8·990	1·158	1·818	35·676	2·973
1856	2·519	5·860	0·461	2·729	3·081	5·399	3·433	4·859	3·915	1·328	2·307	6·069	41·960	3·497
1857	3·904	2·714	3·088	1·963	2·426	6·528	4·096	4·082	2·891	2·107	1·693	3·916	39·408	3·284
1858	3·799	0·306	2·791	2·829	3·481	1·855	3·779	3·380	5·829	6·135	2·421	4·562	41·167	3·431
1859	3·794	3·716	6·247	3·991	0·249	3·015	1·833	5·975	7·333	3·388	2·912	2·991	45·444	3·787
1860	5·022	1·729	5·831	1·664	3·968	6·147	1·732	6·074	3·292	7·431	2·684	3·338	48·912	4·076
1861	1·033	3·796	6·505	1·316	1·356	2·183	5·078	5·979	5·591	2·831	8·249	2·829	46.746	3·896
1862	3·874	1·184	4·496	4·221	4·998	4·679	5·235	4·656	3·542	7·634	2·472	4·862	51·853	4·321

Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly fall.	Monthly fall.
1863	6·060	2·584	2·178	2·392	3·773	4·866	1·914	5·477	7·670	6·057	7·361	5·270	55·602	4·634
1864	3·158	4·411	3·534	1·700	2·799	4·979	2·154	3·133	4·180	2·297	4·951	2·745	40·041	3·337
1865	3·930	3·474	2·199	2·098	4·976	0·664	3·068	5·531	1·013	6·397	3·832	1·615	38·797	3·233
1866	6·022	5·099	2·404	1·052	1·977	4·653	5·928	5·876	9·295	2·814	9·026	8·037	62·183	5·182
1867	4·250	4·159	1·390	5·672	2·004	2·044	5·187	3·356	4·720	5·122	2·072	4·991	44·967	3·747
1868	3·673	4·185	6·079	2·153	1·538	0·697	0·669	4·343	2·407	6·521	3·824	9·044	45·133	3·761
1869	3·712	8·807	1·381	2.799	3·443	2·055	1·051	3·911	9·539	4·004	8·033	5·873	54·608	4·551
1870	4·133	1·618	2·940	2·653	1·966	2·243	2·284	2·893	4·018	13·437	3·540	4·115	45·840	3·820
1871	1·737	4·573	1·981	3·624	1·812	3·377	8·128	2·085	4·229	6·624	2·090	3·917	44·177	3·681
1872	5·594	4·606	4·782	3·697	3·223	5·070	4·517	5·599	8·906	6·040	4·725	4·110	60·869	5·072
1873	6·210	0·826	3·419	0·825	2·871	4·031	4·842	6·415	2·839	8·733	3·892	2·408	47·311	3·943
1874	5·293	1·789	6·496	1·820	1·849	2·061	3·064	7·255	5·593	6·938	5·380	3·972	51·510	4·293
1875	5·166	1·407	1·254	1·601	2·939	4·496	5·725	3·784	5·912	3·806	5·845	2·595	44·530	3·711
1876	3·108	6·033	4·640	2·699	0·640	4·630	5 356	4·339	5·410	3·046	2·193	5·425	47·519	3·952
1877	6·132	5·395	4·400	2·774	2·790	2·894	4·989	6·697	4·507	6·553	6·487	6·684	60·302	5·025
Means	4·268	3·747	3·160	2·423	2·410	3·755	4·075	4·858	4·646	5·407	4·354	4·352	47·501	3·958

NUMBER OF DAYS UPON WHICH ANY RAIN FELL.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November	December.	Number per Year.	Number per Month.
1848	23	22	23	16	11	24	18	27	17	24	19	17	241	20·1
1849	21	19	19	20	14	14	19	24	17	18	18	12	215	17·9
1850	25	21	13	19	17	11	16	22	11	26	21	20	222	18·5
1851	25	11	21	11	13	19	19	19	6	20	16	12	192	16·0
1852	21	15	3	4	11	24	14	19	17	18	23	26	195	16·3
1853	19	7	9	19	5	16	24	10	13	25	16	9	172	14·3
1854	16	18	10	5	15	14	15	16	12	16	20	27	184	15·3
1855	13	10	12	8	11	17	16	12	8	24	8	9	148	12·3
1856	13	12	5	14	12	17	14	20	19	19	15	19	179	14·9
1857	25	14	22	16	11	12	18	14	18	22	19	24	215	17·9
1858	15	6	15	13	16	14	20	19	22	25	11	28	204	17·0
1859	25	24	28	21	16	15	12	23	25	20	18	16	233	19·4
1860	25	16	26	13	22	26	13	28	21	29	19	18	256	21·3
1861	16	21	28	12	11	20	30	27	24	21	23	23	256	21·3
1862	19	13	19	23	25	27	24	21	20	27	20	25	263	21·9
1863	28	25	19	20	18	25	17	26	29	29	25	29	290	24·2
1864	20	16	25	14	16	25	18	22	29	14	23	23	245	20·4
1865	24	20	16	16	23	9	21	21	20	27	26	19	242	20·2
1866	29	25	20	16	11	22	16	26	30	18	25	27	265	22·1
1867	16	23	18	26	17	15	23	22	24	25	22	23	254	21·2
1868	23	28	28	22	20	17	9	22	16	28	21	31	265	22·1
1869	27	25	20	21	20	15	11	17	26	27	28	21	258	21·5
1870	24	21	19	18	18	20	14	14	20	28	25	20	241	20·1
1871	20	24	21	24	16	18	29	22	21	28	25	29	277	23·1
1872	31	27	28	20	28	25	21	21	29	30	29	30	319	26·6
1873	28	16	25	17	21	21	27	29	25	31	22	28	290	24·2
1874	25	22	26	19	18	11	16	22	23	25	24	19	250	20·8
1875	28	18	15	8	25	20	18	20	16	23	22	20	233	19·4
1876	20	23	21	21	8	13	14	18	23	16	19	24	220	18·3
1877	23	22	20	17	13	15	22	24	16	21	25	28	246	20·5
Mns	22·2	18·8	19·1	16·4	16·1	18·0	18·3	20·9	19·9	23·5	20·9	21·9	236	19·7

NUMBER OF DAYS ON WHICH ·01 OR MORE FELL.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Number per Year.	Number per Month
1848	9	23	17	14	4	23	18	12	12	13	6	14	165	13·8
1849	20	16	11	12	12	11	19	19	14	15	18	11	178	14·8
1850	7	19	11	17	15	9	16	21	10	23	19	19	186	15·5
1851	22	10	20	8	11	19	19	17	5	18	15	10	174	14·5
1852	20	15	2	3	11	24	11	19	16	18	21	26	186	15·5
1853	19	6	9	17	5	15	22	8	12	20	14	7	154	12·8
1854	13	17	10	5	15	14	13	15	12	13	20	27	174	14·5
1855	8	4	12	8	11	17	16	11	7	24	7	9	134	11·2
1856	13	12	4	13	11	17	14	16	17	12	11	19	159	13·3
1857	24	12	18	14	10	12	18	11	14	14	12	19	178	14·8
1858	15	5	14	13	15	14	16	16	17	22	7	24	178	14·8
1859	22	16	24	16	4	15	10	15	22	17	14	14	189	15·8
1860	22	14	24	11	20	25	10	26	15	25	15	16	223	18·6
1861	14	18	26	8	9	19	25	23	18	13	23	16	212	17·7
1862	17	10	19	18	21	25	21	15	16	25	13	23	223	18·6
1863	25	21	14	15	16	19	8	24	25	23	19	24	233	19·4
1864	14	10	18	11	15	21	11	16	25	10	17	18	186	15·5
1865	20	18	10	11	18	4	16	14	10	20	16	11	168	14·0
1866	27	22	15	12	8	18	14	22	26	12	22	23	221	18·4
1867	15	18	13	22	14	11	14	18	22	22	12	20	201	16·8
1868	16	21	22	16	12	9	8	18	10	25	13	27	197	16·4
1869	20	23	11	13	13	10	8	12	23	18	26	18	195	16·3
1870	19	13	9	11	14	14	8	7	14	23	16	13	161	13·4
1871	13	21	12	19	10	14	26	14	16	21	15	24	205	17·1
1872	24	25	21	15	20	20	14	18	25	22	24	22	250	20·8
1873	23	8	15	12	18	14	21	25	17	22	15	20	210	17·5
1874	21	12	19	16	17	11	15	21	18	21	18	17	206	17·2
1875	25	10	9	7	20	20	16	16	14	16	16	16	185	15·4
1876	12	22	16	19	8	10	13	16	19	14	14	19	182	15·2
1877	23	21	20	13	12	14	20	24	12	21	22	25	227	18·9
Mns	18·1	15·4	14·8	13·0	13·0	15·6	15·3	17·0	16·1	18·7	16·0	18·4	191·4	15·95

Monthly Magnetical Observations taken at the College Observatory, Stonyhurst, 1878.

THE Horizontal, Vertical, and Total forces are calculated to English measure; one foot, one second of mean solar time, and one grain being assumed as the units of space, of time, and of mass.

The Vertical and Total forces are obtained from the absolute measures of the Horizontal force and of the Dip.

In the observations of Deflection and Vibration, taken each month for absolute measure of Horizontal force, the same magnet has always been employed.

The moment of inertia of the magnet with its stirrup, for different degrees of temperature, and the co-efficients in the corrections required for the effects of temperature and of terrestrial magnetic induction on the magnetic moment of the magnet, were determined at the Kew Observatory by the late Mr. Welsh.

The moment of inertia of the magnet with its stirrup, using the grain and foot as the units of mass and of linear measure, is 5·27303. Its rate of increase for increase of temperature is 0·00073 for every 10° of Fahr.

The weight of the magnet with its stirrup is approximately 825 grains, and the length of the magnet is nearly 3·94 inches. The moment of inertia was determined, independently of the weight and dimensions, by the method of vibration, with and without a known increase of the moment of inertia.

The temperature corrections have always been obtained from the formula $q(t°-35°)+q'(t°-35°)^2$, where t° is the observed temperature and 35° Fahr. the adopted standard temperature. The values of the co-efficients q and q' are respectively ·0001128 and 0·000000436.

The induction co-efficient μ is 0·000244.

The correction for error of graduation of the Deflection bar at 1·0 foot is +0·00004 ft., at 1·3 + 0·000064 ft.

The observed times of vibration are entered in the Table without corrections.

The time of one vibration has been obtained each month from the mean of twelve determinations of the time of 100 or of 200 vibrations.

The angles of deflection are each the mean of two sets of readings.

In deducing from these observations the ratio and product of the magnetic moment m of the magnet, and the earth's horizontal magnetic intensity X, the induction and temperature corrections have always been applied, and the observed time of vibration has been corrected for the effect of torsion of the suspending thread; but no correction has been required for the rate of the chronometer, or for the arc of vibration, the former having been always under 5″, and the latter always under 8′.

The average deflection of the magnet caused by a twist of the torsion circle through 90°, has been about 8′·9 of arc.

In the calculations of the ratio $\frac{m}{X}$, the third and subsequent terms of the series $1 + \frac{P}{r^2} + \frac{Q}{r^4}$ + &c., have always been omitted.

The value of the constant P was found to be 0·0035056.

The Declination observations have been taken once a week. Each reading has been corrected by the photographic curves for all irregular disturbances, as well as for daily and monthly range.

OBSERVATIONS OF DEFLECTION FOR ABSOLUTE MEASURE OF HORIZONTAL FORCE.

Month.	G. M. T.		Distances of centres of Magnets.	Temperature.	Observed Deflection.	$\text{Log}\frac{m}{X}$
	D.	H. M.	FOOT.	°	° ′ ″	
January ...	23rd	11 56 a.m.	1·0	40·8	13 54 53	9·08184
	,,	12 16 p.m.	1·3	41·3	6 17 47	9·08200
February...	19th	9 36 a.m.	1·0	44·6	13 54 32	9·08191
	,,	9 55 a.m.	1·3	45·9	6 17 11	9·08161
March ...	18th	10 56 a.m.	1·0	50·0	13 55 26	9·08273
	,,	11 14 a.m.	1·3	50·9	6 17 53	9·08275
April	26th	11 58 a.m.	1·0	50·1	13 53 20	9·08166
	,,	12 23 p.m.	1·3	51·3	6 16 55	9·08167
May	24th	10 48 a.m.	1·0	54·2	13 54 55	9·08275
	,,	11 11 a.m.	1·3	56·0	6 17 17	9·08241
June	14th	3 49 p.m.	1·0	59·4	13 53 50	9·08257
	,,	4 11 p.m.	1·3	59·6	6 16 53	9·08221
July.....	27th	9 43 a.m.	1·0	63·4	13 48 25	9·08008
	,,	10 49 a.m.	1·3	64·5	6 14 2	9·07928
August ...	26th	10 35 a.m.	1·0	63·0	13 49 58	9·08094
	,,	10 58 a.m.	1·3	65·4	6 16 12	9·08184
September.	21st	11 16 a.m.	1·0	55·9	13 50 44	9·08074
	,,	11 45 a.m.	1·3	57·7	6 16 8	9·08130
October ...	21st	10 45 a.m.	1·0	57·5	13 47 22	9·07912
	,,	11 5 a.m.	1·3	58·4	6 14 6	9·07892
November.	29th	10 33 a.m.	1·0	36·1	13 50 3	9·07907
	,,	10 59 a.m.	1·3	37·2	6 15 11	9·07875
December.	28th	11 58 a.m.	1·0	33·3	13 50 50	9·07930
	,,	12 42 p.m.	1·3	34·6	6 15 41	9·07917

m represents the Magnetic moment of the Deflecting Magnet.
X represents the Earth's Horizontal Magnetic Intensity.

VIBRATION OBSERVATIONS FOR ABSOLUTE MEASURE OF HORIZONTAL FORCE.

Month.	G. M. T.	Temperature.	Time of one vibration.	Log m X	Value of m.
	D. H. M.	°			
January ...	23rd...11 8 a.m.	40·1	5·66509	0·20874	0·44191
February...	19th... 8 49 a.m.	41·0	5·66781	0·20856	0·44174
March	18th... 9 40 a.m.	47·3	5·66983	0·20832	0·44211
April	26th...8 51 a.m.	44·3	5·66671	0·20855	0·44168
May.....	24th... 9 12 a.m.	49·8	5·66435	0·20912	0·44244
June	14th...10 24 a.m.	53·9	5·66517	0·20928	0·44242
July.....	26th...11 8 a.m.	65·7	5·67669	0·20819	0·44049
August ...	26th... 8 41 a.m.	54·2	5·67444	0·20789	0·44121
September.	21st... 9 24 a.m.	48·6	5·67887	0·20692	0·44052
October ...	21st... 9 47 a.m.	52·3	5·67980	0·20679	0·43945
November.	29th... 9 46 a.m.	36·3	5·67692	0·20631	0·43915
December.	28th...11 13 a.m.	36·3	5·67242	0·20664	0·43948

Dip Observations.				Magnetic Intensity.		
Months.	G. M. T.	Needle.	Dip.	X, or Horizontal Force.	Y, or Vertical Force.	Total Force.
	D. H. M.		° ′ ″			
January ...	24th...11 23 a.m.	1	69 19 0	3·6594	9·7095	10·3765
	,, ...12 5 p.m.	3	69 22 53			
February .	20th...11 5 a.m.	1	69 28 16	3·6593	9·7575	10·4211
	,, ...11 58 a.m.	3	69 24 51			
March ...	18th...11 46 a.m.	1	69 27 11	3·6542	9·7320	10·3954
	,, ...12 27 p.m.	3	69 23 10			
April	27th... 9 33 a.m.	1	69 18 55	3·6597	9·6897	10·3577
	,, ...11 5 a.m.	3	69 18 8			
May	25th...11 5 a.m.	1	69 19 36	3·6582	9·7029	10·3696
	,, ...12 3 p.m.	3	69 21 30			
June	15th...10 45 a.m.	1	69 23 26	3·6597	9·7287	10·3943
	,, ...11 20 a.m.	3	69 22 45			
July	29th...11 19 a.m.	1	69 26 45	3·6665	9·7567	10·4229
	,, ...10 37 a.m.	3	69 21 45			
August ...	26th...11 55 a.m.	1	69 22 38	3·6581	9·7261	10·3912
	,, ...12 30 p.m.	3	69 23 56			
September	23rd...11 5 a.m.	1	69 25 50	3·6555	9·7524	10·4150
	,, ...11 42 a.m.	3	69 28 28			
October...	22nd..10 50 a.m.	1	69 22 30	3·6634	9·7549	10·4201
	,, ...11 46 a.m.	3	69 27 30			
November	25th...11 7 a.m.	1	69 20 34	3·6619	9·7137	10·3810
	,, ...12 10 p.m.	3	69 20 45			
December	30th...11 14 a.m.	1	69 22 15	3·6619	9·7166	10·3837
	,, ...11 59 a.m.	3	69 19 45			
	Means.		69 23 1	3·6598	9·7292	10·3940

DECLINATION OBSERVATIONS.

Month.	G. M. T.	Uncorrected. Observation.	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′ ″
January ...	8th... 8 54 a.m.	20 38 25		20 39 37	
	16th... 8 58	35 58		36 50	
	22nd.. 9 0	36 34		36 34	
	28th... 9 11	38 48	20 37 26	39 5	20 38 2
February..	5th... 8 59	42 38		42 21	
	12th... 8 59	38 37		36 54	
	18th... 9 11	39 14		40 40	
	26th... 9 4	39 24	20 39 58	41 42	20 40 24
March ...	4th... 9 0	39 9		40 1	
	12th... 9 8	33 46		35 29	
	18th... 9 1	39 33		42 59	
	25th... 9 7	36 3	20 37 8	38 38	20 39 17
April	2nd... 9 0	34 25		38 43	
	8th... 9 4	35 9		38 18	
	15th... 8 57	31 0		35 1	
	23rd .. 9 6	23 52		25 35	
	29th... 8 55	30 44	20 31 2	34 45	20 34 28
May	7th... 9 4	35 50		38 59	
	13th... 9 3	30 52		33 10	
	21st... 9 6	34 53		38 2	
	28th... 9 13	37 46	20 34 50	41 47	20 38 0
June	4th... 9 1	35 24		38 50	
	10th... 9 5	37 49		39 32	
	18th... 8 57	36 23		38 23	
	25th... 9 8	33 12	20 35 42	36 38	20 38 21
July	3rd... 9 4	30 55		32 21	

DECLINATION OBSERVATIONS (*Continued*).

Month.	G. M. T.	Uncorrected. Observation.	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′ ″
July	8th 9 8 a.m.	20 33 6		20 35 58	
	16th 9 10	26 30		30 48	
	22nd 8 58	35 51		39 0	
	29th 8 53	34 44	20 32 13	38 45	20 35 22
August ...	6th 9 4	34 30		35 56	
	12th 9 3	31 42		32 51	
	20th 9 10	34 58		35 50	
	27th 9 4	25 52	20 31 46	25 52	20 32 37
September	2nd 9 1	29 41		32 16	
	9th 9 13	24 8		25 51	
	17th 8 57	27 13		27 47	
	23rd 9 6	36 8		37 51	
	30th 9 5	33 21	20 30 6	35 4	20 31 46
October ...	8th 8 58	30 8		32 8	
	14th 9 5	25 15		27 15	
	22nd 9 7	27 31		29 14	
	28th 9 3	28 8	20 27 46	29 51	20 29 37
November	5th 9 8	27 51		27 51	
	18th 9 3	33 9		32 17	
	26th 9 9	31 44	20 30 55	31 44	20 30 37
December .	2nd 9 12	23 29		22 20	
	11th 8 55	27 50		27 50	
	16th 9 0	32 11		33 3	
	24th 8 52	35 53		37 19	
	31st 9 3	30 28	20 29 58	28 28	20 29 48
Yearly mean			20 33 14		20 34 52

MAGNETIC DISTURBANCES.

JANUARY.—A slight movement of the magnetic needle towards the E. occurred between midnight and 2 a.m. on the 2nd, and then none but very small irregularities are traceable on the photographic curves until the morning of the 24th. The disturbance of the Declination magnet from 8 p.m. on the 21st to 2 a.m. on the 22nd is perhaps worthy of note: it was accompanied by a slight increase of the Horizontal and a decrease of the Vertical Component of the Intensity between 11.40 p.m. and midnight.

The storm on the 24th began a little before midnight with a slow Easterly motion of the needle. The principal disturbance of the V.F. consisted in a steady decrease from 2.45 a.m. until 5 a.m., followed by a very slow rise. The H.F. was more agitated throughout the day, but no single deflection from the normal value was of any great extent. The most rapid Easterly movement of the magnet occurred between 3.50 a.m. and 4.35, during which time the Declination decreased 30′ 48″. The total range of the magnet during the disturbance was 37′ 4″, the minimum being reached at 5.18 a.m., and the maximum at 8.5. The movements of the Declination magnet throughout the storm were very bold.

From 5 p.m. on the 25th until midnight the Declination varied considerably, but during the remainder of the month there was very little disturbance.

FEBRUARY.—The first disturbance of February commenced about noon on the 1st, lasting for some twelve hours. The rapid movement of the N. end of the needle towards the E. at 11 p.m. was followed five minutes later by an increase of H.F. and a decrease of V.F.

From the 5th to the 12th no day was free from magnetic irregularities, the principal disturbance occurring during the afternoon of the 7th.

From the 14th to the 19th the Declination curves were always irregular between 6 and 8 p.m., but during the remainder of the day were generally undisturbed. With the exception of a slight decrease of W. Declination from 6 to 10 p.m. on the 26th and 28th, the remainder of the month was remarkably quiet.

MARCH.—Throughout this month there was not even an approach to anything that might be called a magnetic storm, but only occasionally slight abnormal movements of the magnet towards the E., and these happened especially between 6 p.m. and midnight. There is a very remarkable similarity between the curves for each day of this month, and this is particularly noticeable on the 12th and the five succeeding days. On the 12th there is the slightest possible Easterly movement between 9 and 10 p.m.; on the 13th this had developed into a considerable irregularity; on the 14th at the same hours it attained its maximum; on the 15th it had considerably diminished, and still more so on the 16th; and there was just the least trace of it remaining on the 17th. As all these similar irregularities on successive days all occurred at invariably the same hour, we have here a very striking instance of the direct action of the sun on the forces which influence the irregular movements of the magnet.

APRIL.—A rather serious disturbance commenced on the 2nd, by a gradual increase of the W. Declination from noon until 6 p.m.; it then diminished rapidly, but remained near its mean value from 8 p.m. until 7 o'clock next morning, when it again increased, and was very irregular until midnight. The Vertical Component of the Intensity began to increase considerably with the W. Declination, and attained its maximum shortly before 8 p.m. on the 2nd. It then fell slowly, but rose again with the Declination on the 3rd, attaining its second maximum a little after 6 p.m.

The Declination was above its mean value, and rather irregular, on the afternoon of the 5th, and then remained very steady until the morning of the 16th. The disturbance was considerable from 2 a.m. until 9 a.m. on the 16th, and at $9^{h.}\ 45^{m.}$ p.m. the needle started a rapid movement towards the E. of 20′ 55″ in 23 minutes, returning Westward rather more slowly. The magnet was again disturbed from 8 p.m. on the 17th until 8 a.m. on the 18th, and there was some irregularity about midnight on the six following nights. The V.F. magnet often fell below the mean position between the 16th and 23rd. The H.F. magnet was much less affected during this month by disturbing forces than the V.F. The latter part of the month was very quiet.

MAY.—With the exception of a slight daily disturbance occurring late in the evening, the beginning of the month was remarkably quiet until 6 a.m. on the 14th. The storm, which then broke out, commenced with a tremulous movement of the Declination needle and also of the H.F. magnet, and was felt at, and about, the same absolute time at the observatories of Zi-Ka-Wei in China, of Toronto in Canada, and of Melbourne in Australia, and also on the telegraphic wires of the Persian Gulf. The tremor of the magnets lasted from $6^{h.}\ 4^{m.}$ a.m. until 4 p.m.,

when the larger movements began. The storm was at its height about midnight, after which it rapidly died away. Towards midnight all the magnets were much disturbed, and the V.F. trace was completely lost for a time, as the magnet was thrown off its balance by the severity of the shock.

During the latter half of the month there were no irregular movements of any importance, a slow Easterly oscillation of the Declination magnet shortly after 10 p.m. on the 23rd being the only disturbance worth recording.

JUNE.—The principal storm of this month, and of the year, gave the first tokens of its advent immediately after midnight on the 3rd, and lasted until 8 a.m. on the 4th. Some of the movements of the Declination magnet were very rapid, the increase of W. Declination between 8h. 17m. and 8h. 28m. being 31′ 14″, and the immediate decrease almost as rapid, thus forming a very sharp peak in the curve.

Between 2 p.m. and 8 p.m. on the 11th there was a slight irregular movement of the magnets, and the remainder of the month was a perfect calm.

JULY.—The magnets were not quite so undisturbed during this month as they had been from the 10th to the 30th of June, but there was no irregularity of any very notable extent.

AUGUST.—The daily range of the Declination magnet was very well marked throughout this month during the day hours. With the exception of a slight disturbance, which began on the evening of the 6th, and lasted until the morning of the 8th, and also some irregularities on the 31st, there is nothing worthy of any special remark.

SEPTEMBER.—A similar Easterly movement of the needle, with a slight increase of H.F., at about the same hour of the evening on the 1st, 2nd, 4th, 6th, and 7th; and a little more irregularity towards the end of the month than is generally traceable on the curve, is all that demands any notice this month.

OCTOBER.—Between midnight and 2 a.m. on the 7th there was a decrease of the Vertical Component of the Force, which then quietly returned to its normal value. The Declination and Horizontal Force were both affected by the same disturbance.

On the 18th, 19th, and 20th, the Declination magnet was much more agitated than usual. A considerable Easterly movement, reaching its maximum at 10 p.m. on the 21st, was followed on the 23rd by a wavy Easterly movement from 5 p.m. to 10 p.m., and the principal irregularities

from 6 to 8 were reproduced at the same hour on the following day, but on a much reduced scale. There is an indication of the same on the H.F. curve. Most of the month was very quiet.

NOVEMBER.—The first disturbance of the month began about 11.45 p.m. on the 3rd, and continued until 2.20 a.m. on the 5th. The V.F. increased considerably during the afternoon of the 4th. The magnets then remained quiet until the morning of the 14th, when the principal disturbance of the month commenced. From 6.30 p.m. to 2 a.m. on the following day the needle was generally considerably to the East of its mean position. The afternoon of the 15th was quiet, but towards midnight the needle moved Westward through a large angle. The H.F. curve was never very irregular, and the V.F. was principally affected by the disturbing force between 7 p.m. and midnight on the 14th. An Easterly oscillation shortly before 8 p.m. on the 19th, was repeated a few minutes earlier on the following day.

DECEMBER.—This month opened with a storm of some magnitude, and lasted with some interruptions until 1 a.m. on the 4th. Between 7 p.m. and 10 p.m. on the 1st, the movements of the Declination magnet were very irregular, and were accompanied by an increase of both Components of the Force. The most rapid oscillation was an Easterly deflection of 23′ 38″ between $8^{h}.\ 22^{m}.$ and $8^{h}.\ 33^{m}.$ There was not much disturbance on the 2nd, except in the evening. A weak disturbing force was again in action at 7 a.m. on the 12th, and it was felt for about twenty-four hours. Two similar oscillations of the Declination needle occurred shortly before 8 p.m. on the 13th and 14th. The magnets were also moving rather irregularly on the 25th, and the year closed with a considerable diminution of W. Declination, and abnormal vibrations of the H.F. and V.F. magnets.

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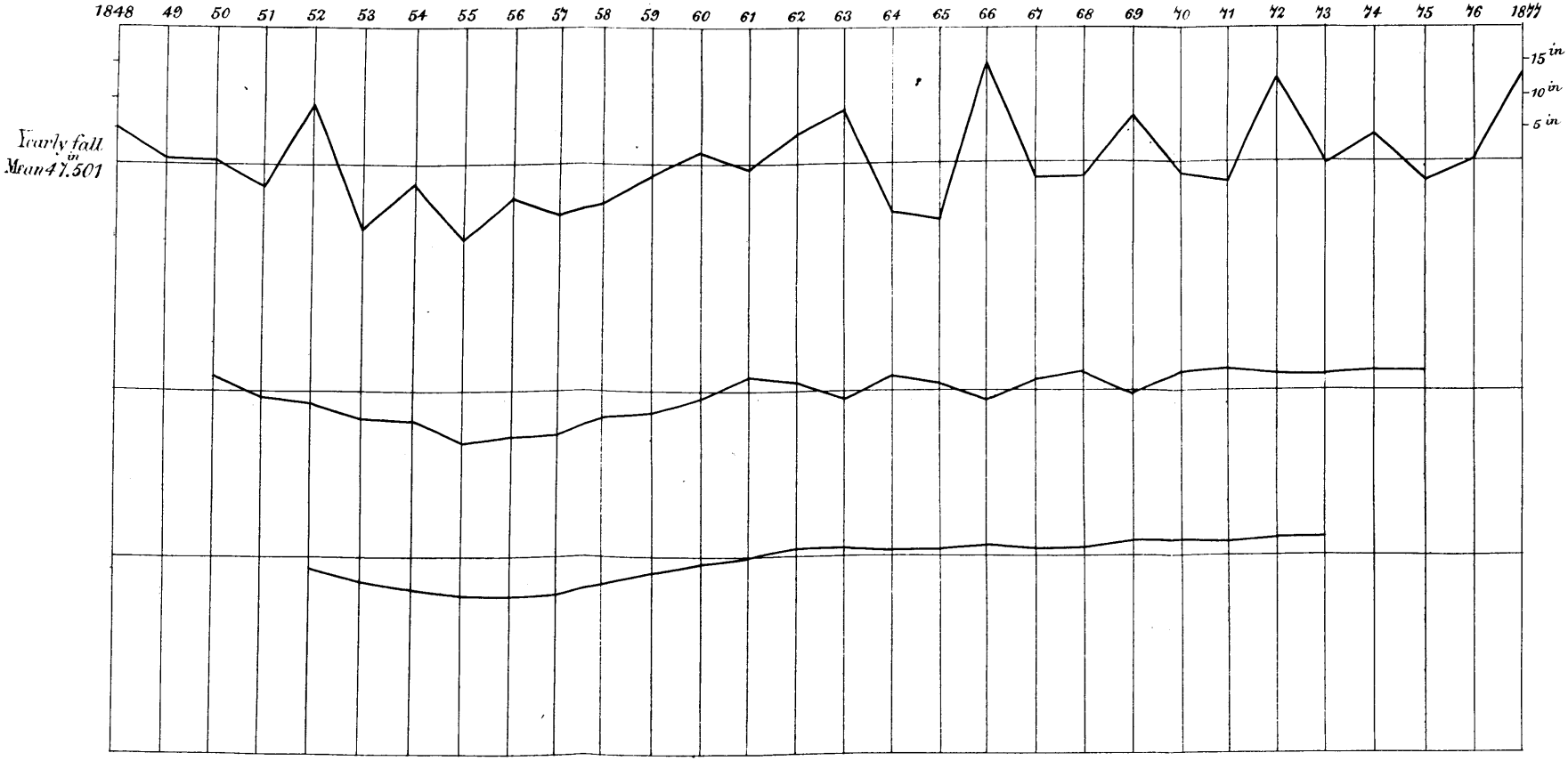
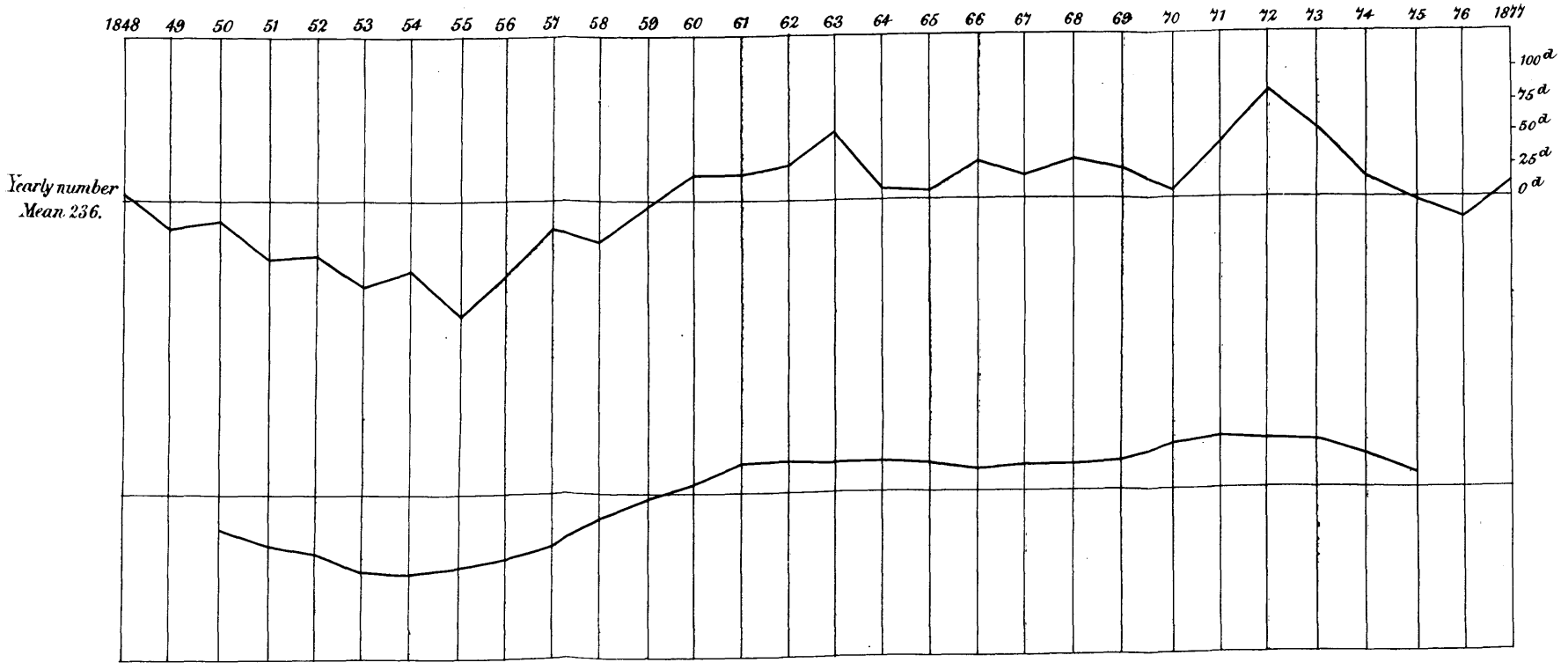
ANNUAL VARIATION IN AMOUNT OF RAINFALL.



ANNUAL VARIATION IN NUMBER OF DAYS ON WHICH RAIN FELL.



YEARLY RANGE OF RAINFALL.