STONYHURST COLLEGE

OBSERVATORY.

RESULTS

OF

METEOROLOGICAL AND MAGNETICAL OBSERVATIONS.

1877.

MANRESA PRESS, ROEHAMPTON.
1878.

INTRODUCTION.

THE change in the directing Committee of the Meteorological Office has caused no alteration in the daily routine work of the Board of Trade Observatories, but the photographic curves, and the hourly measures, are now sent direct to London, instead of being first examined at Kew.

The extra series of Meteorological Observations, including the Synchronous Observations for the American Government, and the registration of the movements of the upper clouds for the Upsala Observatory, are continued as in previous years, with the sole exception of the evaporation experiments, which were not sufficiently reliable for publication during the first part of the year. A table of the observations of the upper clouds is added for the first time to this report.

We are at present engaged in reducing the meteorological work done at Kerguelen during the Transit of Venus Expedition. This extends over the four summer months of November, December, January, and February, and is very complete in all its details. It comprises observations taken every two hours, both day and night, of the barometer, dry and wet-bulb thermometer, direction and force of wind, nature and amount of cloud, and state of sea and weather. Also twice a day readings of a maximum and a minimum thermometer in the shade, of a solar thermometer, of a minimum on grass, of four earth thermometers at different depths, and of a self-recording anemometer. During the day hours the temperature and specific gravity of the sea-water were also observed. It is hoped that these reductions when completed will furnish a full and interesting account of the meteorological conditions of an important island, where few

opportunities are afforded for any continuous scientific researches.

No interruption has occurred this year in the magnetic work of the observatory. The continuous photographic curves, the weekly observations of the Declination, and the monthly determinations of the Dip and Intensity, have been continued, and the measurement of the vertical force curves has been added to that of the Declination and horizontal force.

Two papers on the magnetic observations taken at Kerguelen, and during the voyage to and from the island, have been read before the Royal Society.

The observation of the phenomena of Jupiter's satellites and the measurement of double stars continues.

Three very clear days favoured the search for the supposed planet Vulcan, and an uninterrupted watch was kept up, as a complete negative result might under the circumstances be of considerable value.

The large amount of spherical aberration in the object-glass of the great equatoreal rendered it quite unfit for the noble mounting of the telescope. The glass has been examined by the optician who made it, and he finds the material excellent, and is confident that the convex lenses can easily be repolished so as to correct perfectly the aberration. The instrument is at present in his hands, but will be remounted as soon as possible.

A photographic barograph, thermograph, and electrograph are in course of construction at London and Glasgow for the observatory at Zi-Ka-Wei, and will be despatched to their destination when they have been duly tested.

The work on hand for the Manila Observatory has been delayed on account of difficulty of intercourse.

S. J. PERRY.

Stonyhurst Observatory.

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

METEOROLOGICAL REPORT.

January, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·304	29·402
Highest ,, on the 22nd	30·125	29·997
Lowest ,, on the 1st	28·320	28·536
Range of Barometer Readings	1·805	1·461
Highest Reading of a Max. Therm. on the 7th	59·9	51·8
Lowest Reading of a Min. Therm. on the 1st	24·1	21·1
Range of Thermometer Readings	35·8	30·7
Mean of all the Highest Readings	44·4	42·4
Mean of all the Lowest	35·2	33·2
Mean Daily Range	9·2	9·2
Deduced Monthly Mean (from Mean of Max. and Min.)	39·6	37·6
Mean Temperature from dry bulb	40·9	37·8
Adopted Mean Temperature	40·3	37·7
Mean Temperature of Evaporation	38·7	36·3
Mean Temperature of Dew Point	36·7	34·4
Mean elastic force of Vapour	0·217 in	0·200 in
Mean weight of Vapour in a cubic foot of air	2·5gr	2·3gr
Mean additional weight required for saturation	0·4gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·88	0·86
Mean weight of a cubic foot of air	543·1gr	547·8gr
Fall of Rain	6·095 in	4·238 in
Number of days on which Rain fell	23	21·2
Amount of Evaporation		0·830 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	0	4	2	1	3	10	11	0
Mean Velocity in miles per hour	0	5·8	12·6	3·5	20·8	12·4	15·3	0
Total No. of miles for each Direction	0	560	605	85	1496	2983	4034	0

The total number of miles registered during the month was 9763.

The max. Velocity of the wind was 44 miles per hour; direction S. on the 25th at 5 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)... 8·2

In the month of January, the highest reading of the Barometer during 30 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 mean reading of the Barometer is low, and the extreme range in excess of previous years. The range of temperature and the mean for the month are above the average. The Rainfall is nearly two inches in excess of the mean for the last thirty years. Prevalent wind W.S.W.

There was frost on the 1st, 2nd, 3rd, 5th, 11th, 12th, 13th, 19th, 20th, 22nd, 24th, 25th, 26th, 27th, 28th, and 30th. Snow fell on the 3rd, 4th, and 13th; hail on the 19th, 24th, 28th, and 30th. Fog prevailed on the 17th.

February, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·418	29·490
Highest ,, on the 28th	29·941	30·086
Lowest ,, on the 25th	28·826	28·674
Range of Barometer Readings	1·115	1·412
Highest Reading of a Max. Therm. on the 8th	58·3	51·4
Lowest Reading of a Min. Therm. on the 28th	13·9	22·5
Range of Thermometer Readings	44·4	28·9
Mean of all the Highest Readings	47·3	44·1
Mean of all the Lowest	35·9	33·9
Mean Daily Range	11·4	10·2
Deduced Monthly Mean (from Mean of Max. and Min.)	41·2	38·6
Mean Temperature from dry bulb	42·7	38·7
Adopted Mean Temperature	42·0	38·7
Mean Temperature of Evaporation	40·3	36·7
Mean Temperature of Dew Point	38·2	34·9
Mean elastic force of Vapour	0·231 in	0·198 in
Mean weight of Vapour in a cubic foot of air	2·7 gr	2·4 gr
Mean additional weight required for saturation	0·4 gr	0·4 gr
Mean degree of Humidity (saturation 1·00)	0·87	0·87
Mean weight of a cubic foot of air	543·2 gr	548·4 gr
Fall of Rain	5·363 in	3·773 in
Number of days on which Rain fell	22	17·7
Amount of Evaporation		0·830 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	2	0	0	0	1	6	14	5
Mean Velocity in miles per hour	9·5	0	0	0	21·4	13·2	16·9	10·5
Total No. of miles for each Direction	454	0	0	0	514	1900	5689	1264

The total number of miles registered during the month was 9821.

The max. Velocity of the wind was 36 miles per hour; direction W. on the 12th at 2 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	7·9
In the month of February, the highest reading of the Barometer during 30 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 mean Barometer for this month agrees very closely with that for the last thirty years, and the range is small. The temperature varied very much; but the mean only slightly. The Rainfall and number of rainy days are both considerably in excess. W. wind prevailed.

There was frost on the 1st, 2nd, 4th, and from the 18th to the 28th, both inclusive. Snow fell on the 22nd and 25th; hail on the 3rd, 19th, and 27th, and sleet on the 22nd. Fog prevailed on the 14th.

March, 1877.

Results of bservations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·288	29·447
Highest ,, on the 1st	29·914	30·061
Lowest ,, on the 25th	28·516	28·691
Range of Barometer Readings	1·398	1·370
Highest Reading of a Max. Therm. on the 28th	53·2	56·5
Lowest Reading of a Min. Therm. on the 1st	20·5	23·2
Range of Thermometer Readings	32·7	33·3
Mean of all the Highest Readings	46·9	46·8
Mean of all the Lowest	32·6	34·5
Mean Daily Range	14·3	12·3
Deduced Monthly Mean (from Mean of Max. and Min.)	38·8	39·7
Mean Temperature from dry bulb	39·5	40·1
Adopted Mean Temperature	39·2	39·9
Mean Temperature of Evaporation	37·5	38·0
Mean Temperature of Dew Point	35·3	35·6
Mean elastic force of Vapour	0·207 in	0·206 in
Mean weight of Vapour in a cubic foot of air	2·38gr	2·4gr
Mean additional weight required for saturation	0·4gr	0·5gr
Mean degree of Humidity (saturation 1·00)	0·86	0·85
Mean weight of a cubic foot of air	544·0gr	546·2gr
Fall of Rain	4·374 in	3·168 in
Number of days on which Rain fell	20	18·2
Amount of Evaporation		1·683 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	2	5	2	0	1	2	12	7
Mean Velocity in miles per hour	2·9	5·1	15·5	0	8·0	7·4	14·9	9·8
Total No. of miles for each direction	140	611	745	0	193	355	4286	1648

The total number of miles registered during the month was 7978.

The max. Velocity of the wind was 40 miles per hour; direction N. on the 7th at 2 and 3 p.m.; W. on the 14th at 1 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...				8·1
In the month of March, the highest reading of the Barometer during 30 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

The mean Barometer is rather low, but the range Barometer and Thermometer, and the mean temperature, agree very closely with the average for the thirty years preceding. The Rainfall is still large, and wind W. by N.

There was frost from the 1st to the 10th, from the 15th to the 23rd, and from the 26th to the 29th. Snow fell on the 5th, 7th, and 9th; hail on the 16th and 18th; and sleet on the 16th and 24th. Fog prevailed on the 2nd and 26th. A lunar halo was seen on the 20th, and a solar halo on the 21st. There was hoar-frost on the 20th, and soft hail on the 16th.

April, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·352	29·490
Highest ,, on the 30th	29·898	29·968
Lowest ,, on the 4th	28·521	28·771
Range of Barometer Readings	1·397	1·197
Highest Reading of a Max. Therm. on the 22nd	57·0	67·3
Lowest Reading of a Min. Therm. on the 19th	28·0	28·9
Range of Thermometer Readings	29·0	38·4
Mean of all the Highest Readings	50·9	54·1
Mean of all the Lowest	36·4	38·4
Mean Daily Range	14·5	15·7
Deduced Monthly Mean (from Mean of Max. and Min.)	42·2	44·8
Mean Temperature from dry bulb	43·2	44·8
Adopted Mean Temperature	42·7	44·8
Mean Temperature of Evaporation	40·2	42·0
Mean Temperature of Dew Point	37·2	38·9
Mean elastic force of Vapour	0·222 in	0·238 in
Mean weight of Vapour in a cubic foot of air	2·6gr	2·7gr
Mean additional weight required for saturation	0·6gr	0·7gr
Mean degree of Humidity (saturation 1·00)	0·82	0·80
Mean weight of a cubic foot of air	541·6gr	541·3gr
Fall of Rain	2·757 in	2·406 in
Number of days on which Rain fell	17	15·4
Amount of Evaporation		2·705 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	1	7	12	1	4	2	3	0
Mean Velocity in miles per hour	3·1	8·0	10·6	13·9	8·4	6·2	10·1	0
Total No. of miles for each Direction	74	1349	4052	333	809	296	730	0

The total number of miles registered during the month was 7643.

The max. Velocity of the wind was 37 miles per hour; direction E. on the 16th at 6 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·4
In the month of April, the highest reading of the Barometer during 30 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

The results for this month would fairly represent a correct average for April.

There was frost on the 6th, 11th, 17th, 19th, 24th, and 30th. A thunder-storm occurred on the 6th; thunder was heard on the 4th, 5th, and 6th, and lightning seen on the 23rd. Heavy rain fell on the 19th and 21st. Swallows arrived on the 24th.

May, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·452	29·526
Highest ,, on the 1st	30·000	29·946
Lowest ,, on the 28th	28·559	28·965
Range of Barometer Readings	1·441	0·981
Highest Reading of a Max. Therm. on the 31st	68·1	72·1
Lowest Reading of a Min. Therm. on the 3rd	23·7	31·3
Range of Thermometer Readings	44·4	40·8
Mean of all the Highest Readings	56·3	59·6
Mean of all the Lowest	39·3	42·3
Mean Daily Range	17·0	17·3
Deduced Monthly Mean (from Mean of Max. and Min.)	46·1	49·3
Mean Temperature from dry bulb	46·7	49·6
Adopted Mean Temperature	46·4	49·5
Mean Temperature of Evaporation	43·4	46·3
Mean Temperature of Dew Point	40·0	42·9
Mean elastic force of Vapour	0·248 in	0·277 in
Mean weight of Vapour in a cubic foot of air	2·9gr	3·2gr
Mean additional weight required for saturation	0·8gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·79	0·76
Mean weight of a cubic foot of air	539·0gr	536·9gr
Fall of Rain	2·773 in	2·393 in
Number of days on which Rain fell	13	15·1
Amount of Evaporation	1·995 in	3·604 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	11	8	1	0	5	4	0
Mean Velocity in miles per hour	0	9·2	7·8	5·7	0	14·2	8·5	0
Total No. of miles for each Direction	0	2431	1501	136	0	1698	821	0

The total number of miles registered during the month was 6587.

The max. Velocity of the wind was 36 miles per hour; direction S.W. on the 28th at 11 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·5
In the month of May, the highest reading of the Barometer during 30 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 mean Barometer agrees closely with that of previous years, but the range is large. For the Thermometer the range is high, and the mean low.

There was frost from the 2nd to the 7th, and on the 23rd; a thunder-storm occurred on the 16th; hoar-frost on the 4th. The cuckoo was first heard on the 2nd; the corn-crake on the 15th; and the swift first seen on the 4th.

June, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·561	29·529
Highest ,, on the 16th	29·832	29·904
Lowest ,, on the 1st	28·834	29·010
Range of Barometer Readings	0·998	0·894
Highest Reading of a Max. Therm. on the 19th	80·0	76·8
Lowest Reading of a Min. Therm. on the 23rd	38·2	39·1
Range of Thermometer Readings	41·8	37·7
Mean of all the Highest Readings	66·7	65·2
Mean of all the Lowest	48·0	48·1
Mean Daily Range	18·7	17·1
Deduced Monthly Mean (from Mean of Max. and Min.)	55·6	54·9
Mean Temperature from dry bulb	56·5	54·7
Adopted Mean Temperature	56·1	54·8
Mean Temperature of Evaporation	51·9	52·2
Mean Temperature of Dew Point	47·9	49·0
Mean elastic force of Vapour	0·336 in	0·358 in
Mean weight of Vapour in a cubic foot of air	3·8gr	3·9gr
Mean additional weight required for saturation	1·2gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·74	0·79
Mean weight of a cubic foot of air	530·3gr	531·0gr
Fall of Rain	2·876 in	3·729 in
Number of Days on which Rain fell	15	17·3
Amount of Evaporation	3·398 in	3·807 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	2	7	1	2	7	7	4	0
Mean Velocity in miles per hour	6·5	9·1	6·5	12·6	16·4	11·9	10·6	0
Total No. of miles for each Direction	310	1537	156	606	2763	1993	1019	0

The total number of miles registered during the month was 8384.

The max. Velocity of the wind was 40 miles per hour; direction S. on the 5th at 8 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·6
In the month of June, the highest reading of the Barometer during 30 years, was on the 15th, in 1874, and was			30·219
The lowest	,,	12th, 1862	28·632
The highest Temperature	,,	28th, 1857	84·6
The lowest	,,	30th, 1856	34·2
The highest adopted mean temperature of the month, 1858			59·0
The lowest	,,	1856 and 1860	52·2

Both Barometer and Thermometer are rather high, and Rainfall low, although heavy rain fell on the 1st, 2nd, and 26th. There was heavy dew on the 4th.

July, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·425	29·512
Highest ,, on the 30th	29·841	29·881
Lowest ,, on the 15th	28·564	29·002
Range of Barometer Readings	1·277	0·879
Highest Reading of a Max. Therm. on the 30th	72·0	78·8
Lowest Reading of a Min. Therm. on the 7th	40·2	42·0
Range of Thermometer Readings	31·8	36·8
Mean of all the Highest Readings	65·5	68·1
Mean of all the Lowest	49·3	49·9
Mean Daily Range	16·2	18·2
Deduced Monthly Mean (from Mean of Max. and Min.)	55·5	57·1
Mean Temperature from dry bulb	56·3	58·1
Adopted Mean Temperature	55·9	57·6
Mean Temperature of Evaporation	53·4	55·1
Mean Temperature of Dew Point	51·1	52·6
Mean elastic force of Vapour	0·377 in	0·397 in
Mean weight of Vapour in a cubic foot of air	4·2gr	4·5gr
Mean additional weight required for saturation	0·8gr	1·0gr
Mean degree of Humidity (saturation 1·00)	0·85	0·82
Mean weight of a cubic foot of air	527·7gr	527·1gr
Fall of Rain	4·959 in	4·032 in
Number of days on which Rain fell	22	17·2
Amount of Evaporation	5·014 in	4·138 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	0	0	0	5	16	9	1
Mean Velocity in miles per hour	0	0	0	0	13·7	11·2	10·1	6·7
Total No. of miles for each Direction	0	0	0	0	1649	4304	2174	161

The total number of miles registered during the month was 8288.

The max. Velocity of the wind was 34 miles per hour; direction S.E. by S. on the 16th, at 1 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	9·1
In the month of July, the highest reading of the Barometer during 30 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 Rainfall for the month is almost an inch in excess of previous years, and rain fell on more days than usual.

It is remarkable that during the whole of the month the wind came from the western and never from the eastern half of the compass. In July last year the the wind only blew on one day from the eastern half.

There was a thunder-storm on the 7th, and thunder was heard on the 6th. Heavy rain fell on the 9th, 14th, 15th, and 23rd, and hail on the 7th.

August, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·397	29·495
Highest ,, on the 12th	29·710	29·889
Lowest ,, on the 8th	28·901	28·958
Range of Barometer Readings	0·809	0·931
Highest Reading of a Max. Therm. on the 5th	74·1	77·1
Lowest Reading of a Min. Therm. on the 23rd	41·3	41·4
Range of Thermometer Readings	32·8	35·7
Mean of all the Highest Readings	65·8	67·2
Mean of all the Lowest	51·3	50·9
Mean Daily Range	14·5	16·3
Deduced Monthly Mean (from Mean of Max. and Min.)	56·9	57·4
Mean Temperature from dry bulb	57·6	57·5
Adopted Mean Temperature	57·3	57·5
Mean Temperature of Evaporation	54·6	54·7
Mean Temperature of Dew Point	52·2	52·2
Mean elastic force of Vapour	0·391 in	0·393 in
Mean weight of Vapour in a cubic foot of air	4·4gr	4·3gr
Mean additional weight required for saturation	0·9gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·83	0·83
Mean weight of a cubic foot of air	525·7gr	527·3gr
Fall of Rain	6·657 in	4·828 in
Number of days on which Rain fell	24	19·6
Amount of Evaporation	3·564 in	3·434 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	5	7	7	4	8	0	0
Mean Velocity in miles per hour	0	4·2	6·7	7·9	10·4	13·8	0	0
Total No. of miles for each Direction	0	498	1126	1328	996	2651	0	0

The total number of miles registered during the month was 6599.

The max. Velocity of the wind was 30 miles per hour; direction S.W. on the 21st, at 1 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	8·9
In the month of August, the highest reading of the Barometer during 30 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 mean Barometer and range are only slightly below the average, but the Rainfall and number of rainy days are both greatly in excess of former years.

There was a thunder-storm on the 21st, and thunder was heard and lightning seen on the 8th. Heavy rain fell on the 7th, 8th, 18th, 21st, 22nd, and 31st. Fog prevailed on the 15th.

September, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·661	29·504
Highest ,, on the 17th	30·048	30·045
Lowest ,, on the 11th	29·160	28·863
Range of Barometer Readings	0·888	1·182
Highest Reading of a Max. Therm. on the 15th	68·2	72·1
Lowest Reading of a Min. Therm. on the 21st	33·9	36·8
Range of Thermometer Readings	34·3	35·3
Mean of all the Highest Readings	60·3	62·2
Mean of all the Lowest	44·1	47·1
Mean Daily Range	16·2	15·1
Deduced Monthly Mean (from Mean of Max. and Min.)	50·9	53·4
Mean Temperature from dry bulb	51·8	54·0
Adopted Mean Temperature	51·4	53·7
Mean Temperature of Evaporation	48·3	51·1
Mean Temperature of Dew Point	45·1	48·5
Mean elastic force of Vapour	0·302 in	0·342 in
Mean weight of Vapour in a cubic foot of air	3·4gr	3·9gr
Mean additional weight required for saturation	0·9gr	0·8gr
Mean degree of Humidity (saturation 1·00)	0·79	0·82
Mean weight of a cubic foot of air	537·6gr	531·6gr
Fall of Rain	4·482 in	4·625 in
Number of days on which Rain fell	16	18·6
Amount of Evaporation		2·284 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	4	7	1	1	2	7	3	5
Mean Velocity in miles per hour	6·8	5·5	8·5	13·9	11·7	10·7	6·6	5·7
Total No. of miles for each Direction	650	927	203	334	560	1795	476	684

The total number of miles registered during the month was 5629.

The max. Velocity of the wind was 35 miles per hour; direction S.W. on the 14th, at 8 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			6·3
In the month of September, the highest reading of the Barometer during 30 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

This is the second month of the year in which the Rainfall is not above the average.

Lightning was seen on the first. Heavy rain fell on the 2nd, and hail on the 21st. Fog prevailed on the 19th, 25th, 26th, 27th, and 28th.

October, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·494	29·405
Highest ,, on the 6th	30·282	29·985
Lowest ,, on the 23rd	28·848	28·657
Range of Barometer Readings	1·434	1·328
Highest Reading of a Max. Therm. on the 14th	67·0	64·6
Lowest Reading of a Min. Therm. on the 17th	27·4	30·0
Range of Thermometer Readings	39·6	34·6
Mean of all the Highest Readings	53·3	54·7
Mean of all the Lowest	40·3	42·4
Mean Daily Range	13·0	12·3
Deduced Monthly Mean (from Mean of Max. and Min.)	45·8	47·6
Mean Temperature from dry bulb	47·9	48·2
Adopted Mean Temperature	46·9	47·9
Mean Temperature of Evaporation	44·6	45·7
Mean Temperature of Dew Point	42·0	43·3
Mean elastic force of Vapour	0·267 in	0·283 in
Mean weight of Vapour in a cubic foot of air	3·0gr	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	539·1gr	536·1gr
Fall of Rain	6·514 in	5·405 in
Number of days on which Rain fell	21	21·6
Amount of Evaporation	1·635 in	1·595 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	5	0	1	5	10	7	3
Mean Velocity in miles per hour	0	3·5	0	5·1	15·5	13·8	14·9	10·3
Total No. of miles for each Direction	0	420	0	122	1813	3303	2498	744

The total number of miles registered during the month was 8900.

The max. Velocity of the wind was 52 miles per hour; direction S. on the 15th at 2 and 3 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			6·3
In the month of October, the highest reading of the Barometer during 30 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

The mean Barometer and the range are both higher than usual, but the Rainfall is very heavy.

There was a thunder-storm on the 15th, and lightning was seen on the 13th, 27th, and 28th. Heavy rain fell on the 13th and 22nd, and hail on the 11th, 15th, and 22nd. Fog prevailed on the 4th, 6th, 7th, and 18th, and frost on the 8th, 16th, and 17th.

November, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·106	29·449
Highest ,, on the 17th	29·944	30·056
Lowest ,, on the 11th	28·088	28·584
Range of Barometer Readings	1·856	1·472
Highest Reading of a Max. Therm. on the 15th	58·2	55·5
Lowest Reading of a Min. Therm. on the 24th	28·8	25·5
Range of Thermometer Readings	29·4	30·0
Mean of all the Highest Readings	50·1	46·9
Mean of all the Lowest	38·7	36·3
Mean Daily Range	11·4	10·6
Deduced Monthly Mean (from Mean of Max. and Min.)	44·0	41·2
Mean Temperature from dry bulb	44·4	41·3
Adopted Mean Temperature	44·2	41·3
Mean Temperature of Evaporation	42·5	38·9
Mean Temperature of Dew Point	40·5	37·7
Mean elastic force of Vapour	0·252 in	0·226 in
Mean weight of Vapour in a cubic foot of air	2·9gr	2·6gr
Mean additional weight required for saturation	0·4gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·87	0·87
Mean weight of a cubic foot of air	534·9gr	543·7gr
Fall of Rain	6·447 in	4·078 in
Number of days on which Rain fell	25	19·2
Amount of Evaporation	1·267 in	1·299 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	1	0	0	7	14	7	1
Mean Velocity in miles per hour	0	6·6	0	0	19·8	11·2	17·3	5·0
Total No. of miles for each Direction	0	158	0	0	3318	3745	2910	120

The total number of miles registered during the month was 10251.

The max. Velocity of the wind was 54 miles per hour; direction S. on the 11th at 6 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	8·3
In the month of November, the highest reading of the Barometer during 30 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

The mean Barometer is very much below the average, and the range greater than usual. The mean Temperature is high. The Rainfall is nearly two and a half inches above the mean value, and the number of days on which rain fell is large. The wind was from the western half of the compass on all days except one; the prevalent direction was S.W. by S., or rather nearer S.W.

Thunder was heard on the 22nd and 23rd, and lightning seen on the 9th, 13th, and 22nd; a solar halo on the 7th, and lunar halos on the 15th, 18th, and 20th. Heavy rain fell on the 6th, 9th, and 23rd, and hail on the 19th, 22nd, and 26th. Fog prevailed on the 24th, 26th, and 28th. There was hoar-frost on the 4th, and frost on the 13th, 20th, 23rd, 24th, 25th, 27th, and 28th.

December, 1877.

Results of Observations taken during the month.		Mean for the last 30 years.
Mean Reading of the Barometer	29·528	29·443
Highest ,, on the 19th	30·226	30·051
Lowest ,, on the 1st	28·756	28·602
Range of Barometer Readings	1·470	1·449
Highest Reading of a Max. Therm. on the 6th	50·5	52·9
Lowest Reading of a Min. Therm. on the 26th	25·0	20·7
Range of Thermometer Readings	25·5	32·2
Mean of all the Highest Readings	45·1	43·4
Mean of all the Lowest	34·9	33·9
Mean Daily Range	10·2	9·5
Deduced Monthly Mean (from Mean of Max. and Min.)	40·0	38·7
Mean Temperature from dry bulb	40·6	39·3
Adopted Mean Temperature	40·3	39·0
Mean Temperature of Evaporation	38·9	37·9
Mean Temperature of Dew Point	37·1	36·0
Mean elastic force of Vapour	0·221 in	0·213 in
Mean weight of Vapour in a cubic foot of air	2·6gr	2·5gr
Mean additional weight required for saturation	0·4gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·89	0·88
Mean weight of a cubic foot of air	547·2gr	546·8gr
Fall of Rain	6·644 in	4·511 in
Number of days on which Rain fell	28	20·6
Amount of Evaporation		0·910 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	1	4	0	1	3	7	15	0
Mean Velocity in miles per hour	3·1	5·5	0	23·1	10·3	13·6	10·7	0
Total No. of miles for each Direction	74	527	0	554	727	2284	3861	0

The total number of miles registered during the month was 8027.

The max. Velocity of the wind was 40 miles per hour; direction W. on the 24th at noon.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	7·7
In the month of December, the highest reading of the Barometer during 30 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 ,, ,, 1874	31·0

The range of Temperature for the month is low. Rain fell on almost every day of the month, and the total amount is more than two inches above the usually heavy fall for December. The greatest fall was on the 6th.

There was frost on the 7th, 8th, 10th, 12th, 13th, 14th, 17th, 19th, 20th, 22nd, 24th, 25th, 26th, 27th, 28th, 30th, and 31st, and hoar-frost on the 14th. A thunder-storm occurred on the 14th. Snow fell on the 25th, 26th, and 27th; hail on 7th, 13th, and 14th; and sleet on the 13th. Fog prevailed on the 1st, 18th, 19th, 20th, 21st, and 29th.

Summary of the Observations

FOR 1877.

		Mean for the last 30 years.
Mean Reading of the Barometer	29·416	29·478
Highest ,, on October 6th	30·282	30·280
Lowest ,, on November 11th	28·088	28·266
Range of Barometer Readings	2·194	2·014
Highest Reading of a Max. Therm. on June 19th	80·0	81·7
Lowest Reading of a Min. Therm. on February 28th	13·9	16·0
Range of Thermometer Readings	66·1	65·7
Mean of all the Highest Readings	54·4	54·7
Mean of all the Lowest	40·5	41·0
Mean Daily Range	13·9	13·7
Deduced Yearly Mean (from Mean of Max. and Min.)	46·4	46·8
Mean Temperature of dry bulb	47·3	47·0
Adopted Mean Temperature	46·9	47·0
Mean Temperature of Evaporation	44·5	44·7
Mean Temperature of Dew Point	42·9	42·2
Mean elastic force of Vapour	0·273 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)	0·84	0·84
Mean weight of a cubic foot of air	537·8gr	538·7gr
Total Fall of Rain in the Year	59·941 in	47·333 in
Number of days per Month on which Rain fell	20·5	18·5
Amount of Evaporation		27·241 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	3·357 in
The least ,, ,, May, 1853, and May, 1859	0·3
The greatest number of days on which rain fell in one month } July, 1861, December, 1868	31
The least ,, ,, March, 1852	3

The principal feature of the year is the continuous downpour of rain. The total is 13 inches in excess of the average for the last 30 years. With the exception of July and August the six summer months do not show a Rainfall above that of former years, but the fall in each of the winter months has been remarkably heavy, especially at the close of the year. The following table, giving the excess above the average for each month, will give a clear idea of the distribution of the extra Rainfall throughout the year :—

	in.		in.
January	+1·921	July	+0·962
February	+1·645	August	+1·892
March	+1·248	September	−0·131
April	+0·363	October	+1·151
May	+0·193	November	+2·450
June	−0·538	December	+2·223

The total fall for the year has only been surpassed twice during the last thirty years, viz., in 1866 and 1872, when it reached respectively 61·6 in. and 60·5 in. The lowest yearly Rainfall during the same period was 35·6 in. in 1855.

AGRICULTURAL NOTES.

JANUARY.—Owing to the great amount of rain during the month farming operations have been almost entirely suspended. Very little has been done in the way of tillage.

FEBRUARY.—This month has been mild and wet. A little ploughing for oats about the 10th, but this was soon stopped by the rain. Cattle are healthy. An abundant supply of fresh grass has enabled farmers to keep their cattle out of doors up to the end of the month.

MARCH.—Still very wet. Gardeners complain that things are looking too forward, and fear that late frost may spoil the fruit. Ploughing for oats has been continued during this month, and some oats were sown about the 17th. Green crops not as yet in ground.

APRIL.—The frost on the 19th has nipped the buds of the fruit trees, and it is probable that there will be a very light crop of stone fruit. Oat sowing was finished about the second week of this month. Most green crops in ground towards the end of the month.

MAY.—The commencement of the month was cold and frosty; it was wet in the middle and again at the end. Fruit trees look very unpromising. Everything is late. The last of the green crops were in the ground early in the month. Grass looks very well, but everything else wintery.

JUNE.—Grass cut on the 18th, and a little got in. The rain at the end of the month stopped hay-making. Stone-fruit, with the exception of cherries, which are only a light crop, is a total failure. There are no plums, peaches, or apricots. Gooseberries appear in most places to be a little below the average amount. It is hoped that black currants and strawberries will be plentiful.

JULY.—This month has been very wet, with very little sun. Scarcely any hay has been got in as yet. A few early potatoes were taken up about the 17th. They are small; but as yet there is no sign of disease among them. Peas look very poor from want of sun. Apples and pears very small and very few in number. Strawberries are rotting from constant wet, and although the prospect was excellent at first, there are now very few fit for eating. Black currants are about the average.

AUGUST.—The wet interferes very much with farming operations generally. A large quantity of hay is still out. No wheat or oats have been cut as yet. Both look very poor from wet and cold.

SEPTEMBER.—This month has on the whole been more favourable. The last of the hay was housed in the second week. This crop is a very heavy one, and although it has been out so long it is not much spoiled. Wheat and oats were stacked about the middle of the month. Both are very light crops.

OCTOBER.—This month has been very wet and stormy. Most of the green crops were carted by the middle of the month. Potatoes very poor, very small, and generally much diseased. Turnips are small, but otherwise good, and about the average quantity.

NOVEMBER.—Ploughing in preparation for wheat commenced about the middle of the month. Wheat sown about the 20th under very unfavourable circumstances, the ground being very moist from long-continued rain.

DECEMBER.—The rain has quite stopped all agricultural operations. Ground too soft for tillage.

OBSERVATIONS OF CROPS AND FLOWERS IN 1877.

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. 20th	July	July	Sep. 17th	Potatoes	Ap. 20th	May 18th	Oct. 20th	Anemone	Ap. 7th
Oats	Mar. 15th	July	July	Sep. 17th	Turnips.	Ap. 20th	May 7th	Oct. 25th	Wild Hyacinth	Ap. 15th
Beans	Mar. 15th	May 31st		July 19th	Swedes	April	May 10th	Oct. 26th	Daisy	Mar. 20th
Peas	Mar. 16th	May 30th		June 28th	Beet	Ap. 20th	June 1st	Oct. 20-30	Renunculus	Ap. 5th
					Mangel	Ap. 20th	May 18th	Oct. 25th	Meadow Sweet	Ap. 27th
					Onions	March	Ap. 20th	Sep. 10th	Snowdrop	Jan. 20th
									Crocus	Feb. 14th
									Polyanthus	Feb. 16th
									Daffodil	Mar. 14th

OBSERVATIONS OF TREES AND SHRUBS IN 1877.

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	Ap. 1st	Ap. 25th	Oct. 13th	Apple	May 14th	Aug. 8th	Lilac	May 20th	Oct. 25th
Oak	Ap. 20th	May 8th	Oct. 25th	Pear	Mar. 20th	Aug. 1st	Privet	May 5th	Oct. 20th
Lime	Ap. 12th	Ap. 20th	Oct. 12th	Cherry	Mar. 20th	July 12th	Honeysuckle	July 23rd	Oct. 20th
Sycamore	Ap. 1st	Ap. 17th	Oct. 13th	Peach	Mar. 20th	none	Mountain Ash	May 27th	Oct. 25th
Horse Chesnut	Ap. 4th	Ap. 12th	Oct. 13th	Plum	Ap. 3rd	none	Syringa	May 26th	Oct. 31st
Occidental Plane	Ap. 6th	Ap. 21st	Oct. 15th	Red Currant	Ap. 22nd	July 18th	Laburnum	June 2nd	Nov. 1st
Oriental Plane	Ap. 6th	Ap. 21st	Oct. 15th	Black Currant	Ap. 25th	July 18th	Red Flowering Currant	Feb. 19th	Nov. 1st
Hawthorn	Mar. 20th	Mar. 29th	Nov. 1st	White Currant	Ap. 22nd	July 18th			
Hazel	Mar. 24th	Ap. 16th	Oct. 15th	Strawberry	May 28th	July 5th			
Ash	May 8th	May 30th	Oct. 15th	Gooseberry	Ap. 1st	Aug. 25th			
Beech	Ap. 12th	Ap. 29th	Nov. 1st	Apricot	Mar. 16th	none			

OBSERVATIONS OF UPPER CLOUDS (CIRRUS).

Date.	G. M. T.	Cloud Direction.	Wind Direction.	Wind Force 0—12
January 23	1 p.m.	N.N.W.	S.	2
,, 24	10 a.m.	W.	W.	3
,, ,,	Noon.	S.W.	W.	3
February 9	10 a.m.	W.	W.	2
,, ,,	Noon.	W.	W.	2
,, 23	10 a.m.	W.	N.W.	3
,, ,,	2 p.m.	W.	N.	1
,, 26	8 a.m.	W.	N.	1
,, 28	8 a.m.	N.W.	N.W.	0
,, ,,	10 a.m.	W.	N.	0
,, ,,	4 p.m.	W.	N.W.	0
March 1	8 a.m.	N.N.E.	N.	0
,, 6	10.30 a.m.	N.W.	N.W.	2
,, 20	8 a.m.	S.S.W.	N.	0
,, ,,	9 a.m.	S.S.W.	N.	0
,, ,,	3.30 p.m.	S.W.	N.E.	1
,, ,,	4 p.m.	S.W.	E.	2
,, 30	5.30 p.m.	N.N.W.	N.E.	1
April 5	5.30 p.m.	S.S.W.	S.	0
,, 7	3 p.m.	S.W.	S.	2
,, 10	4 p.m.	S. by W.	W.	1
,, ,,	6 p.m.	S. by W.	N.W.	1
,, 12	8.30 a.m.	W. by S.	E.	0
,, 16	2.30 p.m.	E.N.E.	E.	5
,, ,,	3.30 p.m.	E.	E.	6
,, ,,	4 p.m.	E.	E.	6
,, ,,	6 p.m.	E.	E.	7
,, ,,	7 p.m.	E.	E.	5
,, 17	3.30 p.m.	E.	E.	4
,, ,,	4 p.m.	E.S.E.	E.	4
,, 27	3 p.m.	W.	E.	4
May 2	6.30 p.m.	W.	N.W.	2
,, 6	7 p.m.	W.S.W.	S.W.	0
,, 8	3 p.m.	S.S.W.	S.E.	3
,, ,,	4 p.m.	S.S.W.	E.	3
,, ,,	6 p.m.	S.S.W.	E.	2
,, 15	4 p.m.	S.E. by S.	S.E.	1
,, 16	Noon.	S.W.	S.E.	2
,, 20	9 a.m.	N.N.E.	N.E.	3
,, 21	6 a.m.	E.N.E.	N.E.	0
,, 24	10 a.m.	N.	E.	1
,, 26	8 a.m.	N.W.	W.	1
,, ,,	7 p.m.	N.W.	W.	1

OBSERVATIONS OF UPPER CLOUDS (*Continued*).

Date.	G. M. T.	Cloud Direction.	Wind. Direction.	Force 0—12.
May 28	10 a.m.	S.W.	W.	3
,, 29	3 p.m.	W.S.W.	S.W.	4
,, ,,	4 p.m.	W.S.W.	S.W.	4
,, 30	1 p.m.	S.W. by S.	S.W.	4
,, 31	6 a.m.	S.S.W.	N.	0
,, ,,	8.30 a.m.	S.S.W.	E.	1
June 8	6 a.m.	W.	S.W.	1
,, 10	3 p.m.	W.S.W.	S.W.	1
,, ,,	8 p.m.	W.	S.	3
,, 11	10 a.m.	N.W.	S.W.	2
,, 14	Noon.	E.S.E.	E.	2
,, ,,	2 p.m.	S.E.	E.	1
,, 19	6 a.m.	W.	N.	2
,, ,,	7.30 p.m.	W. by S.	N.	1
,, 21	Noon.	S.W.	N.	1
,, ,,	4 p.m.	S.W.	S.E.	2
,, 23	6 p.m.	N.N.W.	W.	3
,, 24	8 a.m.	N.N.W.	W.	2
,, ,,	6 p.m.	W.	N.W.	1
,, 27	11 a.m.	W.	W.	4
,, 28	9 a.m.	N.W.	S.W.	2
,, ,,	Noon.	N. by W.	S.W.	2
,, 30	8.30 a.m.	W.S.W.	S.W.	1
,, ,,	Noon.	W.S.W.	S.W.	1
July 3	10 a.m.	S.W.	S.W.	2
,, 4	11.30 a.m.	W.S.W.	S.W.	3
,, 5	11.30 a.m.	S.W.	W.	1
,, 6	9.30 a.m.	W.	W.	0
,, 7	9 a.m.	N.N.W.	W.	3
,, 11	5 p.m.	W. by S.	W.	3
,, 26	8.11 a.m.	W.	W.	3
,, 27	8.30 a.m.	W.	W.	2
August 24	6 p.m.	W.	S.W.	3
,, 30	6 p.m.	W.	S.W.	3
September 18	8.30 a.m.	N.E.	S.W.	1
,, 19	5 p.m.	N.N.W.	W.	1
,, 20	9 a.m.	N.N.E.	N.E.	1
,, 21	8 a.m.	N.N.E.	N.	1
,, 22	8 a.m.	N.E. by E.	W.	0
,, 24	2 p.m.	N. by W.	N.E.	1
,, 26	1 p.m.	N.W. by N.	S.	0
October 1	8 a.m.	N.N.W.	N.E.	0
,, 2	2 p.m.	W.N.W.	S.W.	1

OBSERVATIONS OF UPPER CLOUDS (*Continued*).

Date.	G. M. T.	Cloud Direction.	Wind. Direction.	Wind. Force 0—12.
October 5	9 a.m.	N.N.E.	N.	1
,, ,,	10 a.m.	N.W. by N.	N.	0
,, ,,	12.30 p.m.	N.W.	S.E.	1
,, 7	4 p.m.	N.	W.	2
,, 9	3 p.m.	N.W. by W.	W.	1
,, ,,	5 p.m.	N.W.	W.	1
,, 11	3 p.m.	W.	W.	6
,, 12	11 a.m.	W.	W.	4
,, ,,	3 p.m.	W.	W.	3
,, 13	2 p.m.	S.W.	S.W.	6
,, 14	10 a.m.	S.W.	S.	3
,, 17	1 p.m.	N.N.W.	N.W.	3
,, 18	Noon.	N.W.	S.W.	1
November 13	9 a.m.	N.N.W.	S.W.	1
,, ,,	11 a.m.	N.N.W.	S.W.	2
,, 15	10 a.m.	W.	S.	1
,, ,,	2 p.m.	N.W.	S.W.	0
,, 17	8 a.m.	W.S.W.	S.W.	1
,, ,,	9 a.m.	W.S.W.	S.W.	1
,, 25	1.30 p.m.	N.W.	N.N.W.	2
December 14	10 a.m.	W.N.W.	W.	0
,, 18	11.30 a.m.	N. by W.	S.W.	3
,, ,,	Noon.	N. by W.	S.W.	3
,, ,,	2 p.m.	N. by W.	S.W.	3
,, 29	2 p.m.	W.	S.W.	3

BAROMETER READINGS.

HOURS OF MAXIMA AND MINIMA.

THE following tables* are formed from the absolute maxima and minima of the hourly readings of the Barometer, and the observations extend over the same eight years as the corresponding tables for the Thermometer which appeared in the Reports for 1875 and 1876.

In order to exclude the smaller fluctuations which overlay the principal atmospheric waves, those maxima and minima only are included in these tables which differ from adjacent minima and maxima by at least 0·25 of an inch.

The annual curve for the highest readings shows very clearly that there is a tendency of Barometer maxima to congregate between the hours of 10 and 11, both in the morning and in the evening; and also that the total number between midnight and noon is considerably in excess of that from noon to midnight, being almost in the ratio of 4 to 3.

The lowest readings are distributed with very nearly the same regularity as the highest readings, and it is impossible to overlook the evident law in the opposite flexure of the maxima and minima curves. Most of the lowest readings occur from 3 to 4 a.m., and again from 3 to 5 p.m.

In the monthly curves the continuous line represents the maxima, and the dotted line the minima readings

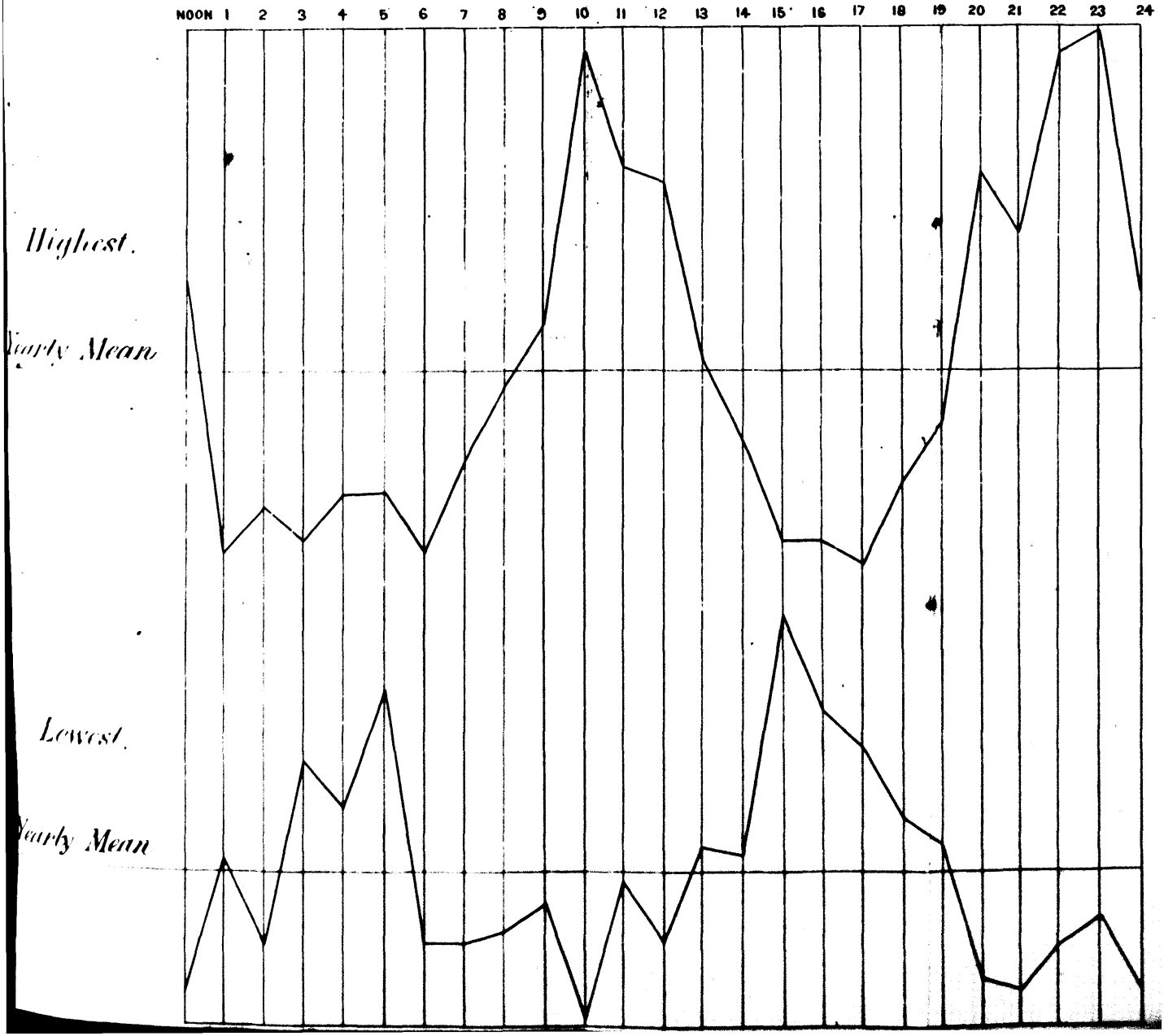
The absence of highest readings during the afternoon hours from March to July is very marked, but during the remainder of the year the distribution is much more uniform. Very few consecutive hours are devoid of lowest readings, except in the months from April to July, when they are generally absent towards midnight.

If we examine the total number of maxima or minima in each month we shall find a steady decrease in their frequency from January to June, and then an increase almost as regular from June to January. The relative frequency in Winter and Summer may be represented by the number 17 and 12: the principal atmospheric waves are therefore broader, or travel more slowly, in Summer than in Winter in the same proportion.

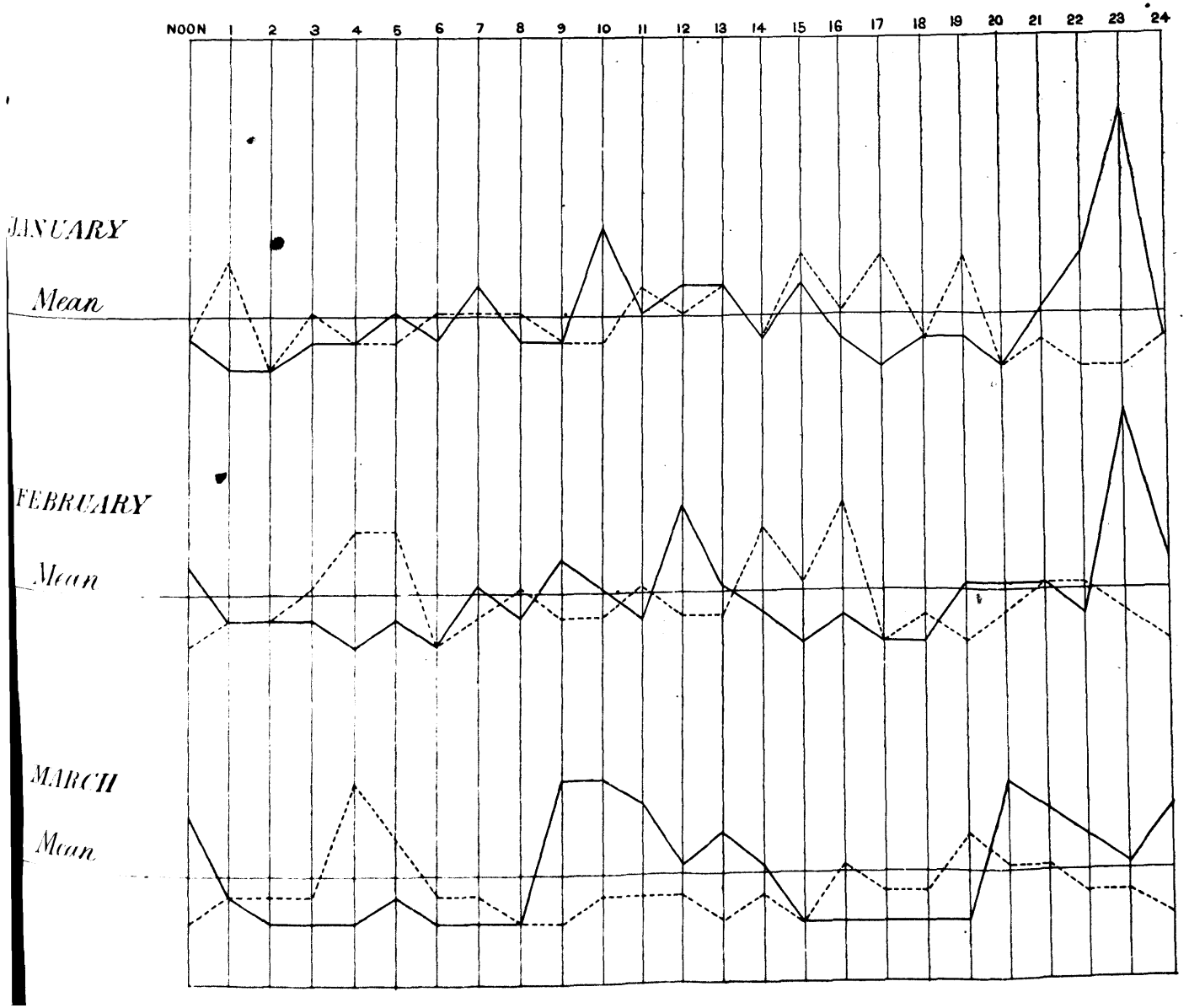
Summary of Hours of Maximum Readings of Barometer during eight years.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1868	1	0	1	3	0	0	1	1	0	6	2	4	0	1	2	0	0	1	5	8	3	6	4	5
1869	0	1	0	2	2	0	2	1	3	9	2	4	3	0	0	1	1	1	4	3	2	4	8	3
1870	0	0	0	1	0	0	1	5	1	3	7	8	0	1	0	2	0	0	1	4	4	5	6	3
1871	0	0	0	0	2	0	2	4	2	4	2	7	1	2	1	0	0	1	0	7	6	8	2	1
1872	0	0	1	0	0	1	0	3	7	8	4	3	3	2	0	0	0	0	0	4	2	7	9	5
1873	0	3	0	1	0	0	1	0	4	5	2	3	2	1	0	0	0	3	0	3	5	3	7	5
1874	0	0	0	0	0	1	1	1	4	3	6	3	5	2	0	0	0	0	3	4	4	6	7	1
1875	1	2	1	0	3	0	2	1	0	6	9	1	4	2	0	0	0	2	0	1	3	5	3	1
Sums	2	6	3	7	7	2	10	16	21	44	34	33	18	11	3	3	1	8	13	34	29	44	46	24

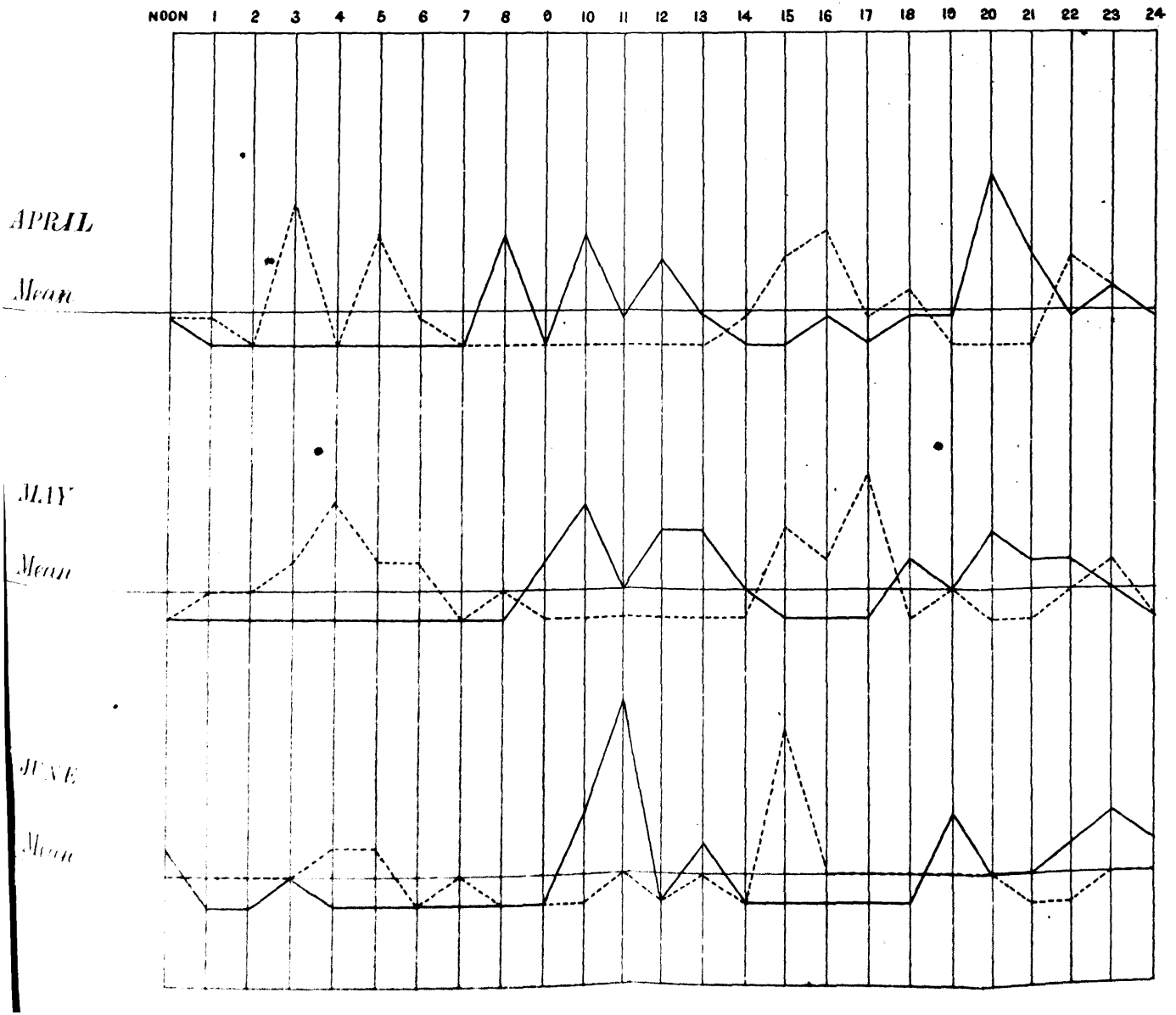
ANNUAL CURVES OF THE HOURS OF HIGHEST AND LOWEST BAROMETER.

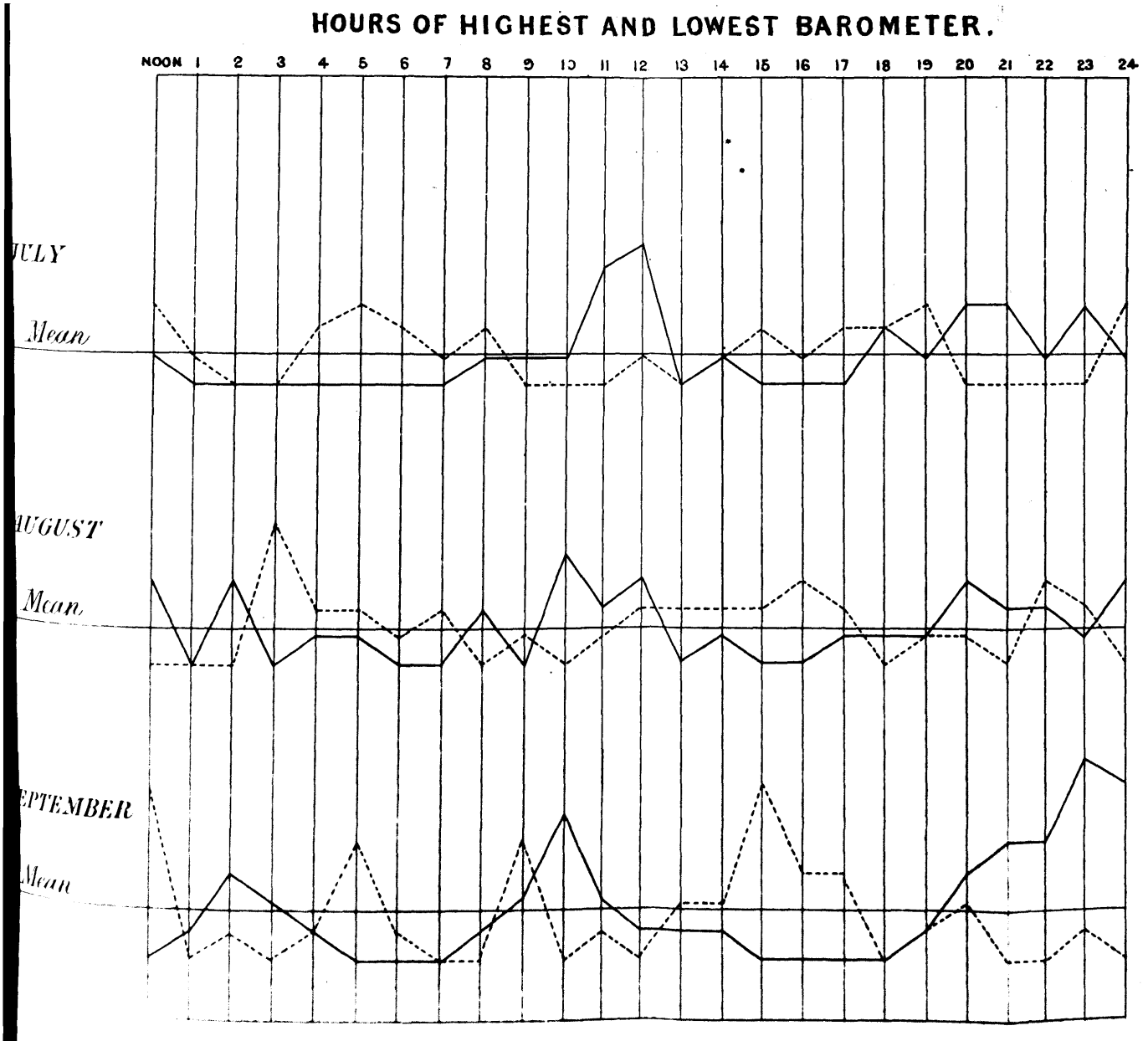


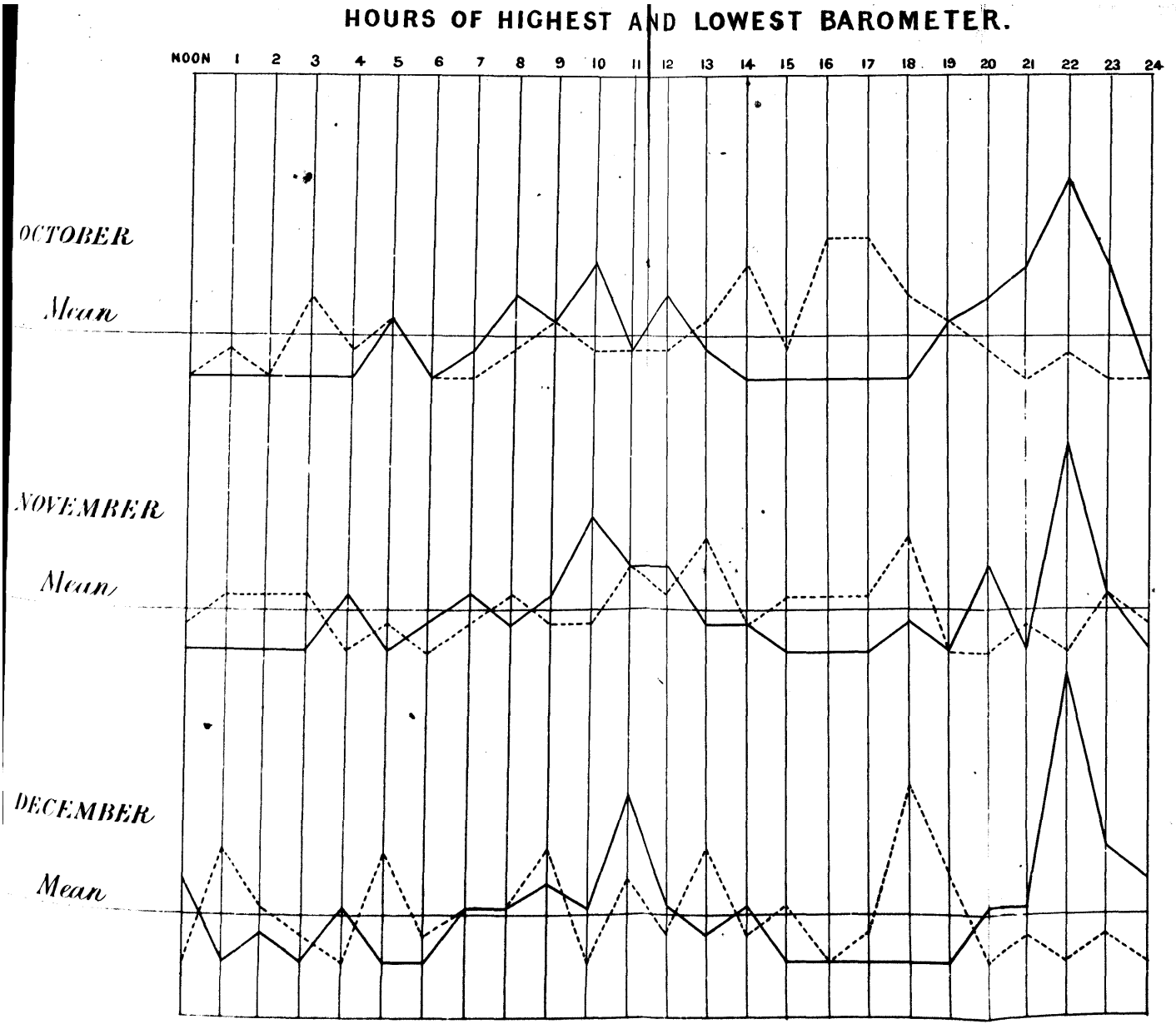
HOURS OF HIGHEST AND LOWEST BAROMETER.



HOURS OF HIGHEST AND LOWEST BAROMETER.




HOURS OF HIGHEST AND LOWEST BAROMETER.
NOON 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
JULY
Mean
AUGUST
Mean
EPTEMBER
Mean


HOURS OF HIGHEST AND LOWEST BAROMETER.
NOON 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
OCTOBER
Mean
NOVEMBER
Mean
DECEMBER
Mean

Summary of Hours of Minimum Readings of Barometer during eight years.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1868	2	2	6	4	4	2	1	2	3	0	4	1	1	1	3	6	3	1	2	0	1	3	1	1
1869	2	0	4	1	3	2	1	0	0	1	1	2	1	5	5	5	4	4	3	0	1	3	2	1
1870	3	1	2	0	5	0	3	2	4	0	1	0	1	3	3	2	5	2	4	3	1	1	0	0
1871	1	2	3	4	3	3	1	0	2	1	2	0	3	2	6	2	4	3	2	2	1	2	4	0
1872	3	1	3	3	5	1	2	2	4	1	1	2	3	2	8	6	0	4	3	1	0	1	0	2
1873	2	2	3	4	5	0	1	2	0	1	3	1	4	0	4	3	4	1	2	0	1	0	2	2
1874	3	2	4	3	2	0	2	3	1	1	4	2	2	3	4	4	4	2	2	1	0	0	3	0
1875	2	1	1	3	5	3	0	1	0	0	0	3	4	2	5	2	3	4	1	1	2	1	1	1
Sums	18	11	26	22	32	11	11	12	14	5	16	11	19	18	38	30	27	21	19	8	7	11	13	7

Monthly Tables of Hours of Maximum Readings of Barometer during eight years.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Jan.	0	0	1	1	2	1	3	1	1	5	2	3	3	1	3	1	0	1	1	0	2	4	9	1
Feb.	1	1	1	0	1	0	2	1	3	2	1	5	2	1	0	1	0	0	2	2	2	1	8	3
Mar.	1	0	0	0	1	0	0	0	5	5	4	2	3	2	0	0	0	0	0	5	4	3	2	4
April.	0	0	0	0	0	0	0	4	0	4	1	3	1	0	0	1	0	1	1	6	3	1	2	1
May.	0	0	0	0	0	0	0	0	2	4	1	3	3	1	0	0	0	2	1	3	2	2	1	0
June.	0	0	1	0	0	0	0	0	0	3	7	0	2	0	0	0	0	0	3	1	1	2	3	2
July.	0	0	0	0	0	0	0	1	1	1	4	5	0	1	0	0	0	2	1	3	3	1	3	1
Aug.	0	3	0	1	1	0	0	2	0	4	2	3	0	1	0	0	1	1	1	3	2	2	1	3
Sept.	0	1	0	1	0	0	0	1	2	5	2	1	1	1	0	0	0	0	1	3	4	4	7	6
Oct.	0	0	0	0	2	0	1	3	2	4	1	3	1	0	0	0	0	0	2	3	4	7	4	0
Nov.	0	0	0	2	0	1	2	1	2	5	3	3	1	1	0	0	0	1	0	3	0	7	2	0
Dec.	0	1	0	2	0	0	2	2	3	2	6	2	1	2	0	0	0	0	0	2	2	10	4	3
Sums.	2	6	3	7	7	2	10	16	21	44	34	33	18	11	3	3	1	8	13	34	29	44	46	24

Monthly Tables of Hours of Minimum Readings of Barometer during eight years.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Jan.	4	0	2	1	1	2	2	2	1	1	3	2	3	1	4	2	4	1	4	0	1	0	0	1
Feb.	1	1	2	4	4	0	1	2	1	1	2	1	1	4	2	5	0	1	0	1	2	2	1	0
Mar.	1	1	1	5	3	1	1	0	0	1	1	1	0	1	5	2	1	1	3	2	2	1	1	0
April.	1	0	5	0	4	1	0	0	0	0	0	0	0	1	3	4	1	2	0	0	0	3	2	1
May.	1	1	2	4	2	2	0	1	0	0	0	0	0	0	3	2	5	0	1	0	0	1	2	0
June.	1	1	1	2	2	0	1	0	0	0	1	0	1	0	6	1	1	1	1	1	0	0	1	1
July.	1	0	0	2	3	2	1	2	0	0	0	1	0	1	2	1	2	2	3	0	0	0	0	3
Aug.	0	0	5	2	2	1	2	0	1	0	1	2	2	2	2	3	2	0	1	1	0	3	2	0
Sept.	1	3	2	1	4	1	0	0	4	0	1	0	2	2	6	3	3	0	1	2	0	0	1	0
Oct.	1	0	3	1	2	0	0	1	2	1	1	1	2	4	1	5	5	3	2	1	0	1	0	0
Nov.	2	2	2	0	1	0	1	2	1	1	3	2	4	1	2	2	2	4	0	0	1	0	2	1
Dec.	4	2	1	0	4	1	2	2	4	0	3	1	4	1	2	0	1	6	3	0	1	0	1	0
Sums.	18	11	26	22	32	11	11	12	14	5	16	11	19	18	38	30	27	21	19	8	7	11	13	7

Monthly Magnetical Observations taken at the College Observatory, Stonyhurst, 1877.

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 2″, and the latter always under 83′.

The average deflection of the magnet caused by a twist of the torsion circle through 90°, has been about 7′·0 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 0·0036962.

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 ...	20th...12 12 p.m.	1·0	52·9	13 59 56	9·08530
	,, ...12 27 p.m.	1·3	53·1	6 19 43	9·08504
February...	26th...11 59 a.m.	1·0	46·5	14 1 2	9·08542
	,, ...12 19 p.m.	1·3	47·2	6 20 29	9·08551
March ...	26th...10 45 a.m.	1·0	44·6	14 1 19	9·08544
	,, ...11 8 a.m.	1·3	45·2	6 20 45	9·08568
April	25th... 8 20 a.m.	1·0	42·0	13 56 54	9·08303
	,, ... 9 14 a.m.	1·3	44·0	6 18 14	9·08274
May	29th...11 54 a.m.	1·0	55·9	13 59 22	9·08522
	,, ...12 16 p.m.	1·3	56·8	6 19 8	9·08463
June	29th...12 0	1·0	65·6	13 55 6	9·08374
	,, ...12 23 p.m.	1·3	65·7	6 17 22	9·08325
July.....	21st...11 55 a.m.	1·0	60·7	13 54 4	9·08287
	,, ...12 15 p.m.	1·3	61·2	6 15 49	9·08113
August ...	24th...10 57 a.m.	1·0	56·0	13 53 26	9·08220
	,, ...11 25 a.m.	1·3	57·7	6 17 14	9·08252
September.	18th...11 57 a.m.	1·0	63·9	13 55 47	9·08397
	,, ...12 18 p.m.	1·3	66.5	6 17 41	9·08367
October ...	30th... 9 47 a.m.	1·0	51·4	13 54 4	9·08221
	,, ...12 10 p.m.	1·3	52·5	6 18 4	9·08312
November.	27th...12 3 p.m.	1·0	46·4	13 55 52	9·08279
	,, ...12 24 p.m.	1·3	46·6	6 18 4	9·08272
December.	18th...11 0 a.m.	1·0	49·4	13 54 29	9·08228
	,, ...11 26 a.m.	1·3	51·8	6 17 46	9·08272

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 ...	20th...11 22 a.m.	59·6	5·65058	0·21216	0·44532
February...	26th...11 6 a.m.	50·7	5·65166	0·21140	0·44508
March	26th... 8 56 a.m.	41·1	5·64821	0·21107	0·44493
April	25th... 4 58 p.m.	54·0	5·65742	0·21042	0·44326
May.....	29th... 9 42 a.m.	51·1	5·67921	0·20691	0·44250
June	29th...10 58 a.m.	65·5	5·67586	0·20823	0·44245
July.....	21st...11 6 a.m.	58·3	5·66796	0·20944	0·44231
August ...	24th... 8 50 a.m.	61·3	5·67846	0·20801	0·44176
September.	19th...12 7 p.m.	59·6	5·67494	0·20839	0·44270
October ...	30th... 8 28 a.m.	48·1	5·66608	0·20904	0·44244
November.	27th...11 2 a.m.	45·9	5·66658	0·20882	0·44237
December.	20th...12 23 p.m.	40·4	5·66175	0·20929	0·44248

Dip Observations.				Magnetic Intensity.		
Months.	G. M. T.	Needle.	Dip.	X, or Horizontal Force.	Y, or Vertical Force.	Total Force.
	D. H. M.		° ′ ″			
January ...	21st...11 20 a.m.	1	69 19 48	3·6604	9·6887	10·3571
	,, ...12 10 p.m.	3	69 16 35			
February .	27th...10 35 a.m.	1	69 21 10	3·6557	9·6870	10·3539
	,, ...11 20 a.m.	3	69 17 45			
March ...	27th...10 48 a.m.	1	69 22 28	3·6539	9·6958	10·3614
	,, ...11 0 a.m.	3	69 19 37			
April	26th...11 15 a.m.	1	69 24 45	3·6624	9·7340	10·4002
	,, ...11 50 a.m.	3	69 21 0			
May	30th...11 30 a.m.	1	69 20 47	3·6391	9·6446	10·3083
	,, ...12 15 p.m.	3	69 18 30			
June	30th...10 48 a.m.	1	69 23 0	3·6507	9·6923	10·3570
	,, ...11 45 a.m.	3	69 20 15			
July	23rd...11 20 a.m.	1	69 26 28	3·6620	9·7554	10·4201
	,, ...11 50 a.m.	3	69 24 30			
August ...	25th...11 0 a.m.	1	69 19 0	3·6545	9·6874	10·3538
	,, ...11 40 a.m.	3	69 20 45			
September	20th...11 15 a.m.	1	69 23 50	3·6500	9·6907	10·3553
	,, ...11 51 a.m.	3	69 19 30			
October...	29th...10 35 a.m.	1	69 18 15	3·6575	9·6787	10·3467
	,, ...11 15 a.m.	3	69 17 37			
November	28th...11 45 a.m.	1	69 21 45	3·6563	9·6856	10·3528
	,, ...12 23 p.m.	3	69 16 28			
December	26th...10 59 a.m.	1	69 19 0	3·6593	9·7030	10·3703
	,, ...11 25 a.m.	3	69 21 30			
	Means.		69 20 36	3·6552	9·6953	10·3614

DECLINATION OBSERVATIONS.

Month.	G. M. T.	Uncorrected. Observation.	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′ ″
January ...	3rd... 8 58 a.m.	20 44 4		20 44 4	
	9th... 9 2	42 53		40 53	
	16th... 9 9	42 53		42 53	
	23rd... 9 13	46 25		46 8	
	30th... 8 54	46 32	20 44 33	46 49	20 44 9
February..	4th... 9 7	42 14		42 14	
	12th... 9 5	47 1		47 1	
	19th... 9 10	38 11		36 28	
	26th... 9 3	47 41	20 43 47	48 33	20 43 34
March ...	5th... 8 56	43 51		45 34	
	13th... 8 57	43 1		45 19	
	19th... 9 6	44 49		47 24	
	26th... 9 0	41 58	20 43 25	44 50	20 45 47
April	3rd... 9 4	43 6		46 15	
	16th... 9 5	41 27		44 36	
	25th... 8 58	42 47		42 47	
	30th... 9 3	47 17	20 43 39	52 26	20 46 31
May	8th... 9 6	43 42		46 17	
	15th... 8 55	43 52		48 27	
	21st ... 9 7	45 18		45 18	
	28th... 9 6	48 1	20 45 13	52 53	20 48 14
June	4th... 9 9	42 15		43 58	
	12th... 8 58	44 5		45 31	
	18th... 9 3	42 14		45 6	
	26th... 9 5	51 23	20 44 59	52 32	20 46 47
July	3rd... 8 53	40 34		41 43	

DECLINATION OBSERVATIONS (*Continued*).

Month.	G. M. T.	Uncorrected. Observation.	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′ ″
July	9th... 9 2 a.m.	20 42 48		20 46 49	
	17th... 9 11	44 35		46 35	
	24th... 9 8	42 9		44 27	
	30th... 9 2	40 35	20 42 8	44 36	20 44 50
August ...	6th... 8 55	38 28		39 54	
	14th... 9 0	39 21		39 21	
	20th... 9 5	38 18		40 36	
	27th... 9 9	41 33	20 39 25	43 16	20 40 47
September	3rd... 9 2	47 9		47 9	
	11th... 9 1	45 31		47 31	
	17th... 9 4	45 20		47 20	
	24th... 9 3	42 35	20 45 9	44 53	20 46 43
October ...	1st... 9 8	40 34		41 30	
	9th... 9 6	38 53		39 49	
	15th... 9 3	39 15		40 41	
	23rd... 9 6	36 45		40 11	
	29th... 9 4	42 33	20 39 36	45 25	20 41 31
November	6th... 8 55	40 51		40 51	
	12th... 9 2	39 8		40 34	
	19th... 9 0	40 28		40 45	
	28th... 9 14	38 5	20 39 38	39 31	20 40 25
December .	3rd... 8 59	42 25		40 42	
	10th... 9 4	40 57		40 5	
	18th... 9 8	43 49		44 23	
	24th... 8 57	43 35		43 52	
	31st... 9 9	41 15	20 42 24	42 41	20 42 21
Yearly mean			20 42 50		20 44 18

MAGNETIC DISTURBANCES.

JANUARY.—The year began quietly, and the first irregular movement of any magnitude was a slight Westerly deviation of the needle at 4 p.m. on the 6th. Small abrupt Easterly movements occurred at 3.45 and 7 p.m. on both the 7th and 8th. The Declination and Horizontal Force magnets were slightly disturbed on the 13th, 14th, and 15th; and the perturbations were greater on the 16th and 17th, the principal disturbance occurring between 8 and 8.50 p.m. on the 16th. Irregular movements appear also on the curves of the 23rd, 25th, 26th, and 28th. Vertical Force magnet unusually quiet throughout the month.

FEBRUARY.—No great irregularities on any of the curves during this month. The only ones worth recording are those at the early hours of the 3rd, and late on the 12th, 13th, and 14th. Also early on the 18th, and both early and late on the 20th. On the 22nd and 23rd there were also slight disturbances.

MARCH.—A considerable disturbance occurred between 9.30 p.m. on the 1st and 10 a.m. on the following day. The most Easterly position was reached by the N. end of the needle a few minutes after 10 p.m., and its Westerly maximum at 8 a.m.; the Range being 28′ 22″. This Disturbance was more marked on the Declination and Vertical Force than on the Horizontal Force curves. Slight irregular movements similar to each other in character were apparent on the three following days. On the morning of the 10th a number of small but rapid oscillations of the Declination magnet preceded the principal disturbance of the month. Between 7 p.m. on the 10th and 9 a.m. next morning the Declination increased by 37′ 36″. On the evening of the 11th three Easterly movements, increasing in magnitude, followed each other at intervals of 2 hours and 30 minutes, and on the 13th there were three similar disturbances, but later in the evening. The largest of the three was apparent on the 12th, but in an opposite direction. There were also traces of this irregularity on the 14th, 15th, and 16th; and they all appear to be connected with the slight storm on the 10th. On the 29th, 30th, and 31st the curves of the Declination between 6 and 10 p.m. bear a striking resemblance to each other in their rather sudden movements towards the East; these however take place a few minutes earlier on each successive day.

APRIL.—The magnets were very quiet throughout the month, and no very great perturbations took place. On the morning of the 8th a disturbance began, which lasted for two days, and another started at 10 p.m. on the 14th and ceased about the same hour on the following day. The irregular movements which commenced on the morning of the 23rd, continued for more than two days, and there is a considerable resemblance between all the curves on the mornings of the 24th and 25th. The Declination trace is also similar on the mornings of the 27th and 28th.

MAY.—This month is remarkable for two great magnetic storms. The first storm of the year commenced shortly after 4 p.m. on the 2nd, and lasted some 38 hours. The needle moved Eastward during the night hours on both days, the oscillations being slow and similar in character on the two nights. Between 5 and 7 a.m. on the 3rd the vibrations of the magnet were short and rapid, and somewhat similar to those from 6 to 8 a.m. on the 4th, when the disturbance ceased. The Horizontal Force magnet was greatly disturbed on the first day of this storm, the movement being a bold undulation, but the tendency was greatly to diminish the value of the Force. The Vertical Force magnet was the most effected by the storm, the total range in about five hours being 0·0098, whilst the Mean Vertical Component for the month was 9·6446. After a steady increase during the afternoon of the 2nd, the Vertical Force began rapidly to diminish at about 10 p.m. The minimum was reached at 3 a.m. on the 3rd, when the magnet gradually returned to its former position, attaining its normal state at about 10 a.m. This storm commenced similarly on all the curves by a quiet increase of ordinate, indicating a Westerly motion of the needle, and an increase of both components of the Intensity, but in all three cases the initial motion was soon reversed, and then the rapid alterations at once occurred.

The magnets again became restless shortly before 9 a.m. on the 11th, and there were some bold movements on the afternoon of the same day, the principal one being an Easterly movement through 27′35″ in 15 minutes, followed immediately by a Westerly movement through 21′29″ in 10 minutes. A rapid dip down of the V.F. curve happened simultaneously with this quick change of the Declination, and the H.F. curve was similarly affected at the same time, but to a less degree. This diminution of all the ordinates took place between 7 and 8 p.m. on the 11th. The movements of the magnets continued rather irregular until about 9 a.m. on the 14th. They then remained quiet for two weeks, but at 6 p.m. on the 28th the greatest disturbance of the whole year commenced with a motion towards the East, which was slow at first, but increasing in rapidity as the minimum was approached. The lowest reading of the Declination curve was at 12.40 a.m. on the 29th, the diminution of the Westerly variation being 46′59″. The H.F. magnet

showed at first a slight increase, followed by a rapid diminution of force combined with an oscillatory motion: the minimum was reached at 2.45 a.m. on the 29th. The V.F. began to fall rapidly at 10 p.m. on the 28th, and this continued until it was thrown off its balance at 11.55 p.m. Shortly before attaining its minimum the Declination magnet oscillated violently, the long and rapid vibrations continuing for about four hours, when they were transformed into short tremulous oscillations superimposed on a lengthened undulation. The Westerly maximum was reached at 7.40 a.m. on the 29th, the total range since midnight being 52′31″ for the Declination, whilst that of the H.F. was 0·02254, the mean for the month being 3·6391. The magnets continued rather agitated until the end of the month.

JUNE.—No perturbations of any moment during June. The first slight disturbance occurred on the morning of the 7th; in the afternoon the magnet was again quiet, but on the morning of the 8th it was more unsteady than on the 7th. There was a small increase of the Declination at 5 a.m. on the 14th. On the 23rd, from 4 to 9 a.m., the tremulous motion of the needle was very apparent, and at 6 a.m. on the 24th the same rapid oscillation continued for several hours, and was reproduced at a somewhat earlier hour next day. The magnet was unsteady throughout the whole of the 24th, and the tremor in the photographic curve reappeared each day between 6 and 8 a.m. until the 28th. A considerable decrease took place in the V.F. shortly after 5 a.m. on the 7th, but this magnetic element was much less variable on the 8th. During the rest of the month the V.F. needle was as quiet and regular as the H.F. showed itself during the whole of June.

JULY.—The slight Easterly movement of the needle just before 11 p.m. on the 5th was followed by a similar Westerly disturbance at 3 a.m. the next morning. Some irregularities of a like nature occurred in the Declination curve on the 8th, and one also at 3 p.m. in the H.F. A somewhat more serious perturbation of the earth's magnetism commenced about 3 p.m. on the 21st, and lasted until the morning of the 23rd. The H.F. was unsteady from 4 to 8 p.m. on the 21st. The only irregularity of any extent noticeable on the V.F. curve during the whole month was a lengthy undulation on the 21st and 22nd, the maximum occurring at 8 p.m., and the minimum shortly after 1 o'clock next morning. The Declination magnet was exceedingly quiet from the 23rd until the end of the month.

AUGUST.—During the first half of the month there was scarcely any departure from the ordinary diurnal range. The H.F. and V.F. magnets were somewhat disturbed on the afternoon of the 17th. From the 19th to the 21st there were some very slight irregularities in the Declination curve, but those from the 28th till the end of the month were more exaggerated. The greatest perturbations occurred between 8 p.m. on the 28th and 4 a.m. on the 29th.

SEPTEMBER.—A gentle tremor of the magnet, commencing at 7 a.m. on the 15th, gave the first sign that the latter half of the month was not to be so quiet as the first. The tremor reappeared on the mornings of the 16th and 17th, and between 10 p.m. on the 15th and 2 a.m. next morning there was a considerable diminution of the Declination. At 8 p.m. on the 18th a more important disturbance began, which lasted for 30 hours, the range of the compass-needle being 32′ 57″ on the morning of the 19th and again 27′ 13″ in the afternoon. The H.F. was a little irregular on the afternoon of the 15th, and also on the 19th, but there was no movement of importance. Two long waves of disturbance passed over the V.F. curve, the maxima occurring at 11 p.m. on the 18th and 5.15 p.m. on the 19th. From this till the end of the month there were only a few small irregularities, most of which took place on the 29th.

OCTOBER.—There was a considerable increase of the Declination between 10 a.m. and 2 p.m. on the 1st, and then a return, the minimum being reached at 7 p.m. The H.F. was also a little unsteady, and the V.F. increased slightly. On the morning of the 12th several large undulations, including a range of 28′ 17″ in the Declination between the minimum at 12.20 and the maximum at 6.30, showed the presence of a vigorous disturbing force. This also affected somewhat the H.F. and decreased considerably the V.F. On the evening of the 23rd, between 9.30 and 10.5, the needle moved quickly through 17′ 54″ towards the East, and then returned. This movement reappeared on the 24th and 25th, but at an earlier hour, and less in extent. A similar repetition is observable on the H.F. curve.

NOVEMBER.—The needle became rather agitated about 10 p.m. on the 2nd, the V.F. fell rapidly at 4 a.m. on the 3rd, and the disturbance continued more or less until the 10th. The Declination Curves on the afternoons of the 8th and 9th are the most irregular during this period, and they also resemble each other very closely. The morning of the 19th was a little disturbed, and the disturbing force reappeared the next morning in an exaggerated form: the V.F. fell quickly at 4 a.m. Between 2 and 4 a.m. on the 24th the needle made a rapid excursion to the West, and the V.F. decreased. The other movements are unimportant.

DECEMBER.—The afternoon of the 7th, and the morning of the 8th, were somewhat unsteady; as was also the afternoon of the 12th. The variations of the V.F. and H.F. are unimportant. An irregular movement of the compass needle at 1 a.m. on the 29th was the last disturbance of the year.

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