

The Fernley Observatory, Southport : report and results of observations for the year 1905 / Borough of Southport Meteorological Department.

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County Borough *of Southport.*



Meteorological Department.

THE FERNLEY OBSERVATORY,
SOUTHPORT.

REPORT

AND

RESULTS OF OBSERVATIONS

FOR

THE YEAR 1905.

BY

JOSEPH BAXENDELL, *F.R.Met.S.*,

Meteorologist to the Southport Corporation.

"VISITER" PRINTING WORKS, SOUTHPORT.

1906.

THE FERNLEY METEOROLOGICAL OBSERVATORY, SOUTHPORT.

Report of the Director, for the Year 1905.

I. **Personnel.**

Mr. F. L. Halliwell, the First Assistant, having repeatedly expressed a desire to be relieved of some of his duties in connection with the Observatories Department, I transferred to Mr. A. Goodwill, the Second Assistant, as from September 1st, 1905, the work of preparing and tabulating corrected *hourly* values, and daily results, from the traces furnished by the various Self-Recording instruments. Suitable re-adjustments of wages were, of course, effected.

The positions of Mr. W. R. Jones (the Relief Observer), and the persons in charge of the outlying Stations, remained as before.

II. **Structures and Instruments.**

The buildings, structures, and instruments were maintained during the year in good repair.

All woodwork and ironwork at the Meteorological Station in Hesketh Park; the Brook-Level Gauge at Mossbridge; and the ironwork of the Anemograph at Marshside, were repainted in the summer.

In the course of the year, some rather important improvements were designed for, and introduced into, the Dines Mercurial Barograph, the Baxendell Self-Recording Anemoscope, and the Halliwell Self-Recording Rain Gauge.

In view of the danger attendant upon the use of Gasoline (which alone would serve for the purpose in cold weather), in the carburetter attached to Halliwell's Self-Recording Rain Gauge, the self-contained-heater system was abolished in

November, and town's gas was brought into use, for the purposes of melting *falling* snow and hail, and preventing the water, that is always in the instrument, from freezing.

A Curtis-pattern Campbell-Stokes Sunshine Recorder, M.O. No. 131, was mounted, on April 12th, to the northward of the Campbell-Stokes Recorder that had been in use at this Observatory since November, 1896. From July 1st, 1905, the sunshine traces from the newer, or Meteorological Office, instrument, have been used instead of those from the older Recorder, the cards employed also being obtained from the Office.

In the Parliamentary Report of the Meteorological Council for the year ending 31st of March, 1904, the following paragraph appeared in reference to Sunshine Observations :—

“ For the purpose of uniformity in the returns, [the Council] deem it desirable that the observations should be made with the Campbell-Stokes instrument, and in order that the published returns may be strictly comparable, they have decided that in future only the results obtained with the Campbell-Stokes or some other equivalent instrument shall be included in the official publications.”

In the Council's corresponding Report for the Year ending 31st of March, 1905, [published this spring, (1906)], the subject is finally dealt with as follows :—

“ Of those [Sunshine] stations which previously sent in records from photographic recorders all except two* have provided themselves with instruments on the Campbell-Stokes principle, and—as intimated in the last report—only the results from burning recorders are included in the official publications. This change took effect at the beginning of 1905.”

Accordingly, no Jordan Sunshine values will be found in the Tables accompanying my present Report. The use of the Jordan instrument at Southport was discontinued after June 30th, 1905.

III. **Official Inspection.**

The meteorological equipment in Hesketh Park was officially inspected on July 24th, 1905, by Mr. William Marriott, F.R.Met.Soc., acting on behalf of both the Royal Meteorological Society and the Meteorological Office. Before leaving, Mr. Marriott made the following entry in the Visitors' Book at the Observatory :—

“ 1905, July 24; Inspected this Station, and found everything in good order.
“(Signed) William Marriott, Royal Meteorological Society.”

* These have since procured Campbell-Stokes instruments. Unfortunately, however, Sunshine results from some places possessing only Jordan photographic Recorders, are still published by the *Royal Meteorological Society*. J. BAXENDELL.

IV. **First-Order Results.**

The practice of making hourly, corrected, tabulations of the traces from the principal Self-Recording instruments, was continued during the year 1905; and the Results are given in this pamphlet in the same form as previously.

I hope, next year, to include a number of averages for terms of years; and, in particular, some showing the *seasonal* variation of the Diurnal Inequality of Frequency of Winds from Different Directions, an important point regarding which I have not hitherto been in a position to publish any statistics.

V. **Returns and Reports.**

Second-Order and Extra Returns were supplied throughout the year to the Royal Meteorological Society; Climatological Reports (both daily and weekly) to the Meteorological Office; and Rainfall Returns, and other information, to the Editor of *British Rainfall* and *Symons's Meteorological Magazine*.

The usual Weekly and Monthly Reports, and occasional notes, were furnished to the local Press.

Throughout the summer months, short reports for the daily newspapers were prepared on six mornings and evenings weekly, and were delivered to a Journalist appointed in the Spring by the Committee. During the other portions of the year, similar reports were despatched direct from the Observatory to the four principal daily Liverpool newspapers.

Sunshine statistics were forwarded monthly to the Leeds Philosophical and Literary Society, for insertion in a comparative table prepared by that Society and published in various Yorkshire newspapers.

VI. **Miscellanea.**

Commencing on March 23rd, daily Weather Forecast telegrams were obtained each morning from the Meteorological Office, London, and were exhibited to the public in the Committee's Frame in Lord Street, where are shown the daily charts or traces made by our standard Self-Recording instruments. A popular explanation of the various charts, etc., was drawn up, printed, and placed in the Frame in the summer.

In the "Rainfall, etc." Table, appended to this Report, monthly values of the Rate of Rainfall per rainy hour, (frequently termed the "Intensity of Rainfall"), have now been inserted.

The Table of Comparative Statistics, which concludes this pamphlet, has again been revised, and values for additional Health Resorts have been included. I am indebted to Mr. William Marriott, Assistant-Secretary of the Royal Meteorological Society, for Results for a number of Stations, in advance of their publication by the Society. Only Statistics checked, and published or supplied, by either the Meteorological Office, or the Royal Meteorological Society, now appear in my Table.

THE ASTRONOMICAL EDUCATIONAL OBSERVATORY.

This Observatory was opened to the Public on every starlight Monday, Wednesday, and Friday evening (Good Friday and Christmas Day excepted) from January 1st to April 15th, and from September 1st to December 31st.

Apart from Astronomers, and some Students, who visited the Observatory in company with the Honorary Astronomical Assistant, the total number of persons who attended, during the year 1905, was 199. Of these, 163 viewed Celestial Objects through the 6-inch Refractor.

JOSEPH BAXENDELL.

*The Fernley Observatory,
Southport, England,
June 20th, 1906.*


SOUTHPORT
METEOROLOGICAL OBSERVATORY.



RESULTS OF OBSERVATIONS

MADE DURING

THE YEAR 1905.



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The Fernley Observatory, Southport.

The Geographical Position of the Hesketh Park or principal Station of the FERNLEY METEOROLOGICAL OBSERVATORY is:—Latitude, $53^{\circ} 39' 24''$ N.; Longitude, $2^{\circ} 59' 3''$ W.

The Fernley Single-louvred Structure, a rectangular wooden building (painted white), 12 feet in length by 9 feet in width, and from 8 to 10 feet in height, is erected upon an asphalt platform, on the summit of the highest knoll in Hesketh Park. In and about this structure are placed the Fortin-Standard and Kew-pattern-Station Barometers, the Richard Aneroidograph, the older set* of Shade Thermometers, the Richard Thermograph, the Richard Hair Hygograph, the Public Shaded Thermometer, the Wind Direction Dial, the Recording portion of the Baxendell Anemoscope, the Sight-Indicating tubes of the Dines Anemometer, and the Ozone Test Papers. At various heights above the roof, up to a maximum of 52 feet from the ground in the case of the "head" of the instrument to be mentioned last in this sentence, are mounted the Sunshine Recorders, the Robinson Cup* Anemometer, the Vane of the Baxendell Recording Anemoscope, and the upper part of the Dines Sight-Indicating Pressure Tube Anemometer. Twenty-five feet to the Southward of the building, over a plot of grass, are fixed the three Solar Radiation Thermometers. The Stevenson-Screen, the Terrestrial Radiation and Underground Thermometers, and the various Rain Gauges, are planted to the N.W. of, and somewhat below, the top of the knoll, in an extensive and open, but not unduly exposed, green. The larger Stevenson-Screen, containing the Dines Thermograph, stands on the higher part of the green. The Dines Mercurial Barograph is mounted in the Computing Room underneath the Astronomical Observatory.

The several non-recording Barometers, Thermometers, and Rain Gauges, have been verified at Kew Observatory, and the readings are all corrected for instrumental errors, including, in the case of the Thermometers, gradual *zero displacement*.

The cisterns of the Barometers are 51 feet above the mean level of the sea.

The Bulbs of the Dry, Wet, and Minimum Thermometers in the Stevenson-Screen are four feet above the grass; the Maximum is slightly lower. The Screen is of the Royal Meteorological Society's pattern; it is repainted white (both outside and inside) annually, in the spring. Distilled water is used for the Wet-bulb.

* The publication of the results of the observations of temperature made in the Fernley Louvred-Structure, as also those of wind movement made with the Robinson Cup Anemometer, terminated with the values for the year 1901.

The Hygrometrical Results are deduced from the *daily* readings of the Dry-bulb and Wet-bulb Thermometers, by means of the eighth edition of Glaisher's Tables.

The Underground Thermometers are suspended by chains in iron tubes sealed (except in the case of the 20-foot Thermometer) at the lower ends, and closed above the grass by copper caps. The instrument suspended 20 feet beneath the surface is one of Messrs. Negretti & Zambra's patent slow-acting Thermometers, having a specially open scale, and divided on the stem to tenths of degrees.

The bulbs of the Solar Radiation Maximum Thermometers are placed five feet above grass. To the readings of the Blackened-bulb Thermometer *in vacuo*, a *special* subtractive correction is applied, for the purpose of rendering the indications of the instrument comparable with those of the Kew Observatory's *present* standard Black-bulb Thermometer *in vacuo*.

The *sensitive* Terrestrial Radiation Minimum Thermometer is one of Messrs. Negretti & Zambra's Link-bulb pattern. The shield-tube over the stem is hermetically sealed.

The Minimum Thermometers in the shade are occasionally placed for 12 hours in vertical positions, bulbs downwards; and those on the grass are left in a similar position (in padded metal wells) every day during the summer months, from 9 a.m. until about 6 p.m. No spirit therefore collects in the upper parts of the tubes.

The Curtis-pattern Campbell-Stokes Sunshine Recorder is adopted as the standard Sunshine Recorder of the Observatory. The traces are measured in accordance with the practice of the Meteorological Office.

The Direction of the Wind is given according to *true*, and not to magnetic, bearings. When the air is practically calm at the time of observing, the point at which the Vane is standing is noted, and entered as the approximate Direction.

The Ozone Test Papers and Scale used are Moffat's, and are obtained from Messrs. Negretti & Zambra, of London.

The upper edge of the receiver of the Rain Gauge (a Meteorological-Office-pattern one, eight inches in diameter, and constructed of copper) is one foot above the surface of the ground, and 38 feet above mean sea level; it is examined daily at 9 a.m., and the rain found, if any, is entered to the previous day. A 5-inch Snowdon Rain Gauge, similarly placed, is read *twice* daily, viz., at 9 a.m. and 9 p.m. Both these standard Rain Gauges are fitted with hot-water chambers, for melting collected snow. The Duration of Rainfall is obtained from the charts of the Halliwell (Float-pattern) Self-Recording Rain Gauge, in tabulating the traces from which, the civil day ending at midnight is employed; the rim of this

instrument is 1 foot 6 inches above the ground, and 39 feet above mean sea level. The older, or Casella-Halliwel (Balance-pattern), Self-Recording Rain Gauge is also retained in use.

The Fog and related Results are derived from observations of the visibility of objects and lights at definite distances from the Observatory Hill.

The Averages, with which a number of the results for 1905 are compared in the accompanying Tables, are those for the following periods:—

Barometric Oscillations	} 30 years, 1872-1901 inclusive.
Relative Humidity	
Underground Temperature	
Amount of Cloud	
Wind Direction	
Total Rainfall	
Days with Rain	} 16 years, 1889-1904 inclusive.
Mean Temperature	
Daily Range of Temperature.....	} 13 years 1892-1904 inclusive.
Barometric Pressure	
Amount of Ozone.....	} 8 years, 1897-1904 inclusive.
Stokes Sunshine	
Wind Velocity	} 7 years, 1898-1904 inclusive.

It seems scarcely necessary to add that the sign + in the columns headed "Difference from the Average" signifies that the 1905 value *exceeded* the average by the amount following the sign, and that the sign — similarly indicates that the result for 1905 was *below* the average to the extent stated.

Marshside Anemograph Station.

The Geographical Position of this Station is:—Latitude, 53° 40' 18" N.; Longitude, 2° 58' 23" W. It is situate on the coast, over a mile to the N.N.E. of the Hesketh Park Observatory, viz., in the direction of the estuary of the Ribble; and is in an extensive reclaimed marsh, adjoining the beach.

The vane of the one-inch-pattern Dines-Baxendell Anemograph is 60 feet above the ground, and 50 feet above the roof of the Marshside Fog Bell brick hut. On, and revolving around, the same standard, at a height of 55 feet above the ground, is the new Non-Oscillating Maximum Pressure Plate Anemometer.

The vane of the *older* Dines Recording Pressure Tube Anemometer is 50 feet above the ground. This instrument is now mainly employed for experimental and comparative purposes, and no ordinary results derived from its traces are, as a rule, published.

Barton Moss Evaporation Station.

(Adjacent to Formby Moss, but in the Parish of Downholland).

The Geographical Position of this Station is:—Latitude, $53^{\circ} 34' 37''$ N. ; Longitude, $3^{\circ} 1' 12''$ W. It is situate 3 miles inland from the sea, and is about $5\frac{1}{2}$ miles to the S.S.W. of the Hesketh Park Observatory. The Station has an exceptionally open exposure in all directions.

The rims of the various instruments are from 14 to 15 feet above Ordnance datum.

The Rain Gauge is a Snowdon-pattern one, 5 inches in diameter; its rim is 9 inches above the ground.

The Standard Evaporation Tank is one of Symons's pattern, 6 feet square and 2 feet deep, and its rim is 3 inches above the ground. The height of the water is measured daily, at 9 a.m., by means of a Halliwell Float-and-Multiplying-Index-Finger-Gauge. The amount of evaporation is entered to the previous day; as is also the rainfall.

A second Evaporation Tank, only 3 feet square, but in all other respects similar to the standard one just described, is in use for comparative purposes.

The Downholland-Brook Level Gauge is fixed some distance away, under the railway girder bridge spanning that watercourse, about a quarter of a mile to the N.W. of Mossbridge Station, on the Southport and Cheshire Lines Extension Railway.

At all the Stations, Greenwich Mean Time is employed for the First-Order Results; and Local Mean Time for the Second-Order Observations.

The Hourly values of Barometric Pressure, and of Air Temperature, are the corrected measurements* of the Dines traces†, in each case at the exact hour. The Hourly values of Wind Frequencies and Wind Velocity, and of Rainfall Duration and Amount, all refer to the period extending from 30 minutes before, to 30 minutes after, the exact hour. The Wind Velocities are Actual, being obtained, by the usual method of estimation, from the traces of the Dines Pressure Tube Anemometer.

* Made from base lines automatically drawn on the daily charts of the Dines Mercurial Barograph, and the Dines Thermograph.

† Corrected by control eye-readings of standard instruments.

Barometric Pressure.

1905.	MEAN PRESSURE * For Gravity of Latitude 45° † At 32 deg., and Station Level.		Difference from the Average (At Sea Level).	Mean of Daily Observed Oscillations.*	Difference from the Average.	Observed Monthly Range.*	Extreme Monthly Range. ‡
	INCHES.	INCHES.					
January ...	30.192	30.249	+0.280	0.310	+0.056	1.863	1.970
February ...	30.111	30.168	+ .258	.233	+ .001	1.684	1.760
March ...	29.634	29.691	- .204	.273	+ .046	1.690	1.750
April	29.820	29.875	- .077	.193	+ .002	1.120	1.150
May	30.134	30.190	+ .158	.126	- .038	1.373	1.410
June	29.962	30.017	- .011	.102	- .057	0.720	0.735
July	30.029	30.084	+ .077	.122	- .029	0.567	0.595
August ...	29.817	29.872	- .083	.211	+ .040	1.014	1.075
September ...	29.936	29.992	- .009	.163	- .018	0.970	1.020
October ...	29.982	30.038	+ .139	.224	+ .003	1.513	1.520
November ...	29.622	29.679	- .322	.289	+ .037	1.459	1.465
December ...	30.131	30.188	+0.326	0.207	-0.066	1.549	1.615
Means.....	29.948	30.004	+0.044	0.204	-0.002	1.294	1.339

* From Observations at 9 a.m. and 9 p.m. daily; no correction being applied for diurnal variation.

† Gravity correction employed = + 0.023 inch.

‡ From the records of the Dines Mercurial Barograph.

Temperature; and Humidity.

Stevenson-Screen Results.

1905.	Mean Tempera- ture.*	Difference from the Average.	Mean Daily Range of Tempera- ture.	Difference from the Average.	Absolute Extremes of Temperature.				Mean Relative Humidity of the Air.		Difference (at 9 a.m.) from the Average.
					Highest.		Lowest.		9 a.m.	9 p.m.	
					Temp.	Date.	Temp.	Date.			
	°	°	°	°	°		°		%	%	%
January ...	39.2	+0.4	7.4	-0.8	51.7	8th	23.8	16th	85	87	-3
February...	41.3	+2.4	8.6	-1.2	54.3	18th	27.1	24th	88	88	+1
March	44.5	+2.9	11.7	+0.4	61.1	22nd	27.4	3rd	84	86	0
April	44.7	-1.3	11.5	-2.2	59.9	15th	28.5	8th	79	85	0
May	51.4	+0.3	14.8	+0.4	70.8	28th	33.1	5th	75	79	-1
June.....	58.4	+1.2	17.9	+3.9	78.5	23rd	39.1	9th	69	78	-7
July.....	61.9	+2.3	12.6	+0.6	82.5	9th	46.0	28th	76	84	-2
August.....	58.5	-0.7	12.9	+1.2	74.1	15th	43.8	9th	77	84	-3
September	54.0	-2.0	12.4	-0.3	67.1	5th	35.1	21st	80	87	-2
October ...	45.6	-3.3	12.7	+1.3	58.0	9th	27.0	20th	81	86	-4
November	41.2	-2.9	9.6	+0.2	51.8	11th	19.8	19th	90	90	+2
December	42.3	+2.8	6.9	-1.6	51.9	7th	30.7	31st	91	88	+3
Means	48.6	+0.2	11.6	+0.2	HIGHEST. 82.5	JULY 9th	LOWEST. 19.8	NOV. 19th	81	85	-1

* Mean of the daily indications (each for the 24 hours ending at 9 p.m.) of the Maximum and Minimum Thermometers in the Screen.

NOTE.—For "Number of Days with Frost," see Table headed "Miscellaneous Phenomena."

Underground Temperatures; and Solar and Terrestrial Radiation.

1905.	Mean Underground Temperatures at 9 a.m.				Difference (at 1 foot) from the Average.	Mean Daily Max. Temps. in Sun.			Mean Excess of Blackened bulb in <i>Vacuo</i> over Bright-bulb in <i>Vacuo</i> .	Mean Daily Min.*on Short- Grass or Snow.
	1 foot.	4 feet.	10 feet.	20 feet.		Blackened bulb in <i>Vacuo</i> .	Bright bulb in <i>Vacuo</i> .	Black-glass bulb in Open Air		
January ...	37.4	40.7	45.8	49.79	+0.2	60.8	47.8	45.2	13.0	31.7
February...	39.4	41.2	44.7	48.96	+1.8	76.7	55.6	51.3	21.1	31.8
March	42.6	42.7	44.5	48.32	+2.4	91.2	63.2	57.8	28.0	33.0
April	46.2	46.1	45.8	47.92	+0.4	91.9	64.1	59.1	27.8	33.8
May	54.1	50.9	47.7	47.91	+0.9	108.1	75.4	69.6	32.7	37.7
June	61.8	56.5	50.6	48.28	+1.4	114.3	83.1	78.0	31.2	44.8
July	66.2	61.2	53.8	49.03	+2.4	119.1	86.7	80.7	32.4	50.7
August.....	61.8	60.6	55.7	50.00	-0.9	111.6	81.8	75.7	29.8	47.3
September	56.2	57.7	55.7	50.81	-2.0	101.7	74.6	69.7	27.1	42.1
October ...	46.8	51.5	53.9	51.23	-3.6	85.8	62.9	58.7	22.9	32.4
November	40.3	45.0	50.3	51.13	-3.5	65.8	51.5	49.7	14.3	30.6
December	39.7	42.7	47.1	50.41	+1.0	61.3	49.7	47.6	11.6	34.0
Means	49.4	49.7	49.6	49.48	0.0	90.7	66.4	61.9	24.3	37.5

* From the indications of a sensitive Minimum Thermometer.

Sunshine; Cloud; and Ozone.

1905.	SUNSHINE. Per Campbell-Stokes Recorder.					CLOUD. Mean Amount.		Difference from the Average.		OZONE.	
	Total Bright Sun- shine.	Difference from the Average.	Most Sunshine in One Day.	um- ber of Sun- less Days.		9 a.m.	9 p.m.	9 a.m.	9 p.m.	12-hourly Mean.	Difference from the Average.
	Hours.	Hours.	Hours.			0 to 10.	0 to 10.	0 to 10.	0 to 10.	0 to 10.	0 to 10.
January ...	41.6	- 1.8	5.0	28th	12	8.2	7.3	+0.3	0.0	2.6	+0.2
February...	86.2	+19.7	7.7	17th	5	7.5	6.3	-0.3	-0.8	3.6	+1.3
March	151.7	+34.4	10.3	31st	2	6.1	6.6	-1.2	+0.1	2.6	-0.8
April	126.7	-46.1	13.0	22nd	3	7.4	7.6	+0.2	+1.3	3.5	-0.4
May	220.3	+ 5.5	14.2	17th	0	7.0	6.1	0.0	-0.4	3.3	-0.7
June.....	242.1	+32.7	15.5	25th	1	6.0	5.1	-1.1	-1.7	3.8	-0.4
July	242.7	+28.1	15.6	7th	1	6.9	5.7	-0.6	-1.1	4.5	-0.2
August.....	167.0	-26.0	12.2	14th	2	7.7	7.5	+0.3	+0.7	3.7	+0.1
September	118.3	-28.8	9.3	20th	1	7.2	5.5	-0.1	-0.5	3.2	+0.4
October ...	117.1	+22.3	9.5	16th	3	6.8	5.5	-0.7	-1.3	3.0	+0.9
November	57.5	+ 7.2	7.4	16th	9	7.2	7.0	-0.6	-0.4	1.0	-1.1
December	53.2	+22.2	5.8	7th	11	7.3	7.8	-0.7	+0.3	1.2	-0.9
Year.....	1624.4	+69.7	MOST. 15.6	JULY 7th	50	7.1	6.5	-0.4	-0.3	3.0	-0.1

Direction of the Wind.

1905.	DIRECTION OF THE WIND.															
	From Observations at 9 a.m. and 9 p.m. Daily.								Difference from the Average.							
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
January ...	0	2	6	22	12	14	39	5	- 6	- 2	- 2	- 3	- 8	- 2	+ 23	0
February ...	10	8	0	4	11	19	35	13	+ 2	+ 2	- 11	- 17	- 6	+ 3	+ 20	+ 7
March	6	2	3	18	16	31	19	5	- 3	- 5	- 9	+ 1	+ 4	+ 15	+ 2	- 5
April	7	15	6	21	5	16	9	21	0	+ 5	- 13	+ 5	- 8	+ 5	- 7	+ 13
May	6	5	21	6	13	11	20	18	- 1	- 4	+ 4	- 5	+ 2	- 1	0	+ 5
June	4	22	29	9	5	14	14	3	- 1	+ 16	+ 18	- 2	- 7	- 1	- 11	- 12
July	4	5	4	3	7	21	38	18	- 1	+ 1	- 3	- 6	- 4	+ 3	+ 9	+ 1
August	8	7	15	12	11	10	23	14	+ 2	+ 3	+ 5	0	- 3	- 7	- 1	+ 1
September	11	17	14	6	11	13	21	7	+ 4	+ 12	+ 3	- 11	- 4	- 2	+ 3	- 5
October ..	20	18	5	5	9	2	14	27	+ 11	+ 10	- 6	- 14	- 8	- 10	0	+ 17
November ..	6	20	15	20	15	3	16	5	- 3	+ 12	+ 4	- 1	- 3	- 10	+ 3	- 2
December .	2	2	5	28	23	19	15	6	- 6	- 2	- 3	+ 5	+ 5	+ 4	- 1	- 2
Means	7	10	10	13	12	14	22	12	0	+ 4	- 1	- 4	- 3	0	+ 3	+ 1

Rainfall, &c.

1905.	Total Rainfall.*	Difference from the Average.	No. of days† with Rain (0 or in. or more).	Difference from the Average.	Greatest Fall in One Day.†		Total Duration of Rain.‡	Mean Rate of Rain per rainfall hour.	Mean Level of Subsoil Water. §	
					Amount.	Date.			Hesketh Park.	Birkdale.
	INCHES.	INCHES.			INCHES.		HOURS.	INCH.	INCHES.	INCHES.
January ...	1.65	- 1.05	19	+ 2	0.33	11th	52.0	0.032	43.2	38.4
February ...	1.24	- 0.77	15	0	0.23	26th	31.5	.039	43.9	40.4
March	2.98	+ 0.86	18	+ 3	0.52	10th	60.7	.049	41.8	36.2
April	2.60	+ 0.88	19	+ 6	0.56	6th	54.4	.048	39.8	36.0
May	0.31	- 1.76	6	- 7	0.14	31st	8.0	.039	42.2	39.1
June	1.87	- 0.37	11	- 2	0.86	17th	39.0	.048	48.0	41.9
July	1.75	- 1.45	14	- 1	0.48	26th	36.0	.049	52.4	45.5
August	3.40	- 0.41	17	0	0.87	25th	44.4	.077	54.8	49.1
September..	2.25	- 1.07	15	0	0.91	9th	40.8	.055	53.7	48.6
October ...	2.87	- 0.97	13	- 5	0.62	14th	60.3	.048	53.9	48.3
November..	4.77	+ 1.46	19	+ 2	0.59	11th ||	85.8	.056	48.1	41.3
December...	0.62	- 2.46	10	- 8	0.14	5th	29.3	0.021	42.4	37.7
Totals	26.31	- 7.11	176	- 10	GREATEST, 0.91	SEPTEMBER 9th	542.2	MEAN. 0.049¶	MEAN. 47.0	MEAN. 41.9

* From 9 a.m. on the 1st; including each month the fall during the first nine hours of the succeeding month.

† 24 hours ending at 9 a.m. next day. ‡ From and to 12 midnight each month-end.

§ Mean distance below the surface of the ground. The measurements are made from fixed zeros.

|| And also on the 22nd.

¶ Derived from the year's totals of Rainfall and Duration.

Miscellaneous Phenomena.

1905.	At one or both of the Chief Observing Hours.*					At any Hour.												Total Depth of Snow.	Frost on the Grass.	Frost in the Screen	Ice on the Lake
	Thick Fog	Slight Fog or Haze.	Sky Haze.	Clear Air.	Clear Sky.	Gales. †	Solar Halos.	Lunar Halos.	Thun- der Storms ‡	Light- ning only.	Hail.§	Snow.									
	No. of Days.	No. of Days.	No. of Days.	No. of Days.	No. of Days.	No. of Days.	No. of Days.	No. of Days.	No. of Days.	No. of Days.	No. of Days.	No. of Days.	INCHES.	No. of Days.	No. of Days.	No. of Days.					
January ...	0	12	11	16	3	12	0	1	0	0	4	2	1.5	15	10	13					
February ...	1	8	7	20	8	9	0	1	1	0	6	0	0.0	12	5	4					
March	0	7	13	24	10	7	4	3	0	0	1	0	0.0	11	1	1					
April	2	6	9	20	5	5	0	0	0	0	3	3	2.8	13	5	0					
May	0	1	6	27	15	1	4	0	0	0	0	0	0.0	7	0	0					
June.....	0	0	9	22	13	1	3	1	2	0	0	0	0.0	2	0	0					
July	0	3	4	28	12	2	1	0	2	0	1	0	0.0	0	0	0					
August.....	0	1	6	23	5	3	0	0	2	0	0	0	0.0	0	0	0					
September..	1	4	9	24	9	5	1	0	0	0	0	0	0.0	2	0	0					
October ...	0	7	10	19	14	8	0	0	0	1	1	0	0.0	14	7	0					
November..	5	13	9	14	4	2	0	1	0	0	0	0	0.0	15	6	6					
December..	4	13	17	14	5	2	0	0	0	0	0	0	0.0	12	2	0					
Totals	13	75	110	251	103	57	13	7	7	1	16	5	4.3	103	36	24					

* i.e., 9 a.m. and 9 p.m. † 30 miles or upwards of wind movement in the case of one or more of the ordinary hourly tabulations of the charts from the Dines Anemometer.

‡ Including both Thunder-only, and Thunderstorms. § Including "Soft Hail."

Marshside Anemograph Results.

1905.	DIRECTION OF THE WIND. From the Hourly Tabulations of the Charts from the Baxendell Recording Anemoscope.								MOVEMENT OF THE WIND. Per Dines Recording Pressure Tube Anemometer.*				PRESSURE OF THE WIND. †	
	Frequency Percentages.								Mean Daily Movement.	Difference from the Average.	Max. for 1 Hour. Mean Daily.	Absolute Monthly.	Mean Daily Max.	Absolute Monthly Max.
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Miles.	Miles.	Miles.	Miles.	Lbs. per square foot	
January ...	1	2	7	24	10	16	35	5	455	+ 75	26	46	5.2	14.8
February ...	10	6	1	5	7	23	37	11	454	+ 108	27	43	5.5	16.9
March	4	4	2	18	17	22	27	6	366	+ 18	24	40	†	14.2
April	6	13	9	16	10	13	14	19	347	- 16	22	38	†	†
May	5	11	15	10	10	12	15	22	286	- 17	18	31	†	5.1
June	6	20	27	8	7	11	13	8	298	+ 3	20	32	2.7	6.6
July	2	4	6	9	6	14	41	18	308	+ 1	21	34	2.8	5.6
August	9	4	14	13	12	9	27	12	320	- 5	21	46	3.5	12.3
September	12	13	12	8	8	13	23	11	353	+ 31	22	39	3.5	9.4
October ...	23	14	5	5	8	4	15	26	352	+ 7	23	42	3.7	11.5
November	8	20	10	22	16	7	12	5	286	- 64	19	56	3.1	18.6
December	1	2	6	28	23	20	15	5	324	- 53	19	33	2.8	6.2
Means	7	9	10	14	11	14	23	12	346	+ 7	22	HIGHEST. 56	...	HIGHEST 18.6

* With one-inch connecting pipes.

† From the indications of a Dines-Baxendell Non-Oscillating Pressure Plate Maximum Anemometer.

‡ Instrument temporarily dismantled.

Evaporation, &c., at Barton Moss.

(Adjacent to Formby Moss).

1905.	Total Rain-fall.	Total Evaporation. Per Symons Tanks.		Level of Downholland Brook, near Mossbridge Railway Station.					
		6-feet square.	3-feet square.	Mean Height above Ordnance Datum.	Highest Level.		Lowest Level.		Dates.
					Height.	Dates.	Height.	Dates.	
	Inches.	Inches.	Inches.	Ft. Ins.	Ft. Ins.		Ft. Ins.		
January	1.45	0.53	0.55	9 6	10 5	17th & 18th	9 2		23rd & 24th
February	1.43	0.83	0.89	9 1	9 4	2nd	8 9		21st
March	2.91	1.77	1.79	9 8	10 11	13th	9 1		3rd to 5th
April	2.41	2.01	2.03	9 4	11 2	8th	8 11		25th
May	0.83	3.35	3.35	9 1	9 9	1st	8 11		22nd to 31st
June	1.91	3.86	3.86	8 11	9 9	18th	8 8		14th to 17th
July	1.99	4.37	4.37	8 10	9 0	2, 3, & 28 to 30	8 9		Various.
August	2.92	3.07	3.12	9 0	9 2	27th & 28th	8 10		2nd & 3rd
September	2.09	1.80	1.88	9 2	9 8	11th	8 11		25th to 30th
October	2.67	1.31	1.30	9 0	9 6	16th	8 10		Various.
November	4.44	0.43	0.36	10 3	13 6	28th	9 1		5th
December	0.63	0.43	0.43	9 9	12 1	1st	9 2		27, 29, & 30
				MEAN.	HIGHEST.	NOVEMBER	LOWEST.		JUNE.
Totals	25.18	23.76	23.93	9 4	13 6	28th	8 8		14th to 17th

Rainfall in the District.*

1905.	COAST LINE.								INLAND.		
	Fleet-wood.	Black-pool.	St. Annes-on-the-Sea.	South-port.	Birkdale.	Blundell-sands.	New Brighton.	Hoylelake.	Rufford.	Barton Moss.	Aughton.
	30 ft.	67 ft.	25 ft.	38 ft.	27 ft.	33 ft.	130 ft.	50 ft.	39 ft.	14 ft.	138 ft.
ALTITUDE.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
January ...	1.39	1.55	1.48	1.65	1.57	1.16	1.16	1.28	1.45	1.45	1.40
February ...	1.03	1.35	1.33	1.24	1.32	1.09	1.00	1.04	1.45	1.43	1.37
March	2.42	2.67	2.45	2.98	3.12	2.87	3.26	2.81	3.17	2.91	2.93
April	2.67	2.57	2.44	2.60	2.55	1.96	2.28	1.87	2.52	2.41	2.39
May	0.78	0.58	0.44	0.31	0.30	0.28	0.33	0.43	0.30	0.33	0.37
June	1.99	2.04	1.93	1.87	2.08	1.54	1.72	2.00	2.52	1.91	2.06
July	1.64	1.56	1.36	1.75	1.89	1.94	2.32	1.73	2.36	1.99	2.13
August	3.55	3.82	3.96	3.40	3.04	2.71	3.08	3.01	2.80	2.92	3.03
September	3.05	2.78	2.70	2.25	2.08	1.45	1.88	1.30	2.20	2.09	2.04
October ...	2.78	2.76	2.64	2.87	2.81	2.76	2.76	2.26	3.42	2.67	2.92
November	3.79	4.45	4.31	4.77	4.45	3.91	3.24	3.63	4.56	4.44	4.76
December	1.14	0.83	0.81	0.62	0.62	0.38	0.46	0.60	0.66	0.63	0.69
Totals	26.23	26.96	25.85	26.31	25.83	22.05	23.49	21.96	27.41	25.18	26.09

* The Results from Fleetwood, Blackpool, St. Annes-on-the-Sea, Blundellsands, New Brighton, Hoylelake, Rufford, and Aughton, given in this Table, have been kindly furnished respectively by the Urban District Council of Fleetwood (per Mr. M. S. Gaultier, Sanitary Inspector); the Corporation of Blackpool (per Dr. F. J. H. Coutts, D.P.H., Medical Officer of Health); the Urban District Council of St. Annes-on-the-Sea (per Mr. W. E. Proctor, Assoc. Royal San. Inst., Sanitary Inspector); T. Mellard Reade, Esq., C.E.; W. Bell, Esq., J.P.; the Urban District Council of Hoylelake and West Kirby (per Mr. T. Robinson, Assoc. Royal San. Inst.); G. Hobkirk, Esq.; and Cecil E. Maples, Esq., F.R.Met. S.

The Stations at Southport, Birkdale, and Barton Moss, are those of this Observatory.

Diurnal Variation of

At Mean Sea Level, and

1905.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
January..	30.250	30.249	30.248	30.246	30.247	30.247	30.250	30.257	30.265	30.267	30.267	30.261
February	30.186	30.182	30.174	30.168	30.166	30.164	30.164	30.173	30.174	30.176	30.179	30.178
March ...	29.670	29.668	29.664	29.662	29.663	29.665	29.672	29.676	29.679	29.684	29.686	29.690
April	29.894	29.888	29.881	29.875	29.872	29.876	29.882	29.884	29.884	29.883	29.883	29.876
May	30.169	30.166	30.161	30.160	30.164	30.168	30.174	30.178	30.181	30.181	30.180	30.179
June	30.027	30.020	30.014	30.011	30.011	30.011	30.012	30.013	30.012	30.011	30.010	30.009
July	30.073	30.069	30.067	30.066	30.069	30.073	30.080	30.085	30.086	30.087	30.088	30.088
August...	29.868	29.864	29.860	29.856	29.855	29.856	29.860	29.862	29.862	29.863	29.864	29.866
Septem. .	29.990	29.986	29.981	29.974	29.971	29.975	29.982	29.986	29.992	29.991	29.987	29.985
October..	30.053	30.048	30.041	30.038	30.037	30.039	30.042	30.050	30.053	30.051	30.050	30.046
Novemb'r	29.665	29.666	29.666	29.666	29.667	29.666	29.671	29.678	29.680	29.680	29.682	29.677
Decemb'r	30.183	30.182	30.180	30.177	30.170	30.170	30.176	30.184	30.195	30.199	30.201	30.194
Means ...	30.002	29.999	29.995	29.992	29.991	29.993	29.997	30.002	30.005	30.006	30.006	30.004

Diurnal Variation

Four feet above Grass, and in

1905.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon.
	°	°	°	°	°	°	°	°	°	°	°	°
January	38.6	38.5	38.5	38.4	38.4	38.4	38.2	38.3	38.7	39.5	40.2	40.9
February	39.9	39.9	39.8	39.5	39.1	39.1	39.2	39.3	40.1	41.6	42.4	43.1
March	41.7	41.4	41.2	40.8	40.8	40.9	41.3	42.5	44.4	46.0	47.4	47.9
April	41.8	41.6	41.4	41.3	40.8	41.2	42.2	43.7	45.2	46.3	47.1	47.7
May	46.8	46.1	45.6	45.3	45.4	46.6	48.8	50.7	52.3	53.6	54.6	55.0
June	52.2	51.4	50.8	50.7	51.7	53.8	56.5	58.7	60.6	62.0	63.1	63.7
July	58.0	57.5	56.9	56.3	56.7	57.8	59.5	61.1	62.3	63.3	64.1	64.4
August	54.9	54.3	53.9	53.5	53.1	53.6	55.1	57.0	58.7	60.1	61.0	61.4
September	51.2	51.0	50.6	50.2	49.8	49.8	50.5	52.1	54.4	55.7	56.7	57.3
October	44.2	43.8	43.7	42.9	42.8	42.6	42.4	43.6	45.4	46.7	48.2	49.2
November	40.0	39.7	39.6	39.6	39.4	39.1	39.1	39.4	40.1	41.2	42.6	43.3
December	41.7	41.5	41.3	41.2	41.2	41.2	41.1	41.1	41.2	41.8	42.9	43.5
Means	45.9	45.6	45.3	45.0	44.9	45.3	46.2	47.3	48.6	49.8	50.9	51.5

Barometric Pressure.

for Gravity of Latitude 45°.

1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Midnight	MEANS.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
30·250	30·240	30·233	30·230	30·230	30·227	30·226	30·227	30·233	30·236	30·239	30·238	30·244
30·171	30·164	30·160	30·158	30·160	30·163	30·165	30·163	30·161	30·163	30·160	30·157	30·168
29·690	29·687	29·688	29·688	29·690	29·695	29·702	29·702	29·702	29·703	29·705	29·704	29·685
29·871	29·867	29·859	29·854	29·851	29·851	29·856	29·863	29·865	29·867	29·863	29·861	29·871
30·177	30·176	30·173	30·170	30·170	30·174	30·180	30·187	30·198	30·200	30·201	30·200	30·178
30·007	30·003	30·001	29·998	29·995	30·000	30·006	30·012	30·022	30·026	30·028	30·029	30·012
30·086	30·084	30·082	30·077	30·073	30·072	30·075	30·076	30·081	30·082	30·081	30·077	30·078
29·866	29·865	29·864	29·859	29·860	29·862	29·871	29·877	29·881	29·883	29·882	29·881	29·866
29·981	29·977	29·970	29·966	29·965	29·968	29·975	29·983	29·985	29·987	29·988	29·985	29·980
30·038	30·030	30·024	30·020	30·019	30·023	30·027	30·029	30·030	30·031	30·031	30·028	30·037
29·673	29·667	29·665	29·667	29·670	29·673	29·679	29·680	29·682	29·685	29·685	29·690	29·674
30·188	30·181	30·180	30·183	30·186	30·187	30·189	30·187	30·188	30·187	30·186	30·185	30·185
30·000	29·995	29·992	29·989	29·989	29·991	29·996	29·999	30·002	30·004	30·004	30·003	29·998

of Temperature.

an enlarged Stevenson Screen.

1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Midn't	MEANS.
°	°	°	°	°	°	°	°	°	°	°	°	°
41·4	41·6	41·2	40·7	40·3	39·7	39·6	39·5	39·4	39·2	38·8	38·9	39·5
43·8	44·1	43·8	43·0	42·4	41·7	41·3	40·8	40·4	40·2	39·5	39·6	41·0
48·1	48·7	48·1	47·7	46·5	45·1	43·8	43·3	43·0	42·7	42·1	41·8	44·1
47·7	48·2	48·4	48·3	47·4	46·5	45·2	44·3	43·6	43·2	42·6	42·3	44·5
55·7	56·0	56·3	56·1	55·6	54·6	53·4	51·5	50·2	49·3	48·3	47·7	51·1
63·8	64·1	64·0	64·0	63·6	62·6	61·2	59·1	57·1	55·5	54·1	53·2	58·2
64·6	64·8	64·7	64·4	64·0	63·4	62·7	61·5	60·6	59·8	59·2	58·7	61·1
61·9	62·0	62·1	61·9	61·4	60·4	59·1	57·9	57·1	56·3	55·7	55·5	57·8
57·3	57·5	57·8	57·5	56·5	55·3	54·3	53·9	53·1	52·7	52·2	51·4	53·7
49·2	49·4	49·2	48·5	47·6	47·1	46·5	46·2	45·5	45·2	44·8	44·4	45·8
44·0	44·0	43·5	42·7	42·3	41·8	41·4	41·0	40·7	40·3	40·2	40·1	41·0
43·9	43·8	43·4	42·9	42·6	42·3	42·2	42·2	42·1	42·0	41·9	41·7	42·1
51·8	52·0	51·9	51·5	50·9	50·0	49·2	48·4	47·7	47·2	46·6	46·3	48·3

Diurnal Variation of Frequency of Values for the Year

	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon.
	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.
N.	23.5	26.5	27.5	29.0	30.5	30.5	30.0	28.5	25.0	25.0	27.0	26.5
N.E.	42.5	41.0	40.5	40.5	36.5	36.5	34.5	36.0	35.5	31.5	27.5	25.5
E.	39.5	40.0	43.0	39.0	41.0	41.5	41.0	35.5	35.0	31.0	32.0	23.5
S.E.	58.5	61.0	65.5	71.5	71.5	69.0	62.0	54.5	50.0	49.5	47.0	46.0
S.	52.5	50.5	41.0	40.5	44.0	51.5	52.5	46.5	43.0	43.5	37.0	35.5
S.W.	45.0	42.5	42.5	44.0	38.0	32.0	39.5	48.5	50.0	39.0	50.0	52.5
W.	67.5	66.5	70.5	67.0	69.0	75.0	74.5	76.0	84.0	99.5	101.0	107.5
N.W.	36.0	37.0	34.5	33.5	34.5	29.0	31.0	39.5	42.5	46.0	43.5	48.0

Diurnal Variation (At Marsh-

1905.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon.
	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.
January	17.7	17.9	18.1	18.6	17.8	17.7	18.3	18.4	19.3	19.0	18.9	19.8
February	18.9	19.0	19.9	18.4	18.6	19.1	18.5	18.8	18.8	19.0	19.5	20.2
March	15.3	15.4	15.2	14.7	14.2	14.3	14.4	14.3	15.3	16.5	16.5	17.0
April	13.4	13.7	13.8	13.5	13.2	13.1	12.6	13.2	14.9	15.8	15.1	16.1
May	10.6	10.1	10.2	10.1	9.7	9.8	10.3	10.9	11.4	11.9	13.0	13.4
June	11.1	10.2	10.1	10.3	10.4	10.3	11.7	12.0	13.0	13.4	13.5	13.8
July	11.3	12.2	12.8	11.9	12.1	12.2	12.6	12.3	12.9	13.0	13.9	13.7
August	12.1	12.2	12.3	12.3	11.9	12.1	12.1	12.3	13.1	14.5	15.5	14.7
September	13.2	13.5	13.6	13.2	13.1	12.2	12.6	13.6	14.5	15.0	16.0	17.2
October	13.7	13.8	13.4	13.5	12.4	12.6	12.2	11.7	12.5	13.0	14.4	16.2
November	13.4	12.5	12.4	12.3	11.6	11.8	11.6	11.4	11.1	11.3	12.3	12.2
December	13.3	12.9	13.4	13.4	13.6	13.8	14.4	14.0	13.6	13.6	13.4	13.6
Means	13.7	13.6	13.8	13.5	13.2	13.3	13.4	13.6	14.2	14.7	15.2	15.7

Winds from Different Directions.

1905 (At Marshside).

1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Midn't	TOTALS.
No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.	No. of Hours.
24.5	22.0	21.5	19.0	23.5	27.5	30.0	24.0	25.5	25.5	26.5	26.5	625.5
28.5	25.5	26.0	29.0	32.5	29.0	33.5	41.0	38.0	33.5	32.5	36.5	813.5
16.5	21.0	25.0	25.5	26.0	31.5	31.5	36.0	40.5	41.5	49.0	42.5	828.5
44.0	37.0	31.5	34.0	33.5	37.0	42.0	40.5	44.0	53.5	53.5	60.5	1217.0
32.0	32.0	34.0	35.0	36.5	31.5	27.5	31.0	41.0	42.5	47.0	47.0	975.0
50.0	53.5	53.0	56.0	54.5	62.0	67.5	66.5	57.0	55.5	49.5	51.5	1200.0
113.5	105.0	103.0	98.0	98.0	91.5	85.5	77.5	73.5	68.0	68.5	64.0	2004.0
56.0	69.0	71.0	68.5	60.5	55.0	47.5	48.5	45.5	45.0	38.5	36.5	1096.5

of Wind Velocity.

side).

1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Midn't	MEANS.
Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.	Miles per Hour.
19.9	20.2	19.8	20.0	19.8	19.8	19.6	20.1	19.0	18.8	18.2	17.8	18.9
20.0	20.1	19.5	19.1	19.1	19.3	18.4	18.1	18.1	17.4	18.1	18.0	18.9
17.1	16.3	16.3	15.7	14.3	13.3	13.7	14.4	15.0	14.8	15.4	15.4	15.2
16.4	16.3	16.6	16.8	16.1	15.4	14.6	14.2	12.8	12.6	13.0	13.9	14.5
13.7	14.4	14.9	15.1	15.0	14.5	13.1	11.8	11.3	10.7	10.2	10.1	11.9
15.2	15.5	14.8	15.0	14.8	14.0	13.3	12.6	11.5	11.1	10.0	10.6	12.4
14.4	14.7	14.5	13.9	13.5	13.4	13.3	12.6	12.7	11.5	11.4	11.3	12.8
14.9	14.6	14.3	14.5	14.9	14.1	13.2	12.8	13.2	13.1	13.2	12.8	13.4
17.5	17.2	17.4	17.1	16.8	15.4	14.9	14.6	13.9	13.8	13.3	13.1	14.7
17.0	17.3	17.7	17.9	17.3	16.9	15.5	14.7	15.1	14.7	14.4	13.9	14.7
12.4	12.3	11.8	11.1	11.5	11.8	11.2	10.9	11.8	11.7	12.8	13.2	11.9
14.0	14.3	13.9	12.7	12.7	12.8	13.1	13.4	13.4	13.5	13.4	13.8	13.5
16.0	16.1	16.0	15.7	15.5	15.1	14.5	14.2	14.0	13.6	13.6	13.7	14.4

Diurnal Variation of

1 foot 6 inches

1905.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon.
	Total Hours	Total Hours	Total Hours	Total Hours	Total Hours	Total Hours	Total Hours	Total Hours	Total Hours	Total Hours	Total Hours	Total Hours
January	2.2	2.8	1.8	1.2	1.4	3.3	3.2	1.8	1.3	2.2	1.2	1.5
February	1.9	1.8	1.3	1.3	1.6	2.1	1.7	2.3	1.9	0.6	0.8	0.8
March	4.5	4.8	4.5	3.4	3.3	2.9	2.1	2.5	2.3	1.8	2.4	1.9
April	2.2	3.0	3.0	2.6	3.4	4.3	2.7	3.1	3.2	1.5	0.6	1.9
May	0.8	0.3	0.2	0.0	0.2	0.2	1.1	1.8	0.8	0.8	0.1	0.7
June	1.7	1.4	2.1	2.5	1.4	1.2	1.3	1.1	2.3	3.6	2.6	1.3
July	2.8	2.9	2.2	1.6	1.5	0.7	1.0	2.6	1.5	0.7	0.2	1.3
August	2.2	2.1	2.1	2.2	2.3	3.2	3.2	2.0	1.2	0.9	1.0	0.7
September	0.1	1.2	1.6	1.7	1.7	2.6	3.0	3.2	2.3	2.6	2.4	2.0
October	3.2	3.1	2.6	2.6	1.9	3.2	3.3	1.3	1.4	1.1	1.5	1.3
November	2.7	1.9	2.9	4.0	3.6	2.1	3.9	3.3	2.9	3.4	3.3	3.8
December	1.1	2.8	1.3	0.2	0.1	1.0	0.9	1.6	1.4	1.5	0.7	1.6
Totals	25.4	28.1	25.6	23.3	22.4	26.8	27.4	26.6	22.5	20.7	16.8	18.8

Diurnal Variation of

1 foot 6 inches

1905.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon.
	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
Totals	1.08	1.13	1.00	1.16	1.30	1.26	1.30	1.24	0.95	1.25	0.75	0.68

Duration of Rainfall.

above the ground.

1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Midn't	TOTALS.
Total Hours.	Total Hours.	Total Hours.	Total Hours.	Total Hours.	Total Hours.	Total Hours.	Total Hours.	Total Hours.	Total Hours.	Total Hours.	Total Hours.	Hours.
2.5	2.5	1.7	0.5	0.9	2.9	2.3	2.3	2.6	4.4	2.8	2.7	52.0
1.4	1.2	1.3	0.6	0.5	0.9	1.3	1.5	1.9	0.5	0.8	1.5	31.5
0.6	0.8	2.3	2.4	1.3	2.0	2.7	2.7	1.6	2.2	2.2	3.5	60.7
2.8	2.6	1.2	1.3	1.6	0.5	0.8	1.6	3.5	2.5	1.8	2.7	54.4
0.1	0.0	0.0	0.1	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.2	8.0
1.8	1.4	0.6	0.3	1.0	0.2	1.1	0.5	0.8	2.0	3.4	3.4	39.0
1.1	1.2	0.8	1.3	1.8	2.8	0.6	1.2	0.6	1.8	1.7	2.1	36.0
0.8	1.6	1.5	1.3	1.3	3.2	3.0	1.4	2.0	0.8	1.4	3.0	44.4
2.5	1.9	1.0	1.0	0.8	0.4	2.0	1.9	1.1	0.8	1.9	1.1	40.8
3.2	2.1	2.7	3.7	4.0	3.7	3.4	2.3	2.1	1.1	2.2	3.3	60.3
3.5	5.3	4.1	4.7	4.2	3.9	3.5	4.5	2.7	2.7	3.8	5.1	85.8
2.0	1.6	1.0	1.6	2.0	0.7	0.9	0.9	1.7	1.3	0.8	0.6	29.3
22.3	22.2	18.2	18.8	19.7	21.5	21.6	20.8	20.6	20.1	22.8	29.2	542.2

Amount of Rainfall.

above the ground.

1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Midn't	TOTAL.
Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches.
1.10	1.00	1.00	0.92	0.80	1.35	1.66	0.95	0.88	0.71	1.33	1.60	26.40

Extremes for the Year.

1905.

The highest *observed reading* of the Barometer at Southport during the year 1905, (corrected, and reduced to 32 degrees, at mean sea level, for gravity of latitude 45°) was 30.963 inches on both January 28th, at 9 p.m., and 29th, at 9 a.m. The lowest was 28.665 inches on March 15th, at 9 a.m. The (corrected, &c.) *absolute extremes*, as deduced from the Barograms, were, respectively, 30.990 inches on January 28th to 29th, at midnight; and 28.610 inches on March 15th, at 8 a.m.

The highest temperature registered in the Stevenson-Screen during the year was 82.5 degrees on July 9th. The lowest was 19.8 degrees on November 19th.

The highest reading of a black-glass-bulb solar radiation maximum thermometer in open air was 91.7 degrees on July 9th. The highest reading of a blackened-bulb thermometer *in vacuo* was 128.3 degrees on July 11th. The greatest difference between the maximum indications upon the same day of the bright-bulb and the blackened-bulb thermometers *in vacuo* was 42.8 degrees on May 11th.

The lowest temperature registered on the grass by a *sensitive* terrestrial radiation minimum thermometer was 13.1 degrees on November 19th.

The greatest general thickness of the ice over the large lake in Hesketh Park was 1.4 inches on January 22nd, and November 20th and 21st.

The day of highest mean temperature of the air was July 14th, and the value for that day was 66.1 degrees. The day of lowest mean temperature was November 18th, and the value for that day was 26.6 degrees.

The greatest range of temperature in the Thermograph Stevenson-Screen upon one civil day was 29.6 degrees on June 12th. The least was 2.1 degrees on January 22nd.

The greatest difference between the mean temperatures of any two consecutive days was a decrease of 8.3 degrees from January 25th to 26th.

The lowest and highest 9 a.m. temperatures of the ground, at the depth of *one* foot below the surface, were, respectively, 33.9 degrees from January 22nd to 24th, and 69.0 degrees on July 15th. The extremes at a depth of *four* feet

were 38.8 degrees on January 29th, and 62.2 degrees on July 24th; those *ten* feet beneath the surface, 44.2 degrees on March 12th, and 55.9 degrees from August 16th to September 16th; and those *twenty* feet underground, 47.84 degrees on both May 1st and 2nd, and 51.29 degrees on both October 22nd and 24th.

The lowest relative humidity of the air, at either 9 a.m. or 9 p.m., was 49 on both June 15th and 25th, at 9 a.m. Complete saturation was recorded on only 2 occasions.

The greatest duration of bright sunshine, per Campbell-Stokes recorder, upon one day was 15.6 hours on July 7th.

The greatest duration of rainfall upon one civil day was 15.7 hours on November 5th. The heaviest fall was 0.82 inch on June 18th.

The heaviest fall of rain in any one "rainfall day" (*i.e.*, 24 hours ending at 9 a.m. next day) was 0.91 inch on September 9th.

At the Marshside Anemograph Station, the greatest total movement of the wind in one civil day was 890 miles (actual) on October 4th. The greatest movement in one hour was 56 miles on November 26th to 27th, at midnight, the direction at the time being N.W. The rate of movement during the strongest momentary gust was 77 miles per hour on November 26th to 27th, at midnight, the direction being N.W. The maximum pressure of the wind on a circular plate, one square foot in area, as registered by the new Non-Oscillating Pressure Plate Anemometer, was 18.6 lbs. for the square foot, on November 27th.

At the Barton Moss Station, the largest amount of evaporation in one day was 0.21 inch on July 16th.

Main Features of the Months.

1905.

JANUARY.

A decidedly dry month, with a very high mean barometric pressure; but, nevertheless, stormy generally, westerly winds being unusually prevalent. Mean temperature practically normal, being only 0.4 degree above the local average. Frost in the Stevenson-Screen on 10 days; and upon the grass or snow on 15 days. Total sunshine 2 hours below the average. Total rainfall 1.05 inches under the average. Underground water level unprecedentedly low for January.

Strong gales on the 6th and 9th, and moderate or fresh gales on 10 other days. Snow on the 1st and 16th, the total depth for the month being 1.5 inches. Hail on the 5th, 9th, and 12th; and soft-hail on the 25th. Hoar-frost (at either 9 a.m. or 9 p.m.) on 7 days. Ice upon the lake in Hesketh Park on 13 days, the greatest thickness being 1.4 inches on the 22nd. A lunar halo on the 12th.

FEBRUARY.

An anomalous month; very stormy, and somewhat mild, westerly winds again greatly predominating; but, on the other hand, unusually dry and sunny, with a high mean barometric pressure. Mean temperature 2.4 degrees above the average. Frost in the Stevenson-Screen on 5 nights; and upon the grass on 12 nights. Total sunshine 20 hours above the average. Total rainfall 0.77 inch below the average. Underground water level, even more remarkably low than in January. Mean daily movement of the wind so much as 108 hours above the average. Ozone very abundant.

Strong gales on the 1st and 27th, and moderate or fresh gales on 7 other days. A slight thunderstorm on the 27th. Hail on 6 days. Hoar-frost on 5 days. Ice upon the lake in Hesketh Park on 4 days. Bright aurora on the evening of the 3rd. A lunar halo on the 15th. Slight fog on the 8th.

MARCH.

A month characterised by an unusual prevalence of south-westerly winds. Mild, and very sunny; but, nevertheless, rather wet. Mean temperature 2.9 degrees above the average. Frost in the Stevenson-Screen on 1 day; and upon the grass on 11 days. Total sunshine 34 hours above the average. Total rainfall 0.86 inch in excess of the average. Underground water level, however, again unprecedentedly low.

Moderate or fresh gales on 7 days. Hail on the 7th. Hoar-frost on 1 day. Ice upon the lake also on 1 day. Aurora on the evening of the 2nd. Solar halos on 5 days; and lunar halos on 3 days.

APRIL.

An exceptionally sunless April; and decidedly wet. Mean temperature 1.3 degrees below the average. Frost in the Stevenson-Screen on 5 days; and upon the grass on 13 days. Total sunshine 46 hours below the average. Total rainfall 0.88 inch above the average. Underground water level still exceptionally low.

Moderate or fresh gales on 5 days. Snow on the 6th, 7th, and 8th; the total depth being about 2.8 inches. Hail on the 5th, 23rd, and 24th. Slight fog on the nights of the 8th and 10th.

MAY.

The driest May during the 34 years' local record. Atmospheric pressure high, and unusually steady. Mean temperature 0.3 degree above the average. Frost upon the grass only, on 7 nights; so low a temperature as 23.2 degrees being registered on the 23rd. Total sunshine 6 hours above the average. Total rainfall 1.76 inches below the average, and 0.23 inch less than the smallest amount previously recorded for May (viz., in 1896).

A moderate gale on the 2nd. Solar halos on the 9th, 10th, 24th, and 27th.

JUNE.

A month chiefly characterised by a very unusual prevalence of north-easterly and easterly winds, occasioning an abnormally dry atmosphere, little cloud, much sunshine, and the largest mean daily range of temperature recorded since a Stevenson-Screen was brought into use in 1888. Mean temperature 1.2 degrees above the average. Frost upon the grass alone, on the early mornings of the 9th and 11th. Total sunshine 33 hours above the average. Total rainfall 0.37 inch below the average.

A moderate gale on the 21st. A brief, but severe, thunderstorm on the afternoon of the 18th, several buildings being struck and damaged by lightning; thunder-only on the 19th. Solar halos on the 1st, 17th, and 20th; and a lunar halo on the 15th.

JULY.

An unusually warm and sunny month, and decidedly dry. An almost continuous prevalence of *sea* winds, of normal strength. Mean temperature 2.3 degrees above the average. A rather hot period from the 8th to the 14th, both inclusive, but no higher temperature experienced than 82.5 degrees, on the 9th. Total sunshine 28 hours above the average. Total rainfall 1.45 inches below the average. Total evaporation exceptionally large.

A moderate gale on the 18th, and a fresh gale on the 30th. Thunder on the 2nd, and a slight thunderstorm on the 9th. Hail on the 2nd. A solar halo on the 21st.

AUGUST.

A dull month, with a low and unsteady barometer; but fairly normal in nearly all other respects. Mean temperature 0·7 degree below the average. Total sunshine 26 hours less than the average. Total rainfall 0·41 inch below the average. Underground water level exceptionally low.

A strong gale from the west-south-westward on the 19th; and moderate to fresh gales on the 14th and 18th. Thunder on the 4th; and a slight thunderstorm on the 22nd.

SEPTEMBER.

Dull and cool throughout, but with south-westerly winds and gales and excessive rainfall during the first fortnight, and light north-easterly winds and a practically complete absence of rainfall during the remainder of the month. Mean temperature 2·0 degrees below the average. Frost upon the grass on 2 nights. Total sunshine 29 hours less than the average. Total rainfall 1·07 inches under the average.

Moderate or fresh gales on 5 days. A solar halo on the 18th. Slight fog on the morning of the 27th.

OCTOBER.

A normal month during the first fortnight and towards the close, but remarkably cold from the 16th to the 26th, under the influence of dry north-north-easterly winds. Exceptionally sunny during the cold period. Mean temperature 3·3 degrees below the average. Frost in the Stevenson-Screen on 7 days; and upon the grass on 14 days. Total sunshine 23 hours above the average. Total rainfall 0·97 inch below the average. Mean underground water level lower than in any previous October since the record commenced.

Strong gales on the 4th and 5th, and moderate or fresh ones upon 6 other days. Lightning, and also hail, on the 4th. Hoar-frost on 4 days.

NOVEMBER.

A month characterised by an abnormally low mean barometric pressure, and an excessive rainfall; yet also by remarkably light winds, except on one day, and by a low mean temperature, due mainly to a brief period of severely cold weather during the third week (particularly from the 17th to the 20th). Mean temperature 2·9 degrees below the average. Frost in the Stevenson-Screen on 6 days; and

upon the grass on 15 days. Total sunshine 7 hours above the average. Total rainfall 1.46 inches in excess of the average. An unusual prevalence of easterly airs.

A whole gale from the north-westward on the night of the 26th to 27th, the maximum velocity for one hour being 56 miles for midnight, and the rate of movement during the strongest momentary gust 77 miles per hour. Hoar-frost on 7 days. Silver-thaw on the 18th and 19th. Ice over the lake in Hesketh Park on 6 days. A lunar halo on the 6th. Fog on portions of 5 days. A brilliant display of aurora on the evening of the 15th.

DECEMBER.

In several respects a remarkable month. The driest December during the 35 years' local record; and notable also for a very exceptionally high mean barometric pressure, abnormal equability of temperature (due to the absence of low minima), and the largest amount of sunshine yet recorded in the month. Mean temperature 2.8 degrees above the average. Frost in the Stevenson-Screen on the 30th and 31st only; and upon the grass on 12 days. Total sunshine 22 hours above the average. Total rainfall 2.46 inches below the average.

Moderate gales on the 19th and 31st. Hoar-frost on 4 days. Slight fog on portions of 4 days.

THE YEAR.

A very dry and sunny year. Mean temperature, however, only 0.2 degree above the average: no strikingly hot or cold months; but temperature most above normal in February, March, July, and December; and most below in September, October, and November. Relative humidity of the air very low, and daily range of temperature exceptionally large, in June. Total sunshine for the year, 69.7 hours above the average; only months having definitely deficient amounts, April, August, and September. Total rainfall no fewer than 7.11 inches below the average; only really wet month, November; exceedingly dry in May and December. Water-levels throughout the district remarkably low. Barometric pressure highest during January, February, and December; and lowest in November: yet the stormiest months were January and February, westerly winds being then unusually prevalent; and the calmest month was November! A striking predominance of north-easterly and easterly winds during June.

Thunder or lightning on 8 days only. Hail on 16 days. Snow on 5 days only; the total depth for the year being 4.3 inches. Frost in the Stevenson-Screen on 36 days; and upon the grass on 103 days. Fog on 13 days. Bright sunshine on no fewer than 315 days.

Comparative Statistics for the Year 1905.

STATION.	Mean Temperature.*		Mean Daily Range of Temperature.	Total Rainfall.	Total Duration of Bright Sunshine. †	Authority supplying the Statistics to the Farnley Observatory, Southport.
	The Year.	June to Sept., inclusive.				
Southport	48·6	58·2	11·6	26·31	1624·4	
Other Health Resorts:—						
Keswick.....	48·0	57·4	12·2	47·66	.....	Royal Meteorological Society.
Saltburn-by-the-Sea.....	48·8	58·1	11·5	16·42	1414·8	The Meteorological Office.
Whitby.....	48·3	57·7	10·6	17·84	1433·3	The Meteorological Office.
Scarborough... ..	48·8	58·5	11·4	19·51	1473·6	Royal Meteorological Society.
Douglas.....	48·4	56·7	10·8	36·79	1731·5	The Meteorological Office.
Harrogate.....	47·2	57·3	13·4	24·53	1625·1	The Meteorological Office.
Blackpool.....	48·0	57·3	11·2	26·96	?	Royal Meteorological Society.
Hoylake.....	49·4	58·8	11·0	21·96	1585·2	Royal Meteorological Society.
Rhyl.....	49·4	58·3	12·3	22·47	1626·8	The Meteorological Office.
Llandudno.....	50·0	59·0	10·3	26·05	1577·5	Royal Meteorological Society.
Buxton.....	45·0	55·3	12·3	42·01	.....	Royal Meteorological Society.
Bettws-y-coed.....	48·4	57·1	13·8	40·29	1252·5	The Meteorological Office.
Cromer.....	48·9	59·8	11·1	19·46	1720·1	The Meteorological Office.
Towyn.....	49·8	58·8	11·4	32·57	.....	The Meteorological Office.
Lowestoft.....	48·5	59·7	11·0	21·35	?	The Meteorological Office.
Aberystwith.....	49·7	58·6	8·5	31·37	1536·5	Royal Meteorological Society.
Malvern.....	49·2	59·5	12·5	28·18	.....	Royal Meteorological Society.
Felixstowe.....	49·5	61·0	11·2	19·70	1802·1	The Meteorological Office.
Cheltenham.....	49·3	59·8	12·3	23·79	.....	Royal Meteorological Society.
Clacton-on-Sea.....	49·4	61·1	11·1	16·67	1689·7	The Meteorological Office.
Margate.....	50·4	61·4	10·7	21·06	1584·1	The Meteorological Office.
Bath.....	49·2	59·5	14·6	22·99	1541·1	The Meteorological Office.
Weston-super-Mare.....	50·4	60·2	11·7	23·22	1448·3	Royal Meteorological Society.
Ilfracombe.....	51·5	60·0	7·6	26·78	.....	Royal Meteorological Society.
Tunbridge Wells.....	48·7	59·7	13·7	26·77	1712·4	Royal Meteorological Society.
Folkestone.....	49·9	60·3	10·2	29·54	.....	Royal Meteorological Society.
St. Leonards-on-Sea.....	49·9	60·2	10·8	26·89	1744·3	The Meteorological Office.
Brighton.....	50·5	60·8	10·4	25·30	1676·0	The Meteorological Office.
Worthing.....	49·8	60·3	11·7	24·63	1715·3	The Meteorological Office.
Bognor.....	50·0	59·7	11·0	24·29	1738·2	The Meteorological Office.
Eastbourne.....	50·4	60·5	10·7	28·36	.....	Royal Meteorological Society.
Bournemouth.....	50·3	60·3	12·7	26·75	?	The Meteorological Office.
Sidmouth.....	49·9	58·9	12·0	26·51	.....	Royal Meteorological Society.
Totland Bay.....	50·5	60·3	11·0	24·65	1747·2	The Meteorological Office.
Weymouth.....	51·1	60·4	11·6	21·61	1678·5	Royal Meteorological Society.
Ventnor.....	51·2	60·6	10·5	27·55	1698·3	The Meteorological Office.
Torquay.....	.....	59·9	.....	27·88	1774·1	Royal Meteorological Society.
Newquay.....	51·1	59·1	8·1	23·64	1682·3	The Meteorological Office.
Salcombe.....	50·7	58·9	11·5	31·50	1776·7	Royal Meteorological Society.
Falmouth.....	51·1	59·5	8·8	35·80	1673·8	The Meteorological Office.
Scilly (St. Mary's).....	51·9	59·1	8·0	27·48	1770·1	The Meteorological Office.
Guernsey (Brooklyn) ...	51·5	59·6	8·7	34·12	1757·2	The Meteorological Office.
Jersey.....	52·2	61·6	9·9	30·31	1732·6	The Meteorological Office.
Large Towns:—						
Newcastle.....	48·4	58·0	10·9	18·76	1062·6	The Meteorological Office.
Hull.....	48·6	59·1	13·5	20·19	1029·4	The Registrar General.
Bolton.....	47·7	57·5	11·3	39·19	982·7	Royal Meteorological Society.
Manchester.....	48·7	58·6	12·5	30·98	1024·9	The Meteorological Office.
Sheffield.....	48·7	58·7	11·7	24·40	1431·9	The Meteorological Office.
Nottingham.....	48·4	59·2	14·5	18·59	1404·9	The Meteorological Office.
Birmingham.....	48·2	58·6	12·1	22·29	1171·7	The Meteorological Office.
London.....	50·3	61·6	14·1	22·94	1314·5	The Meteorological Office.

* Mean of daily Max. and Min.

† Per Campbell-Stokes Recorder.

