The Fernley Observatory, Southport : report and results of observations for the year 1896 / Borough of Southport Meteorological Department.

BOROUGH OF SOUTHPORT.

Meteorological Department.

THE FERNLEY OBSERVATORY,

SOUTHPORT.

REPORT,

AND

RESULTS OF OBSERVATIONS,

FOR

THE YEAR 1896.

BY

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

Meteorologist to the Southport Corporation.

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PRINTED BY WILLIAM MILNE, NEVILL STREET.
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TO THE CHAIRMAN AND MEMBERS OF THE PARKS AND CEMETERY COMMITTEE OF THE SOUTHPORT TOWN COUNCIL.

GENTLEMEN,

I beg to lay before you my Report as to the administration of the Meteorological Department during the year 1896; and to it I subjoin, in the usual form, a number of the principal Results of the Observations made in that year within and around the Borough.

The customary routine observations, and the general work of the Department, suffered no perceptible interruption throughout the year.

On January 1st, 1896, the Observatory was equipped with the instruments specified in this place in my Report for the year 1894, with the addition of the Kew-pattern Station Barometer mentioned on page 4 of that Report, and of the Aneroidograph, the Dines Sight-Indicating Pressure Tube Anemometer, and the Evaporation Gauge described on page 5 of the Report for 1895.

Notes descriptive to some extent of the sites, instruments, and methods will as usual, be found immediately preceding and interspersed amongst the tabular results annexed to this Report.

A few remaining forest trees in the vicinity of the Solar Thermometers and of the Observatory were kindly taken away by the Head Gardener, Mr. James Hathaway, on November 17th.

In May, the Fernley Structure and the Stevenson-Screen and sundry small articles were repainted white, both inside and outside; the Stevenson-Screen, &c., received an additional coat on October 21st, the *whiteness* of the exterior of the Screen being a point of importance.

A system of regular *monthly* general-cleaning, re-adjusting, and lubricating was introduced at the Observatory in the course of the year.

At Mr. Dines' suggestion, concentrated sulphuric-acid moisture-collectors were, upon September 10th, connected to the lower parts of the composition pipes of his Pressure Tube Anemometer, with the object of preventing the ozidation of the iron or steel indices necessarily used in this apparatus. At the same time the scales were gilded.

The large Robinson Anemometer, *at the Observatory*, was dismounted on November 5th, and, upon the following day, erected at a height of 5 feet 6 inches above the position to which it had been raised in 1895. This instrument is now decidedly better exposed than formerly, and it is intended that it shall remain at its present level permanently.

The shaft and bearings of the Wind Vane having, in 25 years, become respectively somewhat bent and worn, the instrument was taken to pieces on July 1st. A new and large spread-vane, constructed of light sheet-zinc, and evenly poised, was fixed in position on July 4th.

The (smaller) Anemometer (*at the Pier-station*) was oiled weekly, dismounted and cleaned every six weeks, and repaired when necessary. It appears to me to be a matter for regret that these *small* Robinson Anemometers are employed at so many Meteorological stations; unless frequently inspected by a skilled mechanic, or by a good watch and clock maker, an instrument of this kind will often, quite unknown to an ordinary observer, be yielding very inaccurate results, and this notwithstanding that it may have been regularly oiled.

The Pier Anemometer Pole was rigidly "guyed" by steel-wire ropes, and the hoisting halliards replaced by weldless rivitless brass chains, in the last week of February.

A specially constructed iron arm, containing inner and outer brass pulleys, was attached to the top of the storm signal pole, near the Pier entrance, on January 23rd, for the purpose of permitting the "Cone" to hang vertically. In the same month, a new "Cone" was supplied to the station from the Meteorological Office, London.

Many minor, but more or less important, repairs and alterations to the structures and instruments at the Observatory and the Sub-stations, were effected during the year. Very little special work of this character now remains to be undertaken.

At the commencement of the year an important addition was made to the equipment of the Fernley Observatory, by the purchase of a standard Campbell-Stokes burning Sunshine Recorder, of the Meteorological Office pattern, which was mounted on a suitable rigid support above the roof of the Fernley Structure, in close proximity to our *Jordan* Photographic Recorder, a practically perfect exposure being obtained. In the autumn, a spare reserve instrument, of the same pattern, was procured, in accordance with our rule that all instruments consisting either wholly or partly of *glass* shall be in duplicate. Both of these Stokes Sunshine Recorders were constructed to order by Messrs. Negretti & Zambra, of London. The first, however, was not verified at the Kew Observatory, owing to some unfortunate delay in placing the order, coupled with the desire that the instrument should be brought into use either

on January 1st, or so soon as possible thereafter. The *spare* Recorder, on the other hand, was forwarded to Kew Observatory, and obtained a satisfactory certificate at that institution; and upon the arrival of the latter instrument the former one was immediately replaced by it. It speedily became evident that, from some obscure cause, the indications of the first Recorder had been altogether unsatisfactory. Knowing that with all these instruments, as at present designed, it is absolutely essential that the balls be composed of the best *crown* glass only, it occurred to me that if lead were present in the glass used for our first ball, the matter would probably be fully explained. Upon weighing the balls, the "spare," or Kew certified one, was found to consist of crown-glass, the weight being satisfactory, or about 3 lbs. 1 oz., while the defective one was proved to be a flint-glass ball, its weight being no less than 3 lbs. 14 oz. I have since ascertained that Southport is not the only well-known Station at which a *very material* per centage of the actual bright sunshine has recently been lost through the circumstance of a flint-glass ball being in use, and not having been detected. It is very desirable that all parties purchasing Campbell-Stokes Sunshine Recorders should endeavour to procure them through the Government Meteorological Office, 63, Victoria Street, London, S.W. However, our defective ball was promptly exchanged by the makers for one of crown-glass, and I have had the altered instrument verified at Kew Observatory.

The thin plain sheet-glass with which each of the apertures of the *Jordan* Sunshine Recorder had been covered since the *Twin-Chamber* instrument was procured in the autumn of 1892, was permanently removed on November 10th.

With regard to the difference between the indications of standard Campbell-Stokes burning Sunshine Recorders and those of Jordan photographic Sunshine Recorders, I may state that it is now improbable that, at any normal Station, the excess of Jordan over Stokes values will, *on the average of a year*, amount to materially over 11 per cent. of the Stokes record, *if* the Jordan charts are duly washed (*i.e.* fixed) prior to tabulation. I have, however, satisfied myself that in the case of a typical city or dense town atmosphere during the winter months, and at other times when the sun's altitude is low or the atmosphere particularly hazy, *much* sunshine fails to imprint itself upon the sensitive chart of the Jordan Recorder, and that then the Stokes indications decidedly exceed the Jordan ones. On the other hand, in an exceptionally *wet* (*or* humid) locality, possessing, however, an atmosphere pretty free from suspended foreign matter, the Stokes cards are, at various times, too damp to be very readily or promptly charred by feeble or intermittent sunshine. In a *dry and pure* air the records from the two instruments are frequently practically identical.

Very satisfactory photographic charts for the Jordan Sunshine Recorders are now being supplied by the makers (Messrs. Negretti & Zambra, of London), and the arrangements made by the firm render improbable, for a length of time at any rate,

any perceptible variations in the sensitivity, &c., of the charts.

During the summer months both of our grass spirit Minimum Thermometers, after being read at 9 a.m., were placed in a vertical position, the bulbs being downwards, in a small ventilated cupboard close at hand (in which are kept the graduated glass measuring jars for the Rain Gauges, and other articles). They were allowed to remain there (except on Saturdays and Sundays) until the newspaper reports were despatched in the *early* evening, when the Observer coming on duty for the latter purpose took out these Thermometers, "set" them, and placed them in position. There was, therefore, no possible loss of record of minimum temperature, and yet the difficulties usually arising from the evaporation of spirit were entirely obviated.

In addition to myself, the following persons were employed throughout the year, during some definite portion of their time, as Assistants and Skilled Workmen at the Observatory; their names are arranged alphabetically:—Mr. F. Lees Halliwell, Messrs. E. Miles and J. France, Mr. James Peet, and Mr. James E. Thompson. Mr. Halliwell assists me generally, is responsible for the tabulation of the Observations and for the Computations, and also relieves the Observers upon Saturday evenings and on Sunday afternoons and evenings. Mr. Thompson and Mr. Peet are charged with the making of the daily and other routine observations, and also with the preparation of the *daily* telegraphic and train newspaper reports. Mr. Peet also attends specially to the self-recording instruments. Messrs. E. Miles and J. France are responsible for the cleaning, repair, and maintenance of all the instruments and structures, and for the carrying out of alterations and the erection of new instruments, and they also act as Overseers of the Sub-stations and of the Observers thereat.

At the Pier-station, Mr. Peter Lunt continued to act as the Week-day Observer, the Southport Pier Company, Limited, kindly allowing him to do so. The Sunday observations there were taken by Mr. Miles; and Mr. Peet acted as Deputy Observer, both upon week-days and Sundays. Mr. H. J. Duddell, the Pier Company's Traffic Manager, and Mr. J. Rimmer, their Superintendent of Works, again assisted us in various ways, and also saw that the telegraphic Storm Warnings from the Meteorological Office, London, received due and prompt attention.

The Observations of the Rainfall on Ashurst's Beacon were continued satisfactorily throughout the year. The Gauge remained under the care of Mr. J. T. Graham, of Ashurst's Hall, Dalton, his daughter, Miss L. Graham, being the regular Observer as from January 1st, 1896, in succession to Miss Blenkinsopp. All the woodwork at our enclosure on the Beacon Hill was repainted in February, and the wire-netting fence was substantially repaired on July 3rd.

Through the kind courtesy of the Chief Engineer to the Cheshire Lines Committee, Mr. W. G. Scott, C.E., and of the Agent to the Marquis de Casteja, Mr.

T. Munford, I was enabled, in March, to establish a most useful river or brook-level gauge Sub-station in Downholland Brook, at the point where that watercourse is crossed by a single-span girder bridge carrying the main line of the Southport and Cheshire Lines Extension Railway, near to Mossbridge Station. I arranged with the Foreman Platelayer on that length of the Line, Mr. James Howard, to act as our Observer, and he has since performed his duties in a satisfactory manner. It would be almost impossible to find any site for a river-level gauge Station more truly representative of the whole district, or one in the neighbourhood of which artificial causes operate to a smaller extent in interfering with the natural variations in the level of the streams.

On July 5th, precisely a quarter-of-a-century had elapsed since the specially-designed wooden Louvred Observatory Building on the highest hill in Hesketh Park, and the first set of instruments, all so generously presented to the Borough by the late Mr. John Fernley, of Birkdale, and formerly of Manchester, were publicly conveyed to the Mayor and Corporation of Southport by the present Earl of Lathom (then Lord Skelmersdale), one or two eminent scientists taking part in the ceremony. On the occasion of this 25th anniversary of that event, I prepared a popular description of the present equipment and work of our institution, and I prefixed to it a few historical and personal particulars. This account appeared on Saturday, July 4th, in each of the three local newspapers. Reprints were afterwards submitted to the Editors of the principal Manchester and Liverpool papers.

In the spring, the Secretary of the Government Meteorological Office, London, Mr. Robert H. Scott, M.A., F.R.S., kindly agreed to accept Southport as a Sunshine Station in connection with that Office, and our daily values of Sunshine, from each type of Recorder, have, since March, been forwarded to him by me weekly, the total *from the Campbell-Stokes Recorder* for each week being printed in the *Weekly Weather Report*, and the monthly results in the *Monthly Summary* which forms a supplement to the just-mentioned official publication. In return for our observations, Mr. Scott generously agreed to furnish me in the future with the *Weekly Weather Report*, and its monthly and quarterly supplements and appendices. At a later date, I arranged for the amount of Bright Sunshine to be transmitted to the Meteorological Office *daily*, for insertion also in the *Daily Weather Report;* in return, I have been favoured with copies of the tabulations of the Fleetwood Anemograms. On July 25th, our Sunshine Recorders were inspected by Mr. Frederic Gaster, F.R.Met.S., on behalf of the Meteorological Office, and that gentleman was much pleased with our Station and arrangements generally.

As the year seemed opportune for the purpose, and circumstances for the first time rendered such a course practicable, I formally offered, early in the year, to

supply to the Royal Meteorological Society in future, complete Second-Order Returns. The Council of that Society accepted the offer, and manuscript copies of the requisite observations, &c., from January 1st, have since been forwarded to them. Full results for Southport now, in consequence, regularly appear in the *Meteorological Record*, published quarterly by the Royal Meteorological Society; and, on July 8th, the Observatory was officially inspected by that Society's Assistant-Secretary, Mr. William Marriott, F.R.Met.S., who will, in future, visit it periodically. I have pleasure in reporting that, before leaving, Mr. Marriott expressed himself as being well satisfied, both with the condition of our instrumental equipment and with the manner in which the observations were taken.

A Visitors' Book was made in the summer, and has since been kept in the Fernley Observatory. Several encouraging remarks have already been entered in the book by Mr. Marriott, Mr. Gaster, and other visitors.

The customary weekly and monthly statistical Reports, and the quarterly Comparative Returns, all of which were sufficiently described in my last Annual Report, were regularly prepared for, and published in the *Southport Guardian*, reprints being obtained and distributed as hitherto. The monthly meteorological results for seven other English and Welsh Health Resorts, given in our quarterly Comparative Returns, were courteously supplied to me by Mr. Ernest W. Ellerbeck, F.R.A.S., Borough Meteorologist, Scarborough; Mr. John Farrah, F.R.Met.S., Borough Meteorologist, Harrogate; Dr. A. Jasper Anderson, M.A., Medical Officer of Health, Blackpool; Dr. James Nicol, F.R.Met.S., Llandudno; Mr. Richard Tyrer, B.A., F.R.Met.S., Cheltenham; Mr. Richard Sheward, F.R.Met.S., Borough Meteorologist, Eastbourne; and Mr. Alfred Chandler, F.R.Met.S., Borough Meteorologist, Torquay.

Some comparative statistics, extracted from Appendix B to my Report for 1895, appeared in 1896 in *Gwyn's Guide to Lowestoft.*

During the summer season (Whitsuntide to September 30th) the usual daily popular paragraphs as to the weather at Southport were supplied each evening to the local representatives of the Press Association, the *Liverpool Daily Post*, the *Liverpool Courier*, the *Liverpool Mercury*, and the *Leeds Mercury*. In addition, reports were despatched by train to the *Manchester Courier*, that newspaper defraying the cost of the carriage. The *Manchester Guardian*, the *Bradford Observer*, the *Yorkshire Post*, and the *Birmingham Daily Gazette*, obtained our paragraphs through the Press Association. No information was supplied on Sundays for either the *Liverpool Courier* or the *Manchester Courier*. At the request of the proprietors of the *Sheffield Evening Telegraph and Star*, and at their expense, special telegraphic reports were again, during the season, forwarded each week-day (towards noon) for that newspaper, this

being still the only instance of the extension of this branch of the work to the Evening Press. These latter reports were also regularly inserted in the following morning's *Sheffield Daily Telegraph.*

Sunshine Results were forwarded monthly throughont the year to the Leeds Philosophical and Literary Society, for publication, with returns from other places, in the *Leeds Mercury* and the *Yorkshire Post.*

Exceptional extremes of heat, frost, rainfall, &c., were specially reported to the *Southport Guardian* ; and descriptive notes on the months of 1896 have, since the end of the year, appeared in that newspaper.

In the autumn the usual Table, containing on this occasion our principal local Meteorological Averages for the previous 24 years, was prepared for and inserted in the *Corporation Year Book* for 1896-7.

A copy of the Observations of Rainfall during 1896, and notes on the months and on the principal occasional phenomena, have, since the close of the year, been supplied to Mr. G. J. Symons, F.R.S., the Editor of *British Rainfall*; and during the year, at that gentleman's request, a special monthly Rainfall Return was supplied to him, the total amounts being regularly published in his *Meteorological Magazine.*

Information of a varied character was furnished during the year gratuitously to various persons by whom enquiries had been addressed to me, either through the post, by messenger, or personally. Friendly advice was also given, on various points, to several English Meteorological Observers, at their special request.

The Observatory was more frequently visited by Meteorologists and others than in any previous year.

As the present occasion appeared to be a fitting one for the purpose, I have to some extent re-arranged the general Tabular Results, &c., for the year, which follow this administration report. A little additional matter has also been given ; results of observations of the frequency of Dew and Hoar-Frost, of the Amount of Evaporation, and of the Level of Downholland Brook, appear for the first time ; values of Relative Humidity of the Air *in the Stevenson-Screen* are inserted, and the " Extremes " have been added to and amplified. Finally, the statistical comparison with other English Health Resorts, forming the concluding Table in this volume, has been considerably extended in various directions, and will, I hope, be found of pretty general use.

It gives me much pleasure to remark that the number of Directors of British and Foreign Observatories, Public Officials, and private individuals, by whom we are courteously favoured with copies of valuable Annual and other Reports, Observations

and Results, has materially increased during the year.

May I add an expression of sincere thanks for the friendly attitude adopted by several of the other Officers of the Corporation?

I am, Gentlemen,

Your obedient Servant,

JOSEPH BAXENDELL,

Borough Meteorologist.

Fernley Observatory, Southport.
April 2nd, 1897.

SOUTHPORT

Meteorological Observatory.

RESULTS OF OBSERVATIONS

MADE DURING

THE YEAR 1896.

THE Geographical Position of the principal structure of the FERNLEY METEOROLOGICAL OBSERVATORY is :—Latitude, 53° 39′ 24″ N.; Longitude, 2° 59′ 3″ W.

The Fernley Louvred-Structure (containing one set of Shade Thermometers, and the Fortin and Kew Barometers, the Aneroidograph, and the Ozone Test Papers), and also the Robinson Cup and the Dines Sight-Indicating Pressure Tube Anemometers, the Wind Vane, the Campbell-Stokes and the Jordan Sunshine Recorders, the Evaporation-Gauge and Screen, and the Solar Thermometers, are erected upon the highest hill in Hesketh Park. The Stevenson-Screen, the Terrestrial Radiation and the Underground Thermometers, and the Raingauges, are planted below the hill, upon or in two adjoining and somewhat extensive level lawns.

The Fortin-Standard and Kew-pattern-Station Barometers, the Aneroidograph, the various Thermometers, the Raingauges, and the Sunshine Recorders, have all been verified at Kew Observatory, and each reading is corrected for instrumental errors, *including* (as regards the Thermometers) *gradual zero displacement.*

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

The underground Thermometers are suspended by chains in iron tubes sealed at the lower ends and closed above the grass by copper caps.

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 strictly comparable with those of the Kew Observatory Standard Black-bulb Thermometer *in vacuo.*

The principal observations of Terrestrial Radiation are made by means of a Hicks "Cylinder-Jacket-bulb" Minimum Thermometer—an instrument which, in point of sensitiveness, is considered to be practically equivalent to a Mercurial Thermometer.

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

The photographic traces of the Jordan Sunshine Recorder are "fixed" *before* being measured.

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 cups of the Robinson Anemometer at the Observatory are six inches in diameter, and they are placed upon 18-in. arms. Particulars regarding the Anemometer on the Pier precede the results derived from its readings.

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

The upper edge of the receiver of the Raingauge (a Meteorological-Office-pattern one, eight inches in diameter, and constructed of copper) is one foot above the surface of the ground, and 22 feet above mean sea level; this gauge is read twice daily, viz: at 9 a.m. and 9 p.m. A 5-in. Snowdon Raingauge, similarly placed, is employed for weekly and monthly check observations.

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

The occurrence of Dew and Hoar-Frost is determined by the use of a thick oak board, painted white, and supported by pegs just over short grass, the board being frequently moved to other pegs to admit of the healthy growth of the grass.

Local Mean Time is employed for the Observations.

The Southport Averages (for the various Meteorological Elements), with which a number of the results for 1896 are compared in the following Tables, are (with the exception of the Sunshine values) those for the 24 years 1872-95 inclusive. The adopted *Jordan* Sunshine Averages, however, are those for the five years 1892-6 inclusive. The Campbell-Stokes ones, on the other hand, have been deduced from about ten years' observations at Blackpool, Stonyhurst, and Llandudno.

It seems scarcely necessary to add that the sign + in the columns headed "Difference from the Average" signifies that the 1896 value *exceeded* the average by the amount following the sign, and that the sign — similarly indicates that the result for 1896 was *below* the average to the extent stated.

Every effort has been made to secure accuracy in the computations, in the preparation of the manuscript for the press, and in the printing.

Atmospheric Pressure.*

1896.	MEAN PRESSURE. At 32 deg., and Station Level.	At 32 deg., and Mean Sea Level.	Observed Monthly Range.	Mean of Daily Observed Oscillations.
	INCHES.	INCHES.	INCHES.	INCHES.
January	30·258	30·316	1·715	0·217
February	30·226	30·284	1·129	0·184
March	29·683	29·739	1·686	0·282
April	30·090	30·146	0·825	0·133
May	30·223	30·280	0·608	0·119
June	29·879	29·934	0·746	0·139
July	29·957	30·012	0.740	0·152
August	29·979	30·034	0·718	0·130
September	29·655	29·710	1·732	0·279
October	29·662	29·718	1·344	0 260
November	30·103	30·161	1·465	0·241
December	29·661	29·718	1·526	0·324
Means	29·948	30·004	1·186	0·205

*From observations at 9-0 a.m. and 9-0 p.m. daily; no corrections being applied for diurnal range.

Temperature.

In the Fernley Louvred-Structure.

(For Stevenson-Screen Results, see p. 19).

1896.	Mean Temperature.*	Difference from the Average.	Mean Daily Range.†	Difference from the Average.	Extreme Monthly Range.	Difference from the Average.	Mean Diff. of Daily Mean Temp. from previous day's.
	°	°	°	°	°	°	°
January	41·4	+3·2	6·2	—2·2	25·9	—3·6	2·9
February	40·6	+1·6	8·4	— 0·4	26·7	—1·0	3·5
March	43·4	+2·6	8·8	—2·0	21·9	—9·3	2·3
April	48·1	+2·7	8·1	—5·0	27·7	—5·9	1·7
May	53·7	+3·3	13·6	+0·4	37·5	+3·1	2·0
June	60·8	+4·3	11·4	—1·5	38·5	+3·9	2·1
July	60·2	+1·1	10·1	—1·2	24·3	—4·9	1·6
August	57·8	—1·1	8·7	—2·7	22·5	—7·7	1·6
September	55·9	+0·6	8·7	—3·2	23·9	—7·5	1·8
October	44·4	—3·9	9·2	—1·4	31·2	—0·6	3·4
November	40·3	—2·8	8·6	—0·5	26·5	—2·3	3·2
December	39·3	+0·6	7·1	—1·6	30·0	—0·6	3·2
Means	48·8	+1·0	9·1	—1·8	28·1	—3·0	2·4

*Mean of daily 9 a.m. and 9 p.m. readings of Maximum and Minimum Thermometers, the instruments being "set" at both hours †24 hours ending at 9 p.m.

Underground and Sea-Surface Temperatures; and Sea Disturbance.

1896.	Mean Underground Temperature at 9 a.m. At depth of 1 foot.	4 feet.	10 feet.	Mean Temp. of Sea at Southport Pierhead.*	Mean Temp. of Sea at North-West Lightship†	Mean Disturbance of the Open Sea.*
	°	°	°	°	°	° to 9.
January	40·9	43·2	47·69	40·1	43·6	1·8
February	40·9	43·1	46·54	40·8	43·6	2·0
March	43·4	43·8	46·00	43·8	45·1	3·1
April	49·0	46·9	46·46	49·3	47·6	2·8
May	55·4	51·9	48·33	55·9	53·2	1·6
June	61·5	56·7	50·98	63·2	58·1	2·0
July	62·3	59·4	53·65	62·7	61·8	1·8
August	60·4	59·3	55·27	60·5	61·8	2·7
September	56·7	57·5	55·63	57·0	59·5	2·5
October	47.7	52·5	54·59	48·0	52·9	2·3
November	41·1	46·1	51·63	42·3	48·4	1·7
December	38·8	43·3	48·91	39·6	44·4	2·0
Means	49·8	50·3	50·47	50·3	51·7	2·2

*These results are obtained through the courteous assistance of the Southport Pier Company, Limited. The daily hour of observation is 11 a.m.

†Copies of the observations of Sea-Surface Temperature made at the Liverpool N.W. Lightship are kindly supplied to this Observatory from the Meteorological Office, London.

Solar and Terrestrial Radiation.

1896.	Mean Daily Max. Temp. in Sun. Blackened-bulb *in Vacuo*	Bright-bulb *in Vacuo*.	Black-glass-bulb in Open-Air.	Mean Excess of Blackened bulb *in Vacuo*, over Bright-bulb *in Vacuo*.	Mean Excess of Blackened bulb *in Vacuo*, over *Day-period* Max. in Shade.	Mean Excess of Black-glass bulb *in Open-Air*, over *Day-period* Max. in Shade.	Mean Daily Min. on Short-Grass or Snow.	Mean *Night-period* Depression of Min. on Grass or Snow, below Min. in Screen.
	°	°	°	°	°	°	°	°
January	61·5	49·1	46·9	12·4	17·8	2·8	33·0	3·5
February ..	69·3	52·1	48·3	17·2	24·5	3·4	31·6	3·2
March	86·3	59·9	53·5	26·4	38·8	6·0	33·0	4·1
April	103·0	69·2	61·5	33·8	50·8	9·3	38·5	4·2
May	115·5	80·3	73·4	35·2	55·1	13·0	37·2	6·2
June	121·7	87·4	80·4	34·3	55·6	14·3	48·9	3·9
July	118·4	84·6	78·3	33·8	53·1	13·0	49·7	4·0
August	115·7	81·7	74·2	34·0	53·4	11·9	48·4	3·4
September ..	101·4	74·2	69·1	27·2	41·0	8·6	46·6	3·8
October	87·5	61·6	57·3	25·9	38·2	7·9	33·2	4·1
November ..	67·2	51·1	49·2	16·1	22·6	4·5	28·6	4·5
December ..	56·8	46·2	44·8	10·6	14·3	2·3	29·6	4·1
Means	92·0	66·5	61·4	25·6	38·8	8·1	38·2	4·1

Vapour Tension; Relative Humidity of the Air; and Amount of Cloud.

1896.	Mean Tension of Vapour.		Mean Relative Humidity of the Air.			Difference (at 9 a.m.) from the Average.	Mean Amount of Cloud.			Difference of Mean at 9 a.m. and 9 p.m. from the Average.
	9 a.m.	9 p.m.	9 a.m.	1 p.m.	9 p.m.		9 a.m.	1 p.m.	9 p.m.	
	Inches.	Inches.	Saturation = 100.				0 to 10.	0 to 10.	0 to 10.	
January	0·239	0·241	93	88	92	+5	8·4	8·9	8·6	+1·2
February	·225	·226	89	82	87	+1	8·1	8·6	8·3	+1·1
March	·239	·245	84	78	87	0	8·4	8·4	7·4	+1·5
April	·274	·273	80	75	83	+1	7·6	6·2	7·9	+1·4
May	·314	·322	71	64	80	−5	5·8	4·9	5·3	−1·3
June	·392	·393	70	67	77	−7	7·2	6·6	7·2	+0·1
July..	·403	·411	75	72	81	−4	8·0	6·6	5·8	−0·5
August	381	·382	79	72	81	−2	8·1	7·2	7·8	+0·7
September	·378	·367	84	78	84	+2	8·7	8·7	7·1	+1·4
October	·252	·251	85	78	86	0	7·7	7·8	6·6	+0·2
November	·215	·225	86	81	89	−2	7·9	7·0	5·9	−0·2
December	0·217	0·226	91	87	90	+3	7·9	8·8	7·6	+0·5
Means	0·294	0·297	82	77	85	−1	7·8	7·5	7·1	+0·5

Duration of Bright Sunshine.

1896.	PER STANDARD CAMPBELL-STOKES RECORDER.					PER JORDAN PHOTOGRAPHIC RECORDER.				
	Total Bright Sunshine	Difference from the Average*	Most Sunshine in One Day. Amount.	Most Sunshine in One Day. Date.	Number of Sunless Days.	Total Bright Sunshine	Difference from the Average*	Most Sunshine in One Day. Amount.	Most Sunshine in One Day. Date.	Number of Sunless Days.
	Hours.	Hours.	Hours.			Hours.	Hours.	Hours.		
January	†	..	..	..	..	30	−14	7·0	29*th*	19
February	†	..	..	..	..	27	−31	7·7	9*th*	16
March	†	..	..	..	..	103	−41	12·9	29*th*	8
April	†	..	..	..	..	208	+ 3	12·1	18*th*	1
May	†	..	..	..	..	294	+61	13·8	10*th*	1
June	†	..	..	..	..	251	+ 9	14·0	18*th*	0
July..	†	..	..	..	..	215	−27	13·8	20*th*	0
August	†	..	..	..	..	168	+ 4	12·2	1*st*	1
September	†	..	..	..	..	92	−49	9·0	1*st*	2
October	†	..	..	..	..	92	− 5	8·5	20*th*	2
November	†	..	..	..	..	51	+ 8	7·5	3*rd*	9
December	32	+5	6·0	19*th*	16	27	+ 2	5·6	19*th*	18
Totals	..	..	..	..	..	1558	−80	MOST 14·0	JUNE 18*th*	77

*Approximate Sunshine Averages only are available. [See the Explanatory Remarks preceding these Tables.]

†The *Crown-glass globe Kew-certified* Campbell-Stokes Recorder was not brought into use until November 11th.

Direction and Velocity of the Wind.

1896.	DIRECTION OF THE WIND. (From Observations at 9 a.m. and 9 p.m. Daily.) N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Mean Daily Movement of the Wind.
	%	%	%	%	%	%	%	%	Miles.
January	10	2	3	23	18	13	28	3	171
February	0	0	7	41	19	16	15	2	173
March	1	3	5	14	19	19	29	10	250
April	8	2	8	3	5	18	43	13	218
May	5	4	22	10	4	4	30	21	165
June	2	5	11	11	11	14	25	21	160
July..	8	8	12	8	10	9	23	22	173
August	15	13	7	3	5	7	23	27	193
September	5	7	13	13	15	13	20	14	202
October	23	19	4	5	17	15	12	5	184
November	11	12	18	17	13	11	16	2	141
December	13	3	14	20	13	16	10	11	197
Means	8	7	10	14	12	13	23	13	186

Direction of the Wind; and Amount of Ozone.

1896.	DIRECTION OF THE WIND.—Difference from the Average. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Mean Ozone Registered in 12 hours.
									0 to 10.
January	+ 6	— 4	—10	— 6	+ 3	— 5	+19	— 3	3·4
February	— 7	— 8	— 9	+19	+ 5	— 1	+ 5	— 4	3·2
March	— 6	— 7	— 8	— 4	+ 7	— 1	+17	+ 2	5·8
April	— 1	—15	—10	—13	— 5	+ 5	+34	+ 5	6·4
May	— 2	—10	+10	— 2	— 7	—14	+14	+11	6·5
June	— 2	— 4	+ 1	— 2	— 1	— 7	+ 3	+12	6·1
July..	+ 5	+ 3	+ 5	— 4	— 4	—17	0	+12	5·7
August	+11	+ 6	— 4	—10	— 9	—16	+ 4	+18	5·6
September	0	— 1	0	— 6	+ 2	— 5	+ 5	+ 5	4·6
October	+15	+ 9	— 9	—16	+ 4	+ 1	0	— 4	3·2
November	+ 3	+ 3	+ 4	— 6	0	— 3	+ 6	— 7	1·5
December	+ 8	— 3	+ 1	— 5	0	— 2	— 1	+ 2	1·3
Means	+ 2	— 3	— 2	— 5	0	— 5	+ 9	+ 4	4·4

Rainfall.

1896.	Total Rainfall.*	Difference from the Average.	No. of Days† with Rain (0·005 in. or more).	Difference from the Average.	Greatest Fall in One Day.† Amount.	Date.	Night-p'riod‡ Rainfall, per cent. of Total Fall.
	INCHES.	INCHES.			INCHES.		%
January	0·83	—1·95	12	— 5	0·18	14*th*	60
February	1·03	—0·99	12	— 3	0·31	29*th*	52
March	3·63	+1·50	23	+ 8	0·63	25*th*	58
April	1·07	—0·58	16	+ 3	0·15	16*th*	51
May	0·47	—1·69	4	—10	0·27	21*st*	65
June	1·98	—0·32	13	0	0·49	22*nd*	56
July	3·98	+0·39	13	— 3	1·80	9*th*	34
August	2·38	—1·48	16	— 1	0·94	23*rd*	80
September	4·43	+0·97	25	+10	0·82	22*nd*	48
October	4·92	+0·99	18	0	0·56	4*th*	58
November	1·59	—1·76	10	— 8	0·87	7*th*	19
December	4·37	+1·35	21	+ 3	0·78	29*th*	53
					GREATEST	JULY	MEAN.
Totals	30·68	—3 57	183	— 6	1·80	9*th*	53

*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. ‡9 p.m. to 9 a.m.

Miscellaneous Phenomena.

1896.	At *one or both* of the *Chief Observing* Hours.*								At *any* Hour.						
	Thick Fog.	Slight Fog, and Mist.	Sea Fog.	Sky or Dust Haze.	Clear Air.	Clear Sky.	Dew.	Hoar-Frost.	Solar Halos	Lunar Halos	Thun-der St'ms.	Light-ning only.	Hail†	Snow.	Total Depth of 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.	No. of Days.	No. of Days	INCHES.
January	4	17	23	15	7	1	4	8	2	0	0	0	0	0	0·0
February	0	20	25	24	2	2	8	2	1	2	0	0	0	0	0·0
March	1	10	18	13	9	5	11	1	7	1	1	0	5	1	0·1
April	0	3	9	12	20	1	9	0	7	2	0	0	2	0	0·0
May	0	0	9	20	19	6	4	0	5	1	1	0	1	0	0·0
June	0	1	12	13	20	4	2	0	6	0	4	0	0	0	0.0
July	0	2	7	10	23	6	5	0	4	0	1	0	0	0	0·0
August	0	1	7	9	25	1	10	0	2	0	0	0	1	0	0·0
September	0	8	13	9	18	3	12	0	5	1	2	2	1	0	0·0
October	1	11	11	13	13	7	12	9	1	1	2	1	6	1	1·0
November	4	16	15	20	8	5	11	12	0	2	0	0	0	0	0·0
December	1	18	20	20	6	5	6	13	2	2	1	0	1	0	0·0
Totals	11	107	169	178	170	46	94	45	42	12	12	3	17	2	1·1

*9 a.m. and 9 p.m. †Including "Soft-Hail."

SUPPLEMENTARY RESULTS.

Temperature and Humidity in a Stevenson-Screen.

For the purpose of securing Thermometric and Hygrometric Results, which shall be strictly comparable with those obtained at the various Stations of the Government Meteorological Office, and of the Royal and Scottish Meteorological Societies, a Stevenson-Screen (of the Royal Meteorological Society's pattern) is employed. It is erected at the Observatory, on lower ground than the Fernley Louvred-Structure, thus approximating fairly to the Town level. The bulbs of the Dry, Wet, and Minimum Thermometers are four feet above the grass, and the Maximum is rather lower; the Screen is 50 feet distant from the nearest tree. From Observations made in this Screen, with duly verified Thermometers, the following Results for the year 1896 have been obtained:—

Stevenson-Screen Results.

1896.	Mean* Temperature.	Mean Daily Range of Temperature.	Absolute Extremes of Temperature. Highest. Temp.	Highest. Date.	Lowest. Temp.	Lowest. Date.	Mean Relative Humidity of the Air. 9 a.m.	9 p.m.
	°	°	°		°		Saturation = 100.	
January	41·1	7·2	53·8	27*th*	28·2	10*th*	92	93
February	40·6	9·6	54·0	8*th*	26·3	24*th*	88	87
March	43·2	10·4	55·9	21*st*	32·0	10*th*	83	87
April	48·1	9·3	61·3	24*th*	30·3	2*nd*	81	83
May	52·7	16·8	74·1	11*th*	32·4	1*st*	71	83
June	60·2	13·5	84·6	15*th*	41·9	1*st*	70	79
July	59·8	12·1	73·3	9*th*	43·8	17*th*	75	83
August	57·5	10·1	70·7	1*st*	43·9	27*th*	80	84
September	56·1	10·2	68·5	10*th*	41·9	30*th*	84	86
October	44·2	11·9	62·3	2*nd*	27·5	27*th*	84	87
November	39·8	10·8	50·9	22*nd*	22·0	6*th*	86	90
December	38·9	8·3	54·2	26*th*	21·3	22*nd*	91	89
			HIGHEST	JUNE	LOWEST	DEC.		
Means	48·5	10·9	84·6	15*th*	21·3	22*nd*	82	86

*The Temperatures here given are the means of the daily indications (each for the 24 hours ending at 9 p.m.) of the Maximum and Minimum Thermometers in the Screen.

FROST.—Temperature in the Stevenson-Screen fell to or below 32 degrees in 1896 in January upon 6 days, in February on 8 days, in March on 1 day, in April on 1 day, in October on 9 days, in November on 14 days, and in December on 12 days.

Velocity of the Wind at the Pierhead.

The Anemometer is mounted (by means of a pole) 23 feet above the deck-flooring of the Pier, and at the seaward end of that structure, being over four-fifths of a mile distant from the nearest portion of the Town. The cups of the instrument are three inches in diameter, and the distance from the shaft axis to the centre of each cup is 6·7 inches.

MEAN DAILY WIND MOVEMENT—1896.

January.....315 miles.	May .... 299 miles.	September .....422 miles.
February .....312 „	June .....306 „	October.....350 „
March .....444 „	July ....345 „	November.. .....261 „
April .....385 „	August .....376 „	December .....359 „

Mean for the Year ..... 348 miles.

The greatest movement in one day (24 hours ending at *11 a.m.*, this instrument not being easy of access in the evening or during the night-time) was 901 miles on January 15th to 16th. The least was 58 miles on January 6th to 7th.

Evaporation; and Well and River Levels.

1896.	Total Evaporation.*	Mean Level of Subsoil Water.† At the Observatory.	Mean Level of Subsoil Water.† At Birkdale.	Level of Downholland Brook.‡ Mean Height.§		Highest Level. Height.		Highest Level. Date.	Lowest Level. Height.		Lowest Level. Date.
	Inches.	Inches.	Inches.	Ft.	Ins.	Ft.	Ins.		Ft.	Ins.	
January	0·97	38·4	35·4	‖		..		..	..		..
February ..	1·23	40·7	38·6	‖		..		..	..		..
March	2·11	38·1	31·6	‖		..		..	..		..
April	1·99	36·9	34·8	9	4	9	11	1*st*	9	0	25*th*
May	3·34	42·6	40·4	8	10	9	0	*Various*	8	8	28*th* & 31*st*
June..	3·49	47·9	44·6	8	9	8	11	*Various*	8	8	*Various*
July	3·02	49·7	43·7	8	11	9	4	*Various*	8	9	7*th*
August	2·99	52·7	46·2	8	10	9	2	25*th*	8	8	9*th* & 10*th*
September ..	2·57	51·5	44·1	9	8	11	9	26*th*	8	11	*Various*
October	2·35	42·4	31·6	11	3	13	0	19*th*	10	0	4*th*
November ..	1·36	37·3	32·0	10	7	11	7	9*th*	9	10	30*th*
December ..	1·61	35·3	31·3	11	0	13	10	29*th* & 30*th*	9	10	2*nd* to 4*th*
	TOTAL										
Means	27·03	42·8	37·9	..		..		..	..		..

*In a Stevenson-Screen, painted white, and erected upon the roof of the Observatory.

†Mean distance below the surface of the ground. The measurements are made daily.

‡Near Mossbridge Station on the Southport and Cheshire Lines Extension Railway.

§Above Ordnance Datum.

‖Station only established on March 27th.

Rainfall in the District.

The Statistics from neighbouring Raingauge Stations, for the year 1896, given in the following Table, have been kindly supplied to this Observatory by the Corporation of Blackpool (per Dr. A. Jasper Anderson, M.A., Medical Officer of Health, Blackpool), and Messrs. T. Mellard Reade, C.E., W. Bell, J.P., T. Hobkirk, G. Cooke, and J. Baxendell, by whom Records of Rainfall were kept respectively at Blackpool, Blundellsands, New Brighton, Rufford, Aughton, and Birkdale. The Observer on Ashurst's Beacon was L. Graham, that Station being maintained by this Observatory.

The Observations were chiefly made at 9 a.m., and each monthly entry represents the Rainfall from 9 a.m. on the first of that month to 9 a.m. on the 1st of the succeeding month. At Rufford, however, the Observations were made at 8 a.m.

District Rainfall.

1896.	COASTLINE.					INLAND.		HILLS.
	Blackpool.	Southport.	Birkdale.	Blundell-sands.	New Brighton.	Rufford.	Aughton.	Ashurst's Beacon.
ALTITUDE	59 ft.	22 ft.	29 ft.	33 ft.	130 ft.	39 ft.	150 ft.	538 ft.
	In.	In.	In.	In.	In.	In.	In.	In.
January ..	1·37	0·83	0·77	1·03	1·09	1·76	0·87	0·90
February	1·48	1·03	1·10	1·14	1·13	1·61	1·19	1·27
March....	3·58	3·63	3·69	3·36	3·25	4·07	3·37	3·18
April	1·40	1·07	1·12	1·22	1·10	1·11	1·34	1·28
May.....	0·50	0·47	0·41	0·27	0·34	0·41	0·52	0·41
June	2·26	1·98	1·84	2·75	2·63	2·63	2·26	3·21
July.....	4·15	3·98	3·91	2·59	2·08	2·66	2·70	2·61
August ..	2·67	2·38	2·25	2·05	2·16	2·93	2·86	4·18
September	5·55	4·43	4·95	4·29	4·39	5·32	5·50	5·84
October ..	4·58	4·92	4·76	4·32	3·94	4·80	5·05	4·10
November	1·56	1·59	1·54	1·65	1·23	1·51	1·61	1·32
December	3·78	4·37	4·35	4·08	3·66	4·70	4·05	4·78
Totals....	32·88	30·68	30·69	28·75	27·00	33·51	31·32	33·08

Extremes.

The highest *observed reading* of the Barometer at Southport during the year 1896 (reduced to 32 degrees, at mean sea level) was 31·016 inches on January 9th, at 9 a.m. The lowest was 28·588 inches on March 4th, at 9 a.m. The (corrected, &c.) *absolute extremes*, as deduced from the Aneroidograms, were, respectively, 31·02 inches on January 9th, at 12 noon; and 28·59 inches on March 4th, at 9 a.m.

The highest temperature registered in the Fernley Louvred-Structure during the year was 83·9 degrees on June 15th. The lowest was 23·6 degrees on November 6th. The respective extremes in the Stevenson-Screen were 84·6 degrees on June 15th, and 21·3 degrees on December 22nd.

The highest reading of a black-glass-bulb solar radiation maximum thermometer in open air was 95·7 degrees on June 15th. The highest reading of a blackened-bulb thermometer *in vacuo* was 136·2 degrees on July 6th. The greatest difference between the maximum indications upon the same day of the shade thermometer and the blackened-bulb thermometer *in vacuo* was 69·4 degrees on May 31st. The greatest difference between the maximum indications upon the same day of the bright-bulb and the blackened-bulb thermometers *in vacuo* was 42·7 degrees on May 31st.

The lowest temperature registered on the grass by Hicks' "Cylinder-Jacket-bulb" terrestrial radiation mimimum thermometer was 17·0 degrees on November 30th. This thermometer fell to, or below, 32 degrees in January upon 11 days, in February on 17 days, in March on 9 days, in April on 4 days, in May on 7 days, in October on 15 days, in November on 21 days, and in December on 20 days. [By "day" is here meant "24 hours ending at 9 p.m."—a remark which equally applies to various other parts of this Report.] The greatest general thickness of the ice over the large lake in Hesketh Park was 2·7 inches on December 24th. The lake was covered with ice in January upon two days, in February on two days, in November on four days, and in December on 15 days.

The day of highest mean temperature in the Fernley Louvred-Structure was June 15th, and the value for that day was 71·2 degrees. The day of lowest mean temperature was December 22nd, and the value for that day was 29·2 degrees.

The greatest range of temperature upon one day in the Fernley Louvred-Structure was 28·7 degrees on June 15th. The least was 1·9 degrees on November 23rd.

The greatest difference between the adopted mean temperatures of any two consecutive days was an increase of 13·2 degrees from December 29th to 30th.

The lowest and highest 9 a.m. temperatures of the ground, at the depth of one foot below the surface, were, respectively, 35·0 degrees on December 24th, and 64·8 degrees on July 14th. The extremes at the depth of four feet were 41·3 degrees on December 27th, and 60·3 degrees on July 25th; while those at 10 feet beneath the surface were 45·95 degrees from March 11th to 26th, and 55·69 degrees from September 7th to 13th.

The lowest relative humidity of the air at any one of the usual observing hours (viz., 9 a.m., 1 p.m., and 9 p.m.) was 32 at 1 p.m. on June 15th. Complete saturation was recorded on two occasions.

The greatest horizontal movement of the wind in one day at the Observatory was 571 miles on September 23rd. The least was 16 miles on November 24th. The extremes for the Pier-head were respectively 901 miles on January 15th, and 58 miles on January 6th.

The largest daily amount of evaporation was 0·23 inch on June 15th.

The greatest duration of sunshine (per Jordan photographic recorder) upon one day was 14·0 hours on June 18th. The greatest duration of *bright* sunshine (per Standard Campbell-Stokes burning recorder) was not accurately ascertained, in consequence of a *flint*-glass sphere being in use during the summer months, as explained on a previous page.

The heaviest fall of rain in any one "rainfall day" (*i.e.* 24 hours ending at 9 a.m. next day) was 1·80 inches on July 9th,—upon the occasion of a thunderstorm.

Main Features of the Months.

1896.

JANUARY.

A very mild, humid month; but, for the most part, calm and comparatively rainless. Cloudy and rather misty generally. Mean temperature over three degrees above the local January average for the 24 years, 1872-95 (inclusive). Frost registered in the Stevenson-Screen on 6 days only, and upon the grass on 11 days. Daily range of temperature extremely small, the mean for the month being the lowest value yet recorded here for any month whatever. An unusually high mean atmospheric pressure; an absolutely unprecedented maximum of 31·02 inches (at 32° and sea level) occurring at noon on the 9th, and a pressure of 30·88 inches being attained at midnight on the 29th to 30th, the circumstance of two such values having been recorded within a single month being most remarkable. Light winds generally, in direction chiefly south-easterly and westerly; a moderate westerly gale, however, on the 15th to 16th. Mean relative humidity of the air abnormally high, but total rainfall no less than 2 inches under the average. Underground water at an unprecedentedly low level for the time of the year. Much fog and haze, and more cloud than in any previous January since the Observatory was established. A deficiency of ozone. Sea both warm and smooth. Park lake at no time completely frozen over. A brilliant pair of parhelia on the morning of the 9th.

FEBRUARY.

A remarkably cloudy and hazy, but very dry month, light south-easterly winds greatly predominating. Warm throughout the second week; much cooler during various portions of the later half of the month. Mean temperature 1½ degrees above the average. Frost registered in the Stevenson-Screen on 8 days, and upon the grass on 17 days. Mean atmospheric pressure nearly as high as that of the previous month, the occurrence of two consecutive months of such abnormally high pressure being probably unprecedented in this country during much more than the last century. Barometric variations small; but oscillations of mean daily temperature exceptionally extensive. An overwhelming prevalence of south-easterly and southerly winds; in force, light generally. Rainfall an inch below the average, half of the total fall, moreover, occurring on the last day. Underground water at an unprecedentedly low level for the season, —decidedly lower, even, than in the previous month. Either haze or slight fog almost daily, and a large excess of cloud. Only about *half* the customary number of hours of bright sunshine. A deficiency of ozone, due to the prevailing airs. Sea very warm and quiet. Particularly bright zodiacal light on the 9th. A fireball on the 11th.

MARCH.

The wettest and most cloudy March during our quarter-of-a-century's record. Very warm and equable throughout. Mean temperature 2½ degrees above the average. Frost in the Stevenson-Screen on 1 night only, and upon the grass on 9 days. Extreme minimum temperature in the shade remarkably high for March, having in that respect only once (in 1882) been equalled, and never exceeded. Range of temperature, both daily and monthly, much below the normal values. Oscillations of atmospheric pressure, however, very considerable. A general prevalence of westerly to south-westerly winds of varying strength. Moderate gales on the 3rd, the night of the 4th to 5th, the 6th, the night of the 26th to 27th, and during the 28th; a fresh gale on the 16th. Total rainfall over an-inch-and-a-half in excess of the average, and both it and the number of days with rain greater than in any previous March during the 25 years. Underground water rising markedly,—an unusual circumstance at Southport in a spring month. Amount of cloud very excessive; sunshine deficient. An abundance of ozone. Sea exceptionally warm, although several times rough. A brief but severe thunderstorm on the evening of the 24th, a chimney-stack at a house near to the Borough Cemetery being struck by lightning and thrown down. Hail on the 3rd, 4th, 16th, 27th, and 28th; and a few flakes of snow on the 3rd. Frequent solar halos, and, on the afternoon of the 29th, a parhelion. Remarkably brilliant zodiacal light during the evening of the 11th, the light of the Milky Way being as nothing, in comparison.

APRIL.

A strikingly abnormal month, there being a marked absence of the easterly airs which in April are at Southport so common, and, instead, a prevalence of westerly winds quite unprecedented in any month during the quarter-of-a-century's local record. Very warm in the night-time, and exceptionally equable throughout, owing to the sea-breezes. Mean temperature 2¾ degrees above the average. Frost in the Stevenson-Screen on 1 night, and upon the grass on 4 nights, only. Earth and water becoming phenomenally warm for the time of the year, owing to the general absence of frost during the whole of the past winter. Mean daily range of temperature by far the lowest April value in the 25 years, and extreme range during the month also small. Oscillations, both of atmospheric pressure and mean daily temperature, very much below the normal values. An overwhelming predominance of moderate westerly winds. A violent squall on the early morning of the 11th, and a strong gale from the north-westward upon the afternoon of the 12th. Total rainfall nearly three-quarters of an inch below the average, but spread over a fair number of days. Underground water falling naturally. A large amount of cloud, but a good record of sunshine nevertheless. Ozone exceptionally abundant. Sea warmer than in any previous April for which observations are available. Hail on the 11th and 29th. A very fine "fireball" or large meteor on the evening of the 12th.

MAY.

The sunniest month on record. Extremely warm and dry. Mean temperature

3¼ degrees above the average. Frost upon the grass on 7 nights, but none in the Stevenson-Screen. Mean underground temperature, one foot below the surface, higher than in any previous May during the 24 years' local record. Normal mean temperature variability and daily and monthly range. Barometric oscilliations, however, exceptionally small. Light winds generally, but mainly from the westward; easterly airs, however, during a very fine period in the earlier half of the month. A fresh gale off the sea on the early morning of the 20th. Rainfall the smallest May total in the 25 years, and over an-inch-and-a-half below the average; days with rain also the fewest for May during that period. Underground water falling rapidly, and, on the whole, lower than in any previous spring since the observations were commenced. Mean relative humidity of the air very much below the normal value. An unprecedentedly large amount of bright sunshine, the total duration being by far the highest yet recorded at Southport for *any* single month. Ozone again plentiful. Sea-water warmer than in any previous May for which local records are available. Slight thunderstorms, and a fall of hail, on the 20th, after the gale above-mentioned, and a rather destructive frost during the night which followed.

JUNE.

By far the warmest June during the 25 years. Temperature above the average *every* day, after the 1st. A *hot* period from the 13th to 16th (inclusive); the absolute maximum in the Stevenson-Screen (on the 15th) being 84·6 degrees,—the highest June value since the year 1878. Mean temperature of the month 4¼ degrees above the average. No frost upon the grass. Absolute minimum in the Screen abnormally high. Mean one-foot earth-temperature also decidedly higher than in any previous June since the Observatory was established. Daily range of temperature variable, but usually small. A marked predominance of light to moderate westerly and north-westerly winds. A fresh west-north-westerly gale, however, for a short time on the 30th. Rainfall half-an-inch below the average, but fairly well spread in the month. Underground water falling steadily, and, altogether, lower than in any previous June for which local records are available. Mean relative humidity of the air again very much below the normal value. Large amounts of sunshine and ozone. Air very clear during the later half of the month. Mean sea-temperature the highest June value yet recorded at Southport. Thunderstorms on the 4th, 6th, 7th, and 8th: upon the 8th three houses within the Borough were struck by lightning.

JULY.

For the most part a normal month. Mean temperature 1 degree above the average. Daily range of temperature rather small generally. An excess of north-westerly and a deficiency of south-westerly winds. Rainfall half-an-inch above the average, owing to heavy thunder-showers on the 9th (which, it may be added, were followed by nearly a fortnight of rainless weather). Mean relative humidity of the air again low. Satisfactory amounts of sunshine and ozone. Air often extremely clear. Sea very warm during the central part of the month. Some heavy squalls of wind upon

the 4th. Two thunderstorms on the 9th, the accompanying rainfall amounting to 1·80 inches.

AUGUST.

A somewhat chilly month, with an unusually equable temperature, the result of an exceptional prevalence of northerly and westerly winds. Much cloud, and very low *day*-temperatures generally. Mean temperature 1 degree below the average. Range of temperature, both daily and monthly, extremely small. Oscillations of atmospheric pressure similarly inconsiderable. Persistent northerly to westerly breezes of normal strength. Rainfall an-inch-and-a-half below the average, and practically confined to the later half of the month. Underground water at a very low level. A deficiency of sunshine. Ozone pretty abundant. Air many times exceedingly clear. Slight hail on the evening of the 25th.

SEPTEMBER.

The cloudiest and most sunless September on record. Wet, and, in the later half, very stormy. Mean temperature half-a-degree above the average. Warm until the 18th; cool afterwards. But range of temperature (both daily and monthly) extremely small, and day-to-day temperature variability also. Oscillations of atmospheric pressure, however, remarkably extensive, the mean daily value for the month amounting to nearly double the average, and far exceeding the highest previous September result during the 25 years. Lowest (reduced) indication of the barometer during the month, 28·66 inches, at 7 a.m. on the 25th. Light, and, for the most part, land airs throughout the first fortnight; strong south-westerly to north-westerly winds subsequently. Fresh to strong westerly and north-westerly gales on the evening of the 22nd and throughout the 23rd, and during the afternoon of the 25th. Rainfall an inch in excess of the average, and rainy days numerous. Underground water commencing to rise definitely. Amount of cloud the largest September value in 26 years. Little more than half the average number of hours of bright sunshine. Ozone pretty freely present. Sea cooling rapidly; calm during the earlier half of the month, but frequently rough later. Slight thunderstorms on the 9th and 12th; distant lightning on the 13th and 27th. Hail on the 27th.

OCTOBER.

The coldest October, with a single exception (1880), during the quarter-of-a-century's local record. Mean temperature 4 degrees below the average. Frost registered in the Stevenson-Screen on 9 days, and upon the grass on 15 days. Daily range of temperature rather small generally, but day-to-day temperature variability, and oscillations of atmospheric pressure, both greatly in excess of the normal values. Moderate to strong south-westerly winds during the first nine days; light northerly airs and calms afterwards. South-westerly gales upon the 5th and 8th, the latter being much the stronger of the two, and, in conjunction with a low barometer, occasioning an exceptionally high and rather destructive mid-day tide. Rainfall an inch in excess

of the average. A considerable rise in the level of the underground water. Slight-fog, and haze somewhat prevalent. Normal amounts of cloud and sunshine. A great falling off in the amount of ozone during the later part of the month. Sea cooling very rapidly; rough from the 4th to the 9th, moderate to smooth subsequently. Distant lightning on the 4th; brief thunderstorms on the 5th and 10th. A heavy fall of snow, extending over more than 3 hours, on the morning of the 11th—the first definite October snowstorm during the 25 years' local record. Frequent showers of hail on the 4th, 5th, 9th, 18th, 24th (soft hail), and 25th. Dense fog on the morning of the 27th.

NOVEMBER.

A calm, dry, cold month. Mean temperature 2¾ degrees below the average. Particularly low readings from the 4th to the 6th, and on the 17th and 30th. Frost in the Stevenson-Screen on 14 days, and upon the grass on 21 days Range of temperature, nevertheless, moderate. Very light airs generally, variable in direction; keen northerly and easterly breezes occasionally. Rainfall unusually light and nearly 2 inches under the average, half of the total fall, moreover, occurring on one day (the 7th). Level of underground water, however, singularly steady. Very much haze; yet a good record of sunshine. Mean amount of ozone extremely small. Sea quiet and cold. No snow or hail. Ice upon the large lake in Hesketh Park on 4 days, the greatest thickness being 0·7 inch on the 6th. Fog on the 4th, 5th, and 6th; and dense fog on the 17th, trees being coated with rime. Gloom on the morning of the 25th.

DECEMBER.

A rather wet, but otherwise fairly normal month. Mean temperature half-a-degree above the average. Mild weather generally until the 14th, and after the 24th; much lower temperatures during the intervening period. Frost in the Stevenson-Screen on 12 days, and upon the grass on 20 days. Daily range of temperature rather small. Winds very variable in direction, and rarely strong; extremely little air-movement during the colder weather. A moderate south-westerly gale, however, on the evening of the 30th. Rainfall particularly heavy in the last week, and the total for the month nearly an-inch-and-a-half in excess of the average. Days with rain somewhat numerous. Water-level exceptionally high at the close of the year, much of the surrounding country being flooded. A good deal of cloud at the fixed observing hours, but a satisfactory record of bright sunshine nevertheless. Mean amount of ozone remarkably small, being even lower than in November. No snow. A brief thunderstorm and sharp hailstorm, and also a slight earthquake shock on the early morning of the 17th. Ice upon the lake in Hesketh Park on 15 days, the greatest thickness being 2·7 inches on the 23rd to 24th. Fog on the 16th, 22nd, and 23rd. Glazed-frost on the 17th to 18th, and on the morning of the 24th. Gloom upon several occasions.

THE YEAR.

Upon the whole, a very calm, decidedly warm, and slightly dry year; though rather cloudy. Mainly remarkable, however, for an overwhelming predominance of westerly and north-westerly winds, quite unparalleled during the quarter-of-a-century's local record, and occasioning unusual daily and monthly equability of temperature. Mean temperature 1·0 degree above the average derived from the previous 24 years' observations. Mild to very warm *every* month during the earlier half of the year; cold in October and November. Daily range of temperature under the average in *eleven* months, the greatest defect occurring in April, which month was characterised by the most striking excess of westerly winds recorded during any portion of the year. Gales or high winds in March, April, August, and September; very calm weather in November. Ozone abundant during the greater part of the year, but singularly deficient in November and December. Wet in March; rainfall otherwise extremely slight until mid-summer, but normal on the whole subsequently: total fall for the year 3·57 inches below the local average. Mean level of underground water very low. Unprecedentedly sunny in May, but record particularly poor during August and September.

Comparison with Other Health Resorts.

The Climatological Statistics from various English and Welsh Health Resorts, for the whole year 1896, with which Southport Results are compared in the following Table, have been courteously furnished to this Observatory by the Superintendents of the different Stations, who alone are responsible for their accuracy.

The values for Southport are derived from Observations so made and reduced as to be strictly comparable with those from the other Stations, which are all under the control either of the Royal Meteorological Society or of the Meteorological Office.

Results from Bolton, as a Lancashire *Town*, and also a series from the Royal Observatory, Greenwich, kindly supplied by the Astronomer Royal, are given at the foot of the Table.

The Stations (with the exception of Southport, Bolton, and London) are arranged in the order of their Latitude, proceeding, however, from North to South.

COMPARATIVE STATISTICS, **1896.**

STATION.	Mean Temperature. The Year.	Mean Temperature. Summer Half-year April to Sept. inclusive.	Mean Daily Range of Temperature.	Mean Relative Humidity at 9 a.m.	Total Rainfall.	Total Duration of Bright Sunshine. Per Standard Campbell-Stokes Recorder.	Total Duration of Bright Sunshine. Per Jordan Photographic Recorder
	°	°	°	%	Inches.	Hours.	Hours.
Southport	48·5	55·7	10·9	82	30·68	†	1558
Windermere	*	*	*	*	59·58	*	1441
Scarborough	47·8	53·1	10·6	82	22·48	*	1292‡
Douglas	49·0	55·0	11·3	85?	41·72	1575	*
Harrogate	47·6	54·6	12·5	81	28·26	†	1376
Blackpool	48·7	56·1	12 9	81	32·88	§	*
Llandudno	50·2	56·5	10·0	79	30·31	‖	*
Colwyn Bay	50·2	56·4	10·2	76	33·23	†	1685
Buxton	46·1	52·3	14·5	83	51·94	*	976
Lowestoft	48·6	55·6	11·8	80	22·58	*	*
Malvern	49·7	57·6	12·7	81	20·99	*	*
Cheltenham	49·2	57·0	15·6	83	21·54	*	*
Margate	50·1	57·3	11·6	?	28·88	1492	*
Weston-super-Mare	51·4	58·3	10·3	84	24·92	*	*
Ilfracombe	52·0	57·9	8·2	82	31·35	*	*
Tunbridge Wells	48·8	56 3	14·8	80	30·07	1547	1719
St. Leonards-on-Sea	50·2	57·3	11·8	?	30·07	1700	*
Brighton	51·2	58·5	12·2	78	27·84	1774	*
Eastbourne	50·5	57·1	9·8	83	32·56	1673	*
Weymouth	50·9	58·2	10·6	77	21·81	1904	*
Ventnor	50·9	57·9	11·6	78	27·01	†	*
Torquay	51·5	58·3	11 1	80	26·82	1551	1713
Bolton	48·1	55·2	11·4	81	43·81	1027	*
London (Royal Observatory, Greenwich)	50·4	58·2	13·3	78	22·42	1016¶	*

*No Observations. †Instrument acquired during the year. ‡At Scalby, near Scarborough.
§Record incomplete. ‖Record ceased. ¶Amount too small, owing to a defective glass ball.