

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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CCXXIV.]

SEPTEMBER, 1884.

[PRICE FOURPENCE,  
or 5s. per ann. post free.]

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THE THUNDERSTORMS OF JULY, 1884.

TUESDAY, JULY 8th.

SUSSEX.

*Littlehampton.*—T.

HANTS.

*Redlands, Emsworth.*—TS at 2 a.m.

NORTHAMPTON.

*Kilsby, Daventry.*—The railway station was struck about 3 p.m. ; a guard who witnessed it described the appearance as that of a small cloud coming down to the chimney stack, and then knocking down part of the wall.

*Oundle.*—T.

WILTS.

*Pewsey.*—T.

STAFFORD.

*Heath House, Cheadle.*—TS.

WARWICK.

*Coventry.*—A young man named Wheatley was cleaning a tombstone and surrounded by tall elms, when he was struck and rendered unconscious ; his hair was singed, his neck, back, and the calf of his leg were discoloured and badly burnt. Part of the crown of his hat was cut away, and the remainder divided into strips ; the left leg of his trousers was torn from the knee downwards, and his left boot was cut into fragments. A cow and five lambs were killed.

*Leamington.*—A chimney in Sherbourne-terrace was demolished.

LEICESTERSHIRE.

*Ibstock, Market Bosworth.*—At 4.30 p.m. the postal telegraph instrument was struck and rendered useless, the dial being blackened. A gas-pipe was also partly severed.

*Long Whaddon, Melton.*—Mr. Wilkins had a valuable horse killed.

*Loughborough.*—Very severe TS, 4.40 to 5 p.m. ; about 0.50 in. of R in 10 minutes. Three cows were in a field at Meadow-lane, two

were killed, one was in a shed being milked, the other was outside—where the third was is not stated—the man who was milking was struck but recovered.

*Stoney Stanton, Melton.*—About 7 p.m. two houses in the village were struck, and a very large oak tree was shivered.

*Whitwick, Ashby-de-la-Zouch.*—At 4.45 p.m. a large tree at Mr. Stinson's was shivered in fragments, also another at Mr. Biddle's and the chimney of Mr. Reed's house was damaged.

#### NOTTINGHAM.

*Carlton, Worksop.*—Cottage struck, but no one hurt.

#### LANCASHIRE.

*Breeze Hill, Liverpool.*—T L.

*Preston.*—A spinning mill in Derby Street was struck, as was also a boy named T. Ashworth, who was in a hut in a brick field at the top of Miller-road.

#### YORKSHIRE.

*Scarborough.*—TS.

#### WESTMORELAND.

*Shap.*—TS at 9.30 p.m.

#### SCOTLAND.

##### ROXBURGH.

*Hawick.*—T.

##### FIFE.

*Newton Bank, St. Andrew's.*—TS and .35 in. of R in 25 minutes.

### WEDNESDAY, JULY 9th.

#### HERTFORDSHIRE.

*Baldock.*—Telegraphic instruments at the post office deranged. One heifer killed and another temporarily disabled.

*Bygrave, Baldock.*—An oak tree splintered.

*Hitchin.*—It is 20 years since I have had to chronicle such a deluge of rain as we had during the thunderstorm between 1.30 and 3 p.m.

My gauge at Oston Heal (one mile west) collected 1.19 in.

That at Wratten           ...           ...           "           1.75 "

And at Fairfield (three-quarter mile east)           "           2.75 "

The volume of water poured into the river in less than a quarter of a mile killed over 200 fine trout, to the total weight of three to four cwt. ; every fish seems to have been suffocated by the rush of turbid water.--W. LUCAS.

*Stevenage.*—The clock on Colonel Medcalf's house at Aston was struck.

NORTHAMPTON.

*Cold Ashby, Daventry.*—Mr. Evans's cottage struck, the chimney thrown down, and much damage done internally, but a child left on a bed was found uninjured.

*Oundle.*—Some sheep killed.

*Thrapston.*—A party of fishermen were making for shelter under a willow tree, when they saw it split in two by the lightning.

HUNTINGDON.

*Tetworth, Abbotsley.*—A bullock killed.

BEDFORD.

*Sandy.*—Heavy TS.

*Tempsford, Potton.*—Eleven bullocks killed beneath a tree.

CAMBRIDGE.

*Comberton, Cambridge.*—A farm was struck and much damaged, and two pigs were killed.

*Little Gransden, Caxton.*—Two trees struck.

NORFOLK.

*Diss.*—T in afternoon.

*Norwich.*—Two persons in different parts of the town were struck, and rather seriously injured. A chimney was struck in West Pottersgate-street.

*Martham, Yarmouth.*—At 8.45 p.m. Mr. Edmond's thatched barn was struck and ignited.

*Off the Norfolk Coast.*—The steamer "Cambria," on her voyage from London to Dundee, was struck about 7.30 p.m. while passing through Yarmouth Roads: the mast was shattered and other damage was done.

GLOUCESTER.

*Maisemore.*—TS.

HEREFORD.

*Ross.*—TS at night.

STAFFORD.

*Heath Ho., Cheadle.*—TS.

WARWICKSHIRE.

*Keresley, Coventry.*—Twelve sheep killed and several trees struck.

LEICESTERSHIRE.

*Great Bowden, Market Harboro'.*—A horse and a sheep were killed.

*Heather, Ashby-de-la-Zouch.*—Two beasts killed while grazing.

*Loughborough.*—Slight TS about 2.30 p.m.

*Thringstone, Whitwick.*—The chimney of the Vicarage was struck and one room damaged.

NOTTINGHAM.

*East Markham, Tuxford.*—Mr. H. Clark had a cow killed.

*Hodsock Priory, Worksop.*—Very heavy H and R. 2.04 in. in 24 hours. 1.34 in. fell between 3 p.m. and 4.20 p.m.

*Upton, Southwell.*—Mr. Twidale had between 30 and 40 sheep killed under one tree.

*West Drayton, Tuxford.*—Mr. Richards had a cow killed while grazing in an open field.

#### DERBYSHIRE.

*Belper.*—Two villas damaged.

*Ilkeston, Derby.*—A signal box set on fire and the tower of the church damaged.

#### LANCASHIRE.

*Bilsborrow, Preston.*—Three cows in the fields killed.

*Claughton, Garstang.*—The Hall struck and slightly damaged.

*Heaton with Oxcliffe, Lancaster.*—Mr. Cottam had four lambs killed.

*Lancaster.*—Five out of the eight telegraph instruments were damaged.

*Royton, Oldham.*—Five men at work on a reservoir took shelter in a hut, two were killed and the other three injured.

#### YORKSHIRE.

*Bottom Boat, Wakefield.*—An old woman sitting by a cottage fire-place was killed, and her daughter who was near was injured.

*Bramley, Rotherham.*—Railway Station struck and roof ignited.

*Doncaster.*—A girl struck, who remained unconscious more than an hour.

*Howden.*—Mr. Noble had a valuable horse killed, and some hay-cocks on Mr. Simpson's land were ignited.

*Kilton-in-Cleveland, Guisborough.*—Mr. Judson with three men was carting hay, when all were struck by lightning and rendered unconscious.

*Meltham Mills Vic.*—A flash of L passed through the kitchen, melted some gas pipe in the cellar, and ignited the gas.

*Rothwell, Leeds.*—J. Hainsworth, engine driver at the collieries, was walking home with three men, when he was killed and the others were rendered insensible for a few minutes.

*Scarborough.*—TS.

*Stanley, Wakefield.*—Violent TS, a woman killed.

### THURSDAY, JULY 10th.

#### BEDFORDSHIRE.

*The Lodge, Sandy.*—TS.

#### DEVON.

*Cookbury Wick, Torrington.*—TS.

#### YORKSHIRE.

*Normanton.*—Two girls struck, but each eventually recovered.

*Pocklington.*—Mr. Jackson's house at Moor Lane struck, and considerably injured.

DURHAM.

*Whorlton*.—T and heavy R.

NORTHUMBERLAND.

*Unthank Hall, Haltwhistle*.—Heavy TS. with 2·10 in. of R.

SCOTLAND.

LANARKSHIRE.

*Motherwell*.—A cottage struck and some rooms entirely wrecked.

SATURDAY, JULY 12th.

HERTFORDSHIRE.

*Cheshunt*.—Two horses killed.

SUNDAY, JULY 13th.

TS with R at *Heath Ho., Cheadle*, STAFFORD; *Broughton-in-Furness*, LANCASHIRE; *Stanley, Wakefield*, YORKS; *Castle Lodge, Keswick*, CUMBERLAND; *Shap*, WESTMORELAND; *Hawick*, ROXBURGH; *Stronvar* and *Dalnaspidal*, PERTH.

MONDAY, JULY 14th.

TS at *Newton Bank, St. Andrew's*, FIFESHIRE, with 0·07 in. of R in four minutes; *Stronvar*, PERTHSHIRE, at 3.30 p.m.; and *Forsinard*, SUTHERLAND.

TUESDAY, JULY 15th.

TS at *Sandy*, BEDFORDSHIRE, and *Maisemore*, GLOUCESTERSHIRE.

WEDNESDAY, July 16th.

T at *Castle Lodge, Keswick*, and *Newton Bank, St. Andrew's*.

THURSDAY, JULY 17th.

T at *Heath Ho., Cheadle*, STAFFORDSHIRE, and TS at *Loughborough*, at 2.45 p.m.

SATURDAY, JULY 19th.

TS at *Rendlesham Hall*, SUFFOLK, at *Diss*, NORFOLK, and T at *Heath Ho., Cheadle*, STAFFORD.

SUNDAY, JULY 20th.

T at *Castle Lodge, Keswick*, CUMBERLAND.

THURSDAY, JULY 24th.

MIDDLESEX.

*London*.—TS in afternoon.

## SUSSEX.

*Slinfold, Horsham.*—Five horses and two boys at Dedisham farm were knocked down ; three horses were killed, one was blinded, the two boys and the fifth horse recovered.

*Addington, Winslow, BUCKS, and Oundle, T, H, and R ; Rendlesham Hall, SUFFOLK, TS, Diss, TS in afternoon ; Compton Bassett, Calne, T L and H ; Pewsey, WILTS, T ; Ross, HEREFORD, TS at 3 p.m. ; Heath Ho., Cheadle, TSS.*

## WILTS.

*Monckton Deverill, near Warminster.*—Twelve heifers standing beside a rolled wire fence with wooden posts were killed ; they were standing in two lines, nine in one place, and three in another, the distance between the two groups being about 200 yards ; fifteen of the wooden posts were damaged, and one much split. One cow was lying down close to the fencing, and was scarcely injured at all.

## NOTTINGHAM.

*Nottingham.*—A milkman (J. Harris) was killed instantly while serving milk to some men working at a sewer ; his hair was ignited.

TSS also occurred at *Breeze Hill, Liverpool ; Newton Bank, St. Andrew's, FIFESHIRE ; and Brook Lodge, Waterford.*

## FRIDAY, JULY 25th.

## RUTLAND.

*Oakham.*—A flash of L struck the spire of the church, damaging the lightning conductor. It then entered the tower splintering the floor, and passing through entered the church and ignited the gas.

## SATURDAY, JULY 26th.

## LANCASHIRE.

*Haverthwaite, Colton.*—At 8.50 a.m. there was a single flash of L, which struck the Blackbeck gunpowder works, exploded the corning house, killed three men, and ignited the clothes of the fourth.

## ADDENDA.

FRIDAY, 4TH.—*Banbury.*—TS. Animals were killed at several places near. In one discharge the flash is said to have moved slowly. In the course of the storm several trees were blown down or damaged by a revolving gust of wind of almost momentary duration.—*Carlisle.*—Stack struck in Blackfriars-street, and at another house in the same street the gas was ignited ; Crown Inn, Botchergate, chimney struck.

SUNDAY, 6TH.—*Bolton.*—In the morning the Chadwick Orphanage was struck, also a chimney in Castle-street.

# ON THE RAINFALL OF JAPAN.

(Based upon J. J. REIN'S *Japan*. London, Hodder and Stoughton.)

So little is generally known as to the rainfall of this great country, that we have extracted from Rein's book some of the leading facts, converted them into English measures, and arranged them as systematically as practicable.

Stations.	Lat. North.	Lon. East.	No. of years observations.	MEAN RAINFALL IN INCHES.				
				Year.	6 months Oct.-Mar.	6 months April-Sep.	Wettest month.	Driest month.
Tôkio .....	35°40'	139°45'	5	65·40	23·87	41·53	13·27, Sept.	2·29, Jan.
Yokohama	35 26	139 49	7	70·63	24·92	45·71	10·20, Sept.	2·36 „
Osaka .....	34 20	135 19	1	41·06	15·32	25·74	6·77, Oct.	1·42 „
Nagasaki..	32 44	129 42	1	47·95	12·52	35·43	11·02, April	1·06 „
Hakodate.	41 46	140 45	9	51·85	23·03	28·82	8·35, Aug.	2·24, Feb.&Mar
Sapporo ..	43 4	141 23	1	45·40	27·05	18·35	6·61, Oct.	1·54, April

At Yokohama in one year Dr. Mourier collected only 41·66 in. September, 1878, was very wet, 18·98 in. fell at Tokio during the month, and 6·93 in. is reported to have fallen in 30 hours at Yokohama.

In Northern Japan some valleys have much snow, *e.g.*, in the valley of Tetori-gawa, in the province of Kaga, at an altitude of 700-800 metres (2297-2625 ft.) above sea level, 6 metres (19·7 ft.) is usual, and 2 metres (6·6 ft.) is an exceptionally small quantity.

The following table of monthly values consists partly of means and partly of absolute readings, but the third column gives the period over which the observations extended.

Station.	Period of Observation.	Jan.	Feb.	Mar.	April.	May	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Tôkio .....	3 years.	3·35	3·50	4·25	3·07	6·02	7·80	4·17	3·54	13·47	4·88	4·61	2·24	60·90
„ Knipping	1873-77.	2·29	2·48	5·32	3·58	5·47	7·95	5·28	5·98	13·27	7·52	3·35	2·91	65·40
*Yokohama.	1863-69.	2·36	3·31	5·04	6·57	5·83	8·19	8·23	6·69	10·20	6·93	3·46	3·82	70·63
+Osaka .....	Dec'69toJan'71	1·42	1·50	1·53	3·70	5·08	2·83	5·00	3·42	5·71	6·77	2·64	1·46	41·06
Nagasaki ..	1872.	1·06	2·32	3·51	11·02	4·88	5·67	2·60	5·75	5·51	1·18	1·77	2·68	47·95
Hakodate ..	9 years.	5·95	2·24	2·24	2·52	2·48	6·93	2·99	8·35	5·55	4·73	4·33	3·54	51·85
Sapporo ...	1876.	3·31	4·96	3·07	1·54	2·87	3·54	1·93	4·65	3·82	6·61	6·42	2·68	45·40

\* Dr. Hepburn.

+ Dr. Gratama.

## A HEAVY INDIAN RAINFALL.

To the Editor of the *Meteorological Magazine*.

SIR,—Mr. Fred. Chambers, the acting superintendent of the Government Observatory, Bombay, has forwarded to me a copy of your magazine for June, 1884, in which some remarks are made regarding the heavy rainfall which occurred at Bhosawul on the night of 1st July, 1883. As I had already written upon the cause of the Surat floods, Mr. Chambers thought I might be able readily to supply the notes you had invited.

The 15·15 inches of rain which fell at Bhosawul between 6 p.m.

of the 1st and 6 a.m. of the 2nd July last year, were due to a cyclone which crossed the Indian Peninsular from the head of the Bay of Bengal to the head of the Arabian Sea. The following is a brief history of the matter :—On the 26th June the Bengal Meteorological Office reported a cyclone to be forming at the head of the bay, and on the 28th the storm signals were hoisted in Calcutta to give warning that a cyclone was expected to pass inland between Saugor Island and False Point. On the morning of the 29th there had been a rainfall at False Point of over 10 inches, and the barometer at Saugor Island had during the preceding 24 hours fallen one-fifth of an inch, making a total fall of three-fifths in four days. On the 30th the centre of the cyclone had moved inland, and was over the hill districts of Orissa, and the barometer at Saugor Island had risen one-third of an inch. The next day (July 1st) the centre had moved as far westward as Seoni in the Central Provinces, and falls of 4 and 5 inches were reported from the stations about. By the morning of July 2nd, the centre of the cyclone had travelled to the neighbourhood of Indore, and very heavy rain had fallen over the hill districts which give rise to the Taptee and Nerbudda rivers, the heaviest falls having occurred in the Taptee valley. At Chikalda there had been a fall of over 21 inches in the previous 30 hours; at Amraoti they had 10·25 inches in the same period; at Akola 8·81 inches, at Buldana 7·01, and at Bhosawul in the previous 24 hours, they had the 18·25 inches which you have referred to. On the morning of the 3rd the centre was over Kutch, and severe gales were felt in Kattiawar and parts of Guzerat and Rajputana; at Rajkote they had a fall of 9·85 inches of rain during the preceding twelve hours. On the morning of the 4th the centre of the cyclone had moved out into the Arabian Sea, a little to the S.W. of Karachi, where it was encountered by the B. I. S. N. Co.'s steamer "Oriental," with the effect of causing her to lose her awning, some of her sails, and two of her boats. By the afternoon of the same day the storm was lost to further observation.

It was this cyclone which caused the flooding of the Taptee and the submergence of Surat. On the evening of the 3rd the river at Surat had risen 45 feet, higher by 3 feet than it was known to have risen before. The country for miles around was under water; in Surat the ground floors of many of the houses which were approached by flights of six or seven steps were covered with four or five feet of water; the B. B. & C. I. Railway embankments, both to the north and south of Surat, were seriously damaged, and the bridge over one of the Taptee tributaries was carried away; and all this in addition to the damage done to the G. I. P. Railway bridges.

The excessive damage done by this cyclone was due to the accidental position of the track of heavy rain, which was a little on the south side of the Satpura and Maha Deva Hills, thus causing by far the greater moiety of the drainage work to be done by the Taptee. Had the centre been only a little further north, the Nerbudda and Taptee rivers would have had an equal share of the work, and while



of course there must inevitably have been considerable damage done, it would not have been so great as was actually the case.

The rainfall at Bhosawul of 15·15 inches in 12 hours was undoubtedly very unusual; the fall at Chikalda (near Elichpur) of 21·22 inches in 30 hours, was also very heavy.—Yours, &c.,

A. N. PEARSON,

Acting Meteorological Reporter for Western India.  
*Meteorological Office, Bombay, 29th July, 1884.*

## METEOROLOGY AT THE INTERNATIONAL HEALTH EXHIBITION.

*English Climatological Stations.* By G. J. Symons, F.R.S.

The Royal Meteorological Society has equipped a Climatological Station in the grounds of the Health Exhibition, in order that anyone organizing a station may see one arranged in accordance with the regulations of the Society.

The object of the Climatological Station is to determine the elements of the climate of a place, hence only such instruments are used as are necessary for that purpose. From observations of these instruments, the highest, lowest, and mean temperatures, the range of temperature as well as the humidity of any locality, can be obtained. Each of these conditions exerts a great influence on health. This is especially true in the case of range of temperature as two places having the same mean temperature may vary considerably, one having a generally equable temperature, while the other is subject to great extremes of heat and cold.

It was in the hope that stations may be started at as many as possible of the English Health Resorts, that the Royal Meteorological Society equipped the Climatological Station. The Society has established 82 stations, from each of which, returns of observations, made with accurate and verified instruments, are received, and each station is regularly inspected by the Assistant Secretary. The positions of these stations are shown on the accompanying map,\* and from a single glance, it is obvious that there is still room for many more.

*The Equinoctial Gales: Do they occur in the British Isles?*

By R. H. Scott, M.A., F.R.S.

This was a re-examination of the results described in a previous paper on the subject, read before the Royal Meteorological Society,† and it confirmed in every particular the statements then made.

*Some Occasional Winds and their Influence on Health.*

By W. Marriott, F.R.Met.Soc.

All winds may be regarded as caused directly by differences of atmospheric pressure, just as the flow of water is due to difference in level. The air flows spirally outwards from a region of high pressure, in the direction of the hands of a watch, in the northern

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\* The map is exhibited in the Meteorological Annexe at the Health Exhibition.

† See *Met. Mag.*, No. CCXXII. (July, 1884), p. 87.

hemisphere, and spirally inwards in a region of low pressure, in the direction opposite to that of the hands of a watch. The movements are exactly the reverse in the southern hemisphere.

The wind most dreaded in this country is the East wind, it generally blows in the spring for several days together; it is dry, cold, and very penetrating.

“ When the wind is in the East,  
’Tis good for neither man nor beast.”

Such winds blowing over the human body, tend to reduce the temperature of its surface, not only by conduction, but also by evaporating moisture from it, and rendering a large amount of heat latent.

The *Mistral* is a very dry and cold N.W. wind, which blows along the Gulf of Lyons; it is often strong enough to blow a man off his horse.

The *Scirocco* occurs along the North African coast, in Sicily, South Italy, &c.; it is a hot S.E. wind blowing from the Sahara. It is dry on the coast of Africa, but in crossing the Mediterranean it becomes moist; in Sicily it sometimes raises the temp. to  $110^{\circ}$  in the shade.

The *Simoom* occasionally visits the deserts of Kutchee, Upper Scinde, and similarly constituted tracts of country in the East. Sudden and singularly fatal in its effects, invisible and intangible, it passes like a knife through the air, leaving a well-defined narrow track marked by the sudden extinction of life, both animal and vegetable. At the close of the hot weather in 1856, five men were on their way from Kandahar to Shikarpoor, when the blast crossing their path, killed three of them and disabled the remaining two.

The *Hot Wind* is one of the features of the climate of Australia; it blows in November, December and January; it is very hot and dry, but not remarkably unhealthy; its actual temperature varies from  $80^{\circ}$  to  $110^{\circ}$ , but it seldom reaches  $100^{\circ}$ .

*Cumulative Temperature.* By R. H. Scott, M.A., F.R.S.

On the walls of the Meteorological Annexe will be found a series of diagrams, exhibiting for various districts in the United Kingdom the march of Temperature, Rainfall and Bright Sunshine. The object of these curves is to show clearly some of the most important factors in the growth of crops. As regards the three elements represented on the diagrams, the curves for rainfall and sunshine require but little explanation, as the successive steps of the curves show the successive weekly totals of rain or sunshine.

The case as regards temperature is, however, different, and those who examine the diagrams will see that there are two curves, one ascending, the other descending; the one red, the other blue. A certain arbitrary base line is assumed, and the values are measured above or below that line.

It is proved almost beyond a doubt, that each individual cereal requires a definite amount of heat to bring it to maturity. Thus maize requires more than wheat, and wheat again more than barley or oats.

Now various investigators, and notably Boussingault and Prof. Alphonse de Candolle, of Geneva, have devoted much attention to

this subject, and the latter has come to the conclusion that a certain total amount of temperature above a definite base line is necessary for plant growth, and that this "sum of temperature" varies for each crop. He found that plants did not give indications of active vegetation until the temperature rose above  $42^{\circ}$  F., and this temperature is taken as the base for all the diagrams.

Although Prof. de Candolle propounded his views some years ago, at the Vienna Conference in 1874 meteorologists were quite at sea as to how these sums of temp. were to be calculated. This problem has been solved by Lieut.-General Strachey; he proposes to adopt as a unit of temperature, to supply a standard for calculation, one degree continued for the unit of time, either one hour or one day, as the case may be.

Such a unit may be conveniently called an hour degree, or day degree. The unit of time adopted for the calculations to which I am about to refer is a day, and the unit of what may be termed the effective temperature is therefore a *day degree*. A day degree therefore signifies one degree F. of excess or defect of temperature above or below  $42^{\circ}$  F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours.

The first step towards determining this effective temperature in day degrees resolves itself into determining the average temperature for the period under consideration. Most observers record the maximum and minimum temperatures once in 24 hours, and it is found that the mean of these readings is nearly the average for the day. If the max. and min. are both above  $42^{\circ}$  all the accumulated temperature is to the good; it is all on the positive side. If they are both below  $42^{\circ}$  it is all on the negative side; but if one is above and the other below, one portion of the effective temp. is positive, and the other negative.

Now, General Strachey carried out a long series of calculations, based on the observed hourly temperatures at Kew Observatory, and at other stations in the United Kingdom, in order to ascertain the magnitude of the co-efficient by which the difference between either of these extreme temperatures and the base temperature ( $42^{\circ}$  F.) should be multiplied so as to obtain the values of the temperatures in excess or defect of  $42^{\circ}$  F. expressed in day-degrees, and he found that this, *for a weekly period*, was 0.4.

Accordingly we get the following rules:—

If the mean of the day is above  $42^{\circ}$  F., we multiply the difference between the minimum and  $42^{\circ}$  by 0.4 (four-tenths), and call this *the negative effective temperature*.

To find the positive effective temperature we subtract from the difference between the mean for the day and  $42^{\circ}$  the negative effective temperature just determined.

If the mean of the day is below  $42^{\circ}$  F. the proceeding is similar; but we first ascertain the positive effective temperature, and subtract that from the difference between  $42^{\circ}$  F. and the mean, thus obtaining the negative effective temperature.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JAN., 1884.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
°		°		°	°	°	0-100	°	°	inches		0-10	
England, London .....	55·6	29	32·2	1	48·8	39·2	40·3	86	57·1	28·6	2·30	16	7·2
Malta .....	62·6	6	42·7	18	58·1	47·5	44·0	75	119·2	36·0	2·43	9	4·0
Mauritius .....	86·0	9	69·0	30	83·7	73·5	69·4	76	138·5	58·2	5·68	20	6·1
Calcutta .....	82·6	30	50·1	11	76·4	54·8	54·5	73	136·0	39·4	·02	1	1·4
Bombay .....	88·5	7	61·6	29	81·3	65·3	61·3	66	137·4	49·0	·03	1	0·4
Ceylon, Colombo .....	88·8	23	68·8	24	86·4	71·2	66·5	67	146·5	62·0	·06	2	4·0
Melbourne .....	97·8	19	45·1	18	74·0	54·1	50·2	65	156·2	36·0	4·75	11	6·1
Adelaide .....	110·2	13	45·1	21	80·8	59·5	...	46	169·3	40·4	1·71	12	4·2
Wellington .....	70·8	2	45·5	5, 19	64·0	51·6	...	...	139·0	40·0	9·58	18	...
Auckland .....	77·5	9	50·0	4	68·0	55·9	50·6	68	149·0	42·0	1·64	16	6·0
Jamaica .....	88·4	16	63·5	30	84·8	67·5	66·8	78	...	56·5	·75	...	3·2
Barbados .....	79·0	30	66·0	27	77·0	70·0	70·2	82	140·0	63·0	2·01	14	6·0
Toronto .....	40·1	30	-13·1	25	23·1	7·6	14·7	85	100·0	-22·0	3·30	19	8·3
New Brunswick, Fredericton .....	43·9	10	-34·5	29	19·5	-4·7	9·0	86	...	...	3·06	13	4·8
Manitoba, Winnipeg ...	30·0	17	-44·5	3	0·6	-22·0	0·5	86	...	...	·61	8	4·1
British Columbia, Spence's Bridge ...	49·0	8	-9·0	1	30·0	16·4	...	...	...	...	·00	0	...

## REMARKS, JANUARY, 1884.

**MALTA.**—Mean temp. 52°·1; mean hourly velocity of wind 11 miles, on 14th the velocity averaged 30 miles for 7 hours, and on 28th 33 miles for 7 hours; the temp. of the sea fell from 61° to 59°. J. SCOLES.

**Mauritius.**—Rainfall 26 in., mean temp. 0°·6, and mean hourly velocity of wind 0·8 mile below their respective averages. T on every day from 5th to 11th inclusive, and L on 15th. Prevailing wind S.E. to E. by N. The secondary glow has appeared occasionally, and lasted 1 hour 20 min. after sunset. C. MELDRUM, F.R.S.

**Melbourne.**—Mean temp. of air 3°·5 of dew point 2°·6, and mean pressure 30·52 in. below their respective averages; mean degree of humidity 1, amount of cloud 1·0, and rainfall 3·15 in. above their respective averages. Prevailing wind S. and W., strong breezes on 7 days. Dust storms on 5th and 7th; L on 20th. Dull and showery from 20th to 28th, very heavy showers on 21st. R. L. J. ELLERY, F.R.S.

**Adelaide.**—The coldest January (excepting 1868) since 1856, the mean temp. (70°·2) being 4°·6 below the average, and the min. the lowest ever recorded in January. Some hot weather occurred in the first part of the month, but from 19th to 28th it was cold, squally, and showery, with H and T. The red glow was visible on clear evenings throughout the month. C. TODD.

**Wellington.**—Generally showery and squally till 23rd, the wind being frequently strong. On 20th R began, and 5·05 in. fell in 36 hours, doing considerable damage. Fine from 23rd to 27th, then showery. Prevailing wind, N.W.; mean temp. 5°·1 below average; rainfall thrice the average. R. B. GORE.

**Auckland.**—Weather singularly cold and variable, the mean temp. being considerably below the average of previous years. Rainfall comparatively small, but spread over an unusual number of days. T. F. CHEESEMAN.

**BARBADOS.**—The mean temp. (73°·3) was the same as the average of 25 years. The wind was from N.E., and averaged 14·3 miles per day, the extremes being 22·0 miles and 5·3 miles. Four days were overcast. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,  
AUGUST, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger .....	1·73	XI.	Carno, Tybrith ... ..	2·10
„	Margate, Birchington...	·53	„	Corwen, Rhug .....	1·00
„	Littlehampton .....	1·56	„	Port Madoc .....	1·75
„	Hailsham .....	1·90	„	I. of Man, Douglas .....	1·47
„	I. of W., St. Lawrence.	1·12	XII.	Stoneykirk, Ardwell Ho.	1·42
„	Alton, Ashdell.....	2·41	„	Melrose, Abbey Gate...	2·52
III.	Winslow, Addington ...	1·54	XIII.	N. Esk Res. [Penicuik]	1·40
„	Oxford, Magdalen Col...	1·52	XIV.	Ayr, Cassillis House ...	2·26
„	Northampton .....	1·80	„	Glasgow, Queen's Park.	2·71
„	Cambridge, Beech Ho...	1·47	XV.	Islay, Gruinart School..	3·39
IV.	Southend .....	·67	XVI.	St. Andrews, Newton Bk.	2·41
„	Harlow, Sheering ... ..	·95	„	Balquhiddy, Stronvar...	5·66
„	Diss .....	1·19	„	Dunkeld, Inver Braan..	2·23
„	Swaffham .....	2·37	„	Dalnaspidal H.R.S. ...	5·10
„	Hindringham .....	...	XVII.	Keith H.R.S. ....	2·25
V.	Salisbury, Alderbury...	1·38	„	Forres H.R.S. ....	1·18
„	Warminster .....	1·60	XVIII.	Strome Ferry H.R.S...	6·07
„	Calne, Compton Bassett	1·45	„	Lochbroom .....	1·94
„	Ashburton, Holne Vic..	2·01	„	Tain, Springfield.....	2·20
„	Holsworthy, Clawton...	2·72	„	Loch Shiel, Glenaladale	7·16
„	Lynmouth, Glenthorne.	2·87	„	Invergarry .....	3·45
„	Probus, Lamellyn .....	1·78	XIX.	Lairg H.R.S. ....	2·96
„	Wincanton, Stowell Rec.	2·04	„	Forsinard H.R.S. ....	3·54
„	Taunton, Fullands .....	1·40	„	Watten H.R.S. ....	4·09
VI.	Bristol, Clifton .....	2·74	XX.	Dunmanway, Coolkelure	1·96
„	Ross .....	2·02	„	Fermoy, Gas Works ...	1·30
„	Wem, Sansaw Hall.....	1·95	„	Tralee, Castlemorris ...	1·42
„	Cheadle, The Heath Ho.	2·73	„	Tipperary, Henry Street	1·07
„	Worcester, Diglis Lock	2·26	„	Newcastle West .....	·84
„	Coventry, Coundon .....	2·41	„	Miltown Malbay.....	2·12
VII.	Melton, Coston .....	1·74	„	Corofin .....	2·40
„	Ketton Hall [Stamford]	1·51	XXI.	Carlow, Browne's Hill..	·66
„	Horncastle, Bucknall ...	1·61	„	Navan, Balrath .....	1·23
„	Mansfield, St. John's St.	2·37	„	Mullingar, Belvedere ...	2·21
VIII.	Macclesfield, The Park.	2·58	„	Athlone, Twyford .....	1·98
„	Walton-on-the-Hill.....	2·34	XXII.	Galway, Queen's Col...	1·58
„	Lancaster, South Road.	1·79	„	Clifden, Kylemore .....	9·20
„	Broughton-in-Furness ..	1·39	„	Crossmolina, Enniscoe..	2·85
IX.	Wakefield, Stanley Vic.	1·12	„	Carriek-on-Shannon ...	2·53
„	Ripon, Mickley .....	1·51	XXIII.	Dowra .....	...
„	Scarborough .....	1·54	„	Rockcorry.....	1·54
„	East Layton [Darlington]	·89	„	Warrenpoint .....	1·00
„	Middleton, Mickleton ..	·92	„	Newtownards .....	2·53
X.	Haltwhistle, Unthank..	1·28	„	Belfast, New Barnsley ..	3·24
„	Shap, Copy Hill .....	·86	„	Cushendun .....	3·65
XI.	Llanfrechfa Grange .....	2·16	„	Bushmills .....	3·97
„	Llandovery .....	3·40	„	Stewartstown .....	2·28
„	Lower Solva .....	1·79	„	Donegal, Revelin Ho....	...
„	Castle Malgwyn .....	2·23	„	Buncrana .....	3·92
„	Rhayader, Nantgwillt..	3·32	„	Carndonagh .....	3·81

## AUGUST, 1884.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Table to which each station belongs.]	RAINFALL.						TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Differ- ence from average 1870-9	Greatest Fall in 24 hours.		Days on which ·01 or more fell.	Max.		Min.				
				Dpth	Date.		Deg.	Date	Deg	Date.			
I.	London (Camden Square) ...	·89	— 1·85	·30	27	10	88·4	8	45·7	26	0	0	
II.	Maidstone (Hunton Court)...	·61	— 1·63	·33	27	5	...	...	...	...	...	...	
III.	Strathfield Turgiss .....	...	...	...	...	...	...	...	...	...	...	...	
IV.	Hitchin .....	1·76	— ·52	·43	27	12	86·0	11	42·0	25	0	0	
V.	Banbury .....	1·94	— ·76	·97	31	9	86·0	11	41·0	26	0	...	
	Bury St. Edmunds (Culford)	1·23	— ·94	·35	31	11	86·0	11	37·0	26	0	...	
VI.	Norwich (Cossey) .....	1·46	— 1·16	·49	19	11	88·5	11	41·5	27	0	0	
	Weymouth (Langton Herring)	1·35	...	·40	31	11	...	...	...	...	...	...	
VII.	Barnstaple .....	3·40	— ·70	·80	31	11	87·0	8	43·0	26b	0	0	
	Bodmin .....	2·19	— 2·65	·79	31	14	78·0	23a	47·0	5	0	0	
VIII.	Cirencester .....	1·79	— 1·87	·62	31	11	...	...	...	...	...	...	
	Church Stretton (Woolstaston)	2·35	— 1·73	1·34	31	10	84·0	11	46·0	26	0	0	
IX.	Tenbury (Orleton) .....	1·99	— 1·73	1·07	31	12	87·0	11	41·0	5	0	0	
	Leicester .....	2·25	...	·92	31	10	90·0	8,11	41·5	26	0	1	
X.	Boston .....	1·11	— 1·50	·71	31	5	87·0	11	42·0	27	0	0	
	Grimsby (Killingholme) .....	1·36	— 1·56	·42	31	8	81·5	24	46·0	26	0	...	
XI.	Hesley Hall [Tickhill] .....	1·29	...	·66	31	7	92·0	11	40·0	5,20	0	...	
	Manchester (Ardwick) .....	1·75	— 2·17	·50	31	8	85·0	11	47·0	26	0	0	
XII.	Wetherby (Ribston Hall) ...	·79	— 1·84	·42	28	5	...	...	...	...	...	...	
	Skipton (Arncliffe) .....	1·93	— 3·87	·48	27	12	85·0	8	40·0	25	0	...	
XIII.	North Shields .....	·72	— 2·37	·25	24	9	80·5	24	40·5	26	0	0	
	Borrowdale (Seathwaite) .....	3·36	— 7·68	·88	10	14	...	...	...	...	...	...	
XIV.	Cardiff (Ely) .....	3·02	— 2·31	1·06	31	10	...	...	...	...	...	...	
	Haverfordwest .....	1·70	— 3·27	·90	31	13	80·0	10	39·0	26	0	1	
XV.	Plinlimmon (Cwmsymlog) ...	3·36	...	1·09	27	11	...	...	...	...	...	...	
	Llandudno .....	1·03	— 2·16	·53	27	7	80·8	8	48·0	5	0	0	
XVI.	Cargen [Dumfries] .....	1·32	— 2·95	·46	27	12	83·6	8	39·0	29	0	...	
	Hawick (Wilton Hill) .....	1·32	...	·51	12	7	...	...	...	...	...	...	
XVII.	Douglas Castle (Newmains)...	1·27	— 3·03	·31	31	11	...	...	...	...	...	...	
	Lochgilphed (Kilmory) .....	6·47	+ 1·25	1·00	27	20	...	...	...	...	...	...	
XVIII.	Oban (Craigvarren) .....	4·20	...	·95	15	22	77·0	8	45·0	29	0	...	
	Mull (Quinish) .....	5·42	...	·93	27	25	...	...	...	...	...	...	
XIX.	Loch Leven Sluices .....	1·50	— 2·58	·50	13	6	...	...	...	...	...	...	
	Arbroath .....	1·55	— 1·78	·59	12	9	72·0	24	40·0	29	0	...	
XX.	Braemar .....	2·46	— 1·97	·50	12	19	76·0	12	35·8	27	0	2	
	Aberdeen .....	2·08	...	·73	28	14	71·0	...	40·0	28c	0	0	
XXI.	Skye (Sligachan) .....	...	...	...	...	...	...	...	...	...	...	...	
	Culloden .....	1·35	— 1·65	·33	28	7	77·0	10	39·0	27	0	1	
XXII.	Dunrobin .....	2·31	...	·79	28	12	71·5	6	41·0	27	0	...	
	Orkney (Sandwick) .....	2·81	— ·09	·82	28	12	69·7	6	44·3	27d	0	0	
XXIII.	Cork (Blackrock) .....	·73	— 3·10	·13	10	13	88·0	8	45·0	31	0	0	
	Dromore Castle .....	2·89	...	·55	29	15	72·0	19	41·0	28	0	...	
XXIV.	Waterford (Brook Lodge) ...	·62	...	·30	12	10	79·0	7	39·0	26	0	2	
	Killaloe .....	1·44	...	·30	17	11	74·0	...	45·0	23	0	...	
XXV.	Portarlinton .....	1·20	— 1·87	·26	12e	16	78·0	11	43·0	28	0	...	
	Dublin (Fitz William Square)	·78	— 2·40	·34	27	8	74·9	12e	44·6	29	0	0	
XXVI.	Ballinasloe .....	2·42	— 1·61	1·28	16	18	72·0	8,9	40·0	5	0	...	
	Waringstown .....	1·86	— 1·58	·61	27	16	83·0	9	41·0	28	0	0	
XXVII.	Londonderry (Creggan Res.)...	3·46	...	·97	16	23	...	...	...	...	...	...	
	Omagh (Edenfel) .....	2·41	— 1·24	·60	16	17	75·0	8,9	42·0	28	0	...	

a And 24. b And 27, 29. c And 29. d And 28. e And 17.

+ Shows that the fall was above the average; — that it was below it.

## METEOROLOGICAL NOTES ON AUGUST.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

[For details respecting the thunderstorms, see separate article.]

### ENGLAND.

**BANBURY.**—The weather was exceedingly favourable for harvest, which was nearly completed by the end of the month. The R at the end was very useful for grass and green crops. Harvest the best for some years. Mean temp.  $63^{\circ}$ ; average amount of cloud at 9 a.m., 5·9; the max. in shade reached  $80^{\circ}$  on 7 days; T and L on 3 days.

**CULFORD.**—The weather of harvest-time was most favourable and the crops were all gathered in in excellent condition; frost on grass on 26th.

**LANGTON HERRING.**—From the beginning of the month to the 24th, only ·22 in. of R fell, and all the wheat crop in this neighbourhood was ingathered under the most favourable circumstances. The mean temp. at 9 a.m. was  $1^{\circ}$ ·9 above the average of 12 years; on the 9th the temp. at 9 a.m. was  $75^{\circ}$ , which is  $1^{\circ}$  higher than that registered at that time on any other day during 12 years; the range of pressure was very small. Violent TS on 24th from 9 to 12 p.m.

**WOOLSTASTON.**—An exceptionally hot and dry month; mean temp.  $62^{\circ}$ ·4. The harvest generally was secured in splendid condition. A great fall of temp. occurred in the last week of the month.

**ORLETON.**—Remarkably fine and hot, with a very high day temp. till the 24th; but the nights were generally clear and cold. The temp. rose above  $80^{\circ}$  on 8 days. On the 25th the wind changed to the northward, and the remainder of the month was cold, the temp. being below the average. The mean of the month was  $2^{\circ}$ ·7 above the average of 23 years, and has only once been exceeded during that period. Very little R fell till the 31st, when more than 1·25 in. fell in 24 hours. L was seen on 8th, and distant T heard on 10th. A very favourable month for the harvest.

**LEICESTER.**—The early part of the month was hot and dry, the temp. in shade rising to  $90^{\circ}$  on the 8th and 11th, and to  $139^{\circ}$  in the sun on the 11th. A very sudden change occurred late in the month, on the 24th the max. was  $85^{\circ}$ ·6, on the 25th  $68^{\circ}$ ·5, and on the 26th,  $56^{\circ}$ ·8. A very useful fall of ·92 in. of R occurred on 31st.

**KILLINGHOLME.**—A month of splendid weather; corn carried in first-rate condition. Yield moderate on heavy land; a welcome fall of R occurred on 31st. Harvest general by the 8th.

**MANCHESTER.**—An exceedingly fine month; there were 20 days of unbroken, fine, sunshiny weather. The temp. during the first half was high, reminding one of old-fashioned summers, but towards the end the weather broke, and the temperature fell considerably. The month was very fine for harvest operations, and there is every reason to think that the year will prove to be fully an average, or above, for cereal produce. Long-continued thunder on the 9th.

### WALES.

**HAVERFORDWEST.**—A remarkably fine month, with a great amount of sunshine; the driest and finest August since 1880. T and magnificent sheet L on 10th, and again on 24th. The 24th was very hot (max.  $78^{\circ}$ ·0) but a change of wind from S.E. to N.W. and N.N.E. followed, and the max. of the 25th was only  $60^{\circ}$ ·6, with a min. on the morning of the 26th of  $39^{\circ}$  in air, and  $32^{\circ}$  on grass. The month ended much cooler, with refreshing rain. The temp. exceeded  $70^{\circ}$  on 17 days, and reached  $80^{\circ}$  once, and nearly reached it on 7 other days. The weather was everything that could be wished for to secure a fine harvest.

LLANDUDNO.—Altogether a splendid month. Such an August has not been equalled here for 10 or 11 years, the weather being dry, sunny and warm. The mean temp. was fully 2 per cent above and the rainfall 66 per cent. below the average; R fell on 7 days only, the average being 14·5, and there were 200 hours of bright sunshine during the month. The daily range of temp. was just the average, and the monthly range but slightly above it. The health of the community was excellent.

#### SCOTLAND.

CARGEN.—Mean temp. of the month  $1^{\circ}$  above the average. A severe TS occurred on 12th, causing a good many accidents to stock in the district; T or T and L on 4 other days.

HAWICK.—TSS occurred on the 10th, 11th and 24th, the rest of the month was most genial and kind.

OBAN.—Although the customary break in the weather came on the 12th (accompanied by heavy T and L and R) the month was on the whole a fair one, and there is a promise of a good harvest. The change was preceded by a heavy white fog, a common coincidence this summer. T and L also on the 8th.

BRAEMAR.—A very fine seasonable month; crops maturing rapidly. T and L on 9th, 11th and 14th.

ABERDEEN.—Rainfall about 1·25 in. below the average for August. The prevailing winds were southerly to south-westerly. Very fine weather was experienced throughout the month. T and L on 12th and 24th; H on 25th.

CULLODEN.—The month was particularly fine, warm, and dry. Little R fell except in T showers. The period between the 1st and 9th was fair and dry; from 9th to 18th heavy TSS were prevalent; from the 19th to the end of the month fair and fine harvest weather prevailed.

SANDWICK.—The temp. of August was  $1^{\circ}·3$  above the mean of 57 years, and the rainfall rather below it. T and L on the 11th and 13th, and T on the 23rd. The weather was generally pleasant, and favourable to vegetation. Harvest begun.

#### IRELAND.

DROMORE.—On the whole a fair month, but there were some very heavy winds from N.N.W.

WATERFORD.—Very little wind during the month; rainfall 2·99 in. below the average of ten years. Frequent heavy dews, and occasional T.

KILLALOE.—A splendid harvest month, only interrupted towards the close by some heavy showers, bringing up a wonderful crop of mushrooms all over the county. Mean temp.  $61^{\circ}·1$ .

DUBLIN.—A very fine and summerlike month, with high temp. and scanty rainfall. The prevalent winds were S.E. to S.W. and moderate in force; mean temp.  $60^{\circ}·3$ ,  $1^{\circ}·4$  above the average of 20 years. Rainfall the smallest for any August during 20 years, and rainy days only half the average. T and L on 11th; L on 13th, 14th and 28th. Mean humidity 78; mean amount of cloud, 5·7.

BALLINASLOE.—The month generally was fine. Very heavy R on the afternoon of the 16th, 20 in. fell between 3.10 and 3.30 p.m.

EDENFEL, OMAGH.—The first half of the month was generally hot and clear; the latter half showery and humid, but as a whole it was very favourable. Harvest commenced here on 20th, three weeks earlier than last year.