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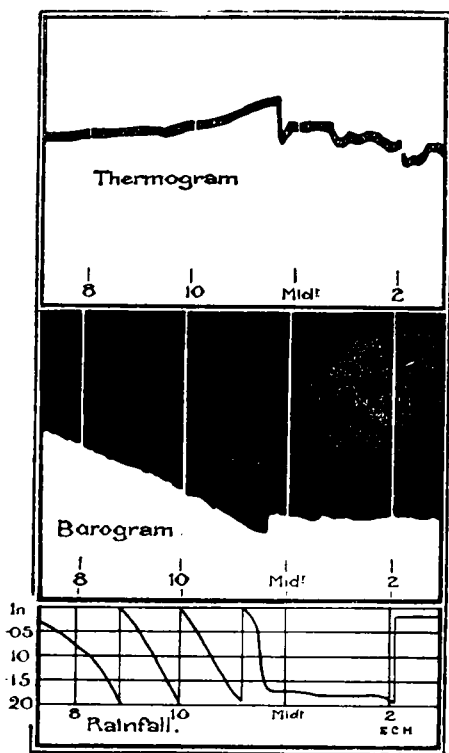
VOL. XL.

## ON A FORM OF SUDDEN WEATHER CHANGE.

By R. G. K. LEMPFERT, M.A.

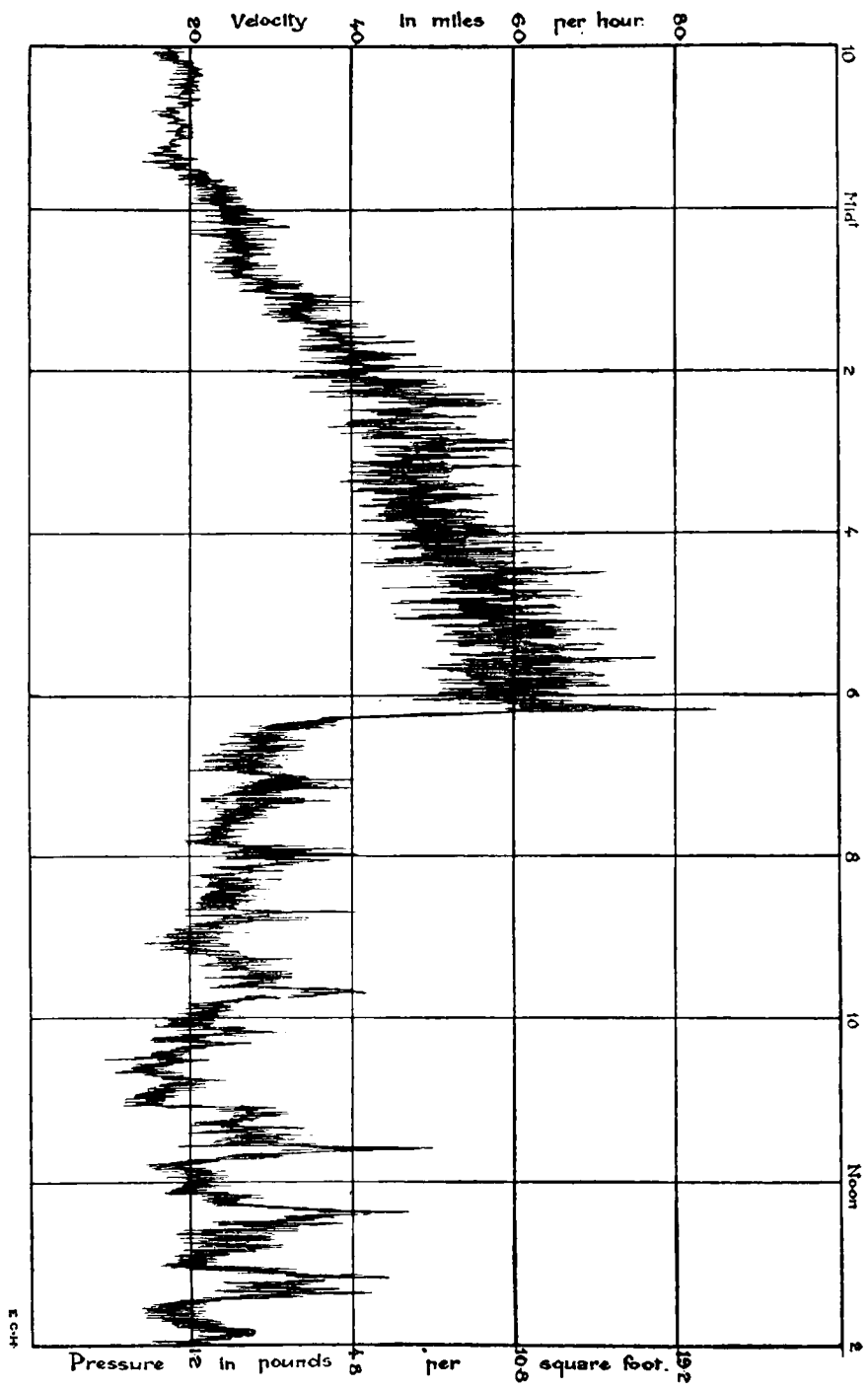
(of the Meteorological Office.)

THE changes shown on the traces of the self-recording instruments at our western Observatories on February 25th and 26th last were so striking that, at the Secretary's request, I forward the following description of them.



At Valencia, our most western station, a strong southerly wind got up during the early part of the evening of the 25th, and reached a velocity of 40 miles an hour at 11 p.m. During this time the barometer fell briskly, while the temperature curve showed a slow rise. Rain set in at 6.30 p.m. and continued steadily during the following hours. At 11.35 p.m. an abrupt change took place in all the elements. The wind veered suddenly from south to west; the barometer rose through as much as 0.08 inch in the space of a few minutes, and the temperature fell 4.5 degrees in the same interval of time. The trace of the rain-gauge was almost vertical through a distance of 0.1 inch, and then the rain ceased; the total rainfall since 6.30 p.m. was about .75 in.

Subsequently the barometer remained steady, but many small oscillations were recorded. The temperature curve, which before the change occurred had been remarkably free from minor fluctuations, became very irregular.



The wind direction was also much less steady, many temporary changes—of which the more prominent ones were accompanied by smart showers—being shown.

Turning now to Falmouth, we find the changes similar in many respects and yet different in others. The pressure tube anemogram is reproduced in the accompanying diagram. During the period of rapidly increasing velocity, the wind direction was from S.S.W., but the sudden drop from 84 to about 30 miles per hour shortly after 6 a.m. was accompanied by a shift of wind to W.S.W. The remaining part of the trace shows a series of oscillations of a period of about an hour, each of which was accompanied by a sudden veering of the wind through several points. The barogram is similar to that from Valencia in that it shows a brisk fall up to the time of change of wind and remains approximately steady afterwards, but the sudden increase of pressure, which was so very characteristic at Valencia, is only faintly indicated at Falmouth. In the thermogram a fall of temperature is indicated, but this change was also less sudden than at Valencia. The marked increase in the rate of rainfall at the time of the change of wind, and the subsequent clearing of the weather, were again very characteristic; the total rainfall between 2 a.m., the hour at which rain commenced, and 6.30 a.m. was 0.37 inch, about half the amount measured at Valencia.

The anemograms from Scilly and Holyhead show changes similar to those recorded at Falmouth, but the difference between the wind velocities in the southerly and westerly winds was not so marked. The change occurred at Scilly at 5 a.m., and at Holyhead at about 5.30 a.m.

At Kew the phenomena were less pronounced. A strong southerly wind prevailed during the morning of the 26th, but no definite hour can be assigned for its interruption. The barometer ceased falling at about 2 p.m.

The phenomena, described above, seem to suggest that we have here a case of an air current from the west cutting into a current from the south, and, in view of the heavy rainfall which accompanied the change, we may perhaps go a step further and regard the westerly current as forcing its way underneath the southerly one. The information at present available is too scanty to enable us to trace the passage of the phenomenon across the country; it would, however, be a matter of interest to see whether it was propagated along a linear front in a similar manner to hail and thunder squalls. I should be glad to hear from any of your readers whose self-recording instruments showed changes which may be brought into connexion with the effects I have described.

The isobaric distribution at 8 a.m. on February 26th was of the type generally described as a depression off the north-west of Scotland; the gradient was moderately steep, and the isobars were concave to a point situated, say, 200 miles to the north-west of

Stornoway. A line drawn slightly to the westward of Liverpool and Jersey separates the map into two portions. On its eastern side the wind was strong in force and generally southerly in direction (it was, however, S.W. at Portland Bill); on its western side it was westerly in direction and rather less strong in force. The same line separates a region of continuous rainfall from a region of detached clouds and occasional showers.

One further point is perhaps of interest. Two years ago, also in the month of February, a very similar series of changes was recorded under similar isobaric conditions at all stations in the south-west of England, and it would be interesting to know whether this type of weather is particularly frequent at this time of the year.



### RECEPTION BY THE METEOROLOGICAL COUNCIL.

It is believed that the Report of the Treasury Committee is about to be acted upon, and the constitution of the Meteorological Office altered, although up to the date of going to press no definite announcement has been made, and nothing can yet be stated as to the future relationship between the national weather service and the Government.

On March 31st, the last day of its official year, the Meteorological Council was "At Home," in 63, Victoria Street, to a large party of men of science, and ladies. General Sir Richard Strachey, Chairman of the Meteorological Council, and Lady Strachey, received the guests, and most of the members of the Council were present, including Professor George Darwin, Admiral Sir William Wharton, and Dr. W. N. Shaw. The fourteen principal rooms of the Office were open for inspection, and an interesting collection of charts, diagrams, and instruments, was on view; which the members of the staff of the office were ready to exhibit and explain. A list of the exhibits formed an attractive memento of the occasion, the cover giving, in colour, reduced facsimiles of the Atlantic pilot-chart for April, and the daily weather chart for March 31st.

The exhibits were largely historical, serving to illustrate the development in the work of the Office from the time of Admiral Fitzroy to the present day. A number of notable records from recording instruments were shown, including those which revealed the air-waves round the world, started by the eruption of Krakatoa, and the twenty-four hour traces of continuous sunshine obtained on the Antarctic expedition of the *Discovery*. The instruments on view included Lord Kelvin's harmonic curve analyser, Sir Richard Strachey's harmonic curve compounder, Mr. F. Galton's pantagraph for reducing diagrams in different ratios for length and breadth, computing machines, and several of the new forms of apparatus which had been shown at the recent exhibition of the Royal Meteorological Society. Mr. Lempfert showed an ingenious application

of the "wheel of life," which represented in a vivid way the movement of a particle of air through an atmospheric depression.

In the forecast room a special weather chart was prepared at 4 p.m., and before the party broke up the later-comers had an opportunity of seeing the usual 6 p.m. chart prepared from the data as they were received. A good deal of interest was aroused by the series of special weather charts prepared in order to advise the captain of the Royal Yacht *Victoria and Albert*, as to the prospects of weather in the Channel, after the Queen had gone on board on March 14th, until the conditions were sufficiently favourable to make it prudent to go to sea on the 18th.

Dr. Shaw and all the members of the Office staff deserve to be congratulated on the happy result of their efforts in showing the work of the Meteorological Council at its best, and in making that work interesting and attractive to all.

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### EXHIBITION OF METEOROLOGICAL INSTRUMENTS.

A LARGE and interesting Exhibition of Meteorological Instruments, arranged by the Royal Meteorological Society, was held in the Library of the Institution of Civil Engineers, Great George Street, Westminster, from Tuesday, March 14th, to Friday, the 17th.

Since the Society's last Exhibition, in 1897, considerable improvements have been made in recording instruments, and there has also been a great development in the methods adopted for ascertaining the meteorological conditions of the upper air. The instruments used for these purposes consequently formed the characteristic portion of the Exhibition, which was admirably arranged in the spacious and convenient room. In the centre there was a railed-off enclosure arranged to represent a typical Climatological Station of the Royal Meteorological Society, with instruments in position.

The Meteorological Council showed in position the photographic barograph and the Beckley self-recording rain gauge which were in use at the Fort William Observatory from 1890 to 1904. Messrs. Negretti and Zambra exhibited their self-recording rain gauges, anemometers, and sunshine recorders, and also a number of other instruments. Messrs. J. Levi and Co. contributed a collection of most of Richard's (Paris) noted self-recording instruments. Mr. F. L. Halliwell showed his rain gauges, anemometers, and an evaporation tank fitted with his float and index for reading the water-level to '01 in.

Mr. W. H. Dines exhibited the kites and meteorographs used by him at Crinan, as well as a Russian kite sent from St. Petersburg. Mr. P. Y. Alexander sent two rubber balloons which had been used as "*ballons sondes*." Meteorographs for use with kites and balloons were exhibited by M. L. Teisserenc de Bort, Mr. W. S. Bruce, Messrs. J. and A. Bosch, and Mr. J. J. Hicks. The kite camera and cage used in the Scottish Antarctic Expedition were also shown by Mr. Bruce. The Royal Meteorological Society exhibited the instru-

ments used by Mr. J. Glaisher in his famous balloon ascents for the British Association during 1862—66, which were placed in position on the board as used in the car of the balloon.

The Meteorological Council showed a number of instruments which had been used in the National Antarctic Expedition and also in several Arctic Expeditions. Mr. W. S. Bruce sent some of the thermometers used in the Scottish Antarctic Expedition. The Cambridge Scientific Instrument Company exhibited their electrical resistance thermometers and Callendar recorder. Dr. H. R. Mill showed a number of old pattern rain gauges used in the early experiments of Mr. G. J. Symons, and also a Redier barograph. Dr. W. N. Shaw and Mr. S. Skinner both exhibited their micro-barographs for the study of minor variations of atmospheric pressure. Mr. R. W. Munro showed the Dines pressure-tube anemometer, and Messrs. Lander and Smith contributed a set of their recording meteorological instruments. Mr. J. Baxendell exhibited his anemograph and snow-melting rain gauge; and anemometers were also shown by the National Physical Laboratory, Mr. C. Dales, Mr. J. J. Hicks, and Mr. R. M. Lowne.

The Astronomer Royal sent several patterns of sunshine recorders which were formerly used at the Royal Observatory, Greenwich. The Meteorological Council exhibited two sunshine recorders used by the National Antarctic Expedition while in the *Discovery's* winter quarters in  $77^{\circ} 50'$  S. lat., the instruments being so constructed as to give continuous records for 24 hours.

Dr. W. N. Shaw gave demonstrations with his "thermopsychrophorus," which is an apparatus illustrating the cooling effect by the communication of heat under certain conditions to a mass of air in the free atmosphere. Mr. G. Simpson exhibited apparatus for measuring the amount of radio-active emanation in the atmosphere, and Herr R. Fuess, of Berlin, showed Assmann's aspiration psychrometer and other instruments.

Dr. J. L. Thomas exhibited a life-size "dummy," dressed in the remains of the clothes of a man who was struck by lightning near Cardiff on July 17th, 1903. Objects struck by lightning were also shown by the Royal Meteorological Society and by Messrs. J. W. Gray and Son.

The Exhibition also included a large collection of interesting meteorological photographs, records, drawings and maps.

A brief address was given each afternoon by Mr. W. Marriott, descriptive of the instruments included in the Exhibition; and the Exhibition succeeded in its purpose of attracting a large number of visitors interested in the science of the atmosphere.

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At the meeting of the Royal Meteorological Society, on Wednesday evening, March 15th, the President, Mr. Richard Bentley, delivered an address on the Growth of Instrumental Meteorology.

After briefly touching on the historic and non-instrumental era of

Meteorology, he spoke of the seven great weapons of the meteorologist—the thermometer, and of later years the heliograph, for temperature—the hygrometer and rain gauge, for moisture—the barometer, for pressure—and the anemometer and kite, for the study of the upper air; and of the foundation of instrumental meteorology laid by Galileo, Torricelli, Wren and Hooke.

The President, in dwelling upon our indebtedness to Italy in science (as well as in art) from Galileo to Marconi, pointed out that the theory of rainfall was correctly enunciated as early as the beginning of the fourteenth century by Dante. He also dwelt on the great services rendered to the community by meteorologists, largely working voluntarily and at their own expense, and referred to the close observation kept by rain gauges on the water supply of the country—by anemometers protecting the traffic over some of our lofty and more exposed railway viaducts—by the use of the barometer for storm warnings and for the safety of miners—by the heliograph with relation to the ripening of fruits and crops—and regretted how much of the immense mass of information daily accumulating had still to be analysed and put to use. It was disappointing to find in so wealthy a country as this, and where the results could not fail to be of the greatest practical utility to the nation, that the means of digestion of this vast amount of data are so meagre and the aid given by the Government is so slender as to be a constant source of reproach, when compared with the large provision made for the same purpose in other countries.

Mr. W. Marriott also exhibited a number of lantern slides illustrating meteorological phenomena.

The following gentlemen were elected Fellows of the Society:—Dr. F. A. Barton, Mr. N. Gyles, Mr. F. W. Harmer, F.G.S., Major A. D. D. Kelly, Mr. J. M. Kerr, Assoc. M.Inst.C.E., and Captain E. R. McKinstry.

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## METEOROLOGICAL NEWS AND NOTES.

PROFESSOR C. H. WIND having been appointed to a Professorship in the University of Utrecht, has resigned the Directorship of the Dutch Meteorological Institute, and Dr. E. van Everdingen has been appointed provisional Director.

THE BRITISH ASSOCIATION for the Advancement of Science meets this year in South Africa, but so far as we are aware no special sub-section for Cosmical Physics will meet. Papers on meteorology will probably be taken in Section A, and Dr. H. R. Mill hopes to be able to arrange for the usual Meteorological Breakfast at Cape Town on the morning when these papers are read. The keen interest taken in the study of the weather in South Africa will, it is hoped, lead to some interesting discussions.

## THREE MONTHS' RAINFALL OF 1905.

*Aggregate Rainfall for January—March, 1905.*

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London .....	5·13	100	Bolton .....	8·90	100	Braemar .....	8·86	110
Tenterden .....	5·53	91	Wetherby .....	4·66	87	Aberdeen .....	6·33	88
Hartley Wintney .....	5·30	85	Arncliffe .....	13·58	84	Cawdor .....	8·82	143
Hitchin .....	4·94	101	Hull .....	3·83	70	Invergarry .....	21·66	133
Winslow .....	4·37	81	Newcastle .....	2·70	48	Bendamph .....	30·18	138
Westley .....	4·82	99	Seathwaite .....	30·11	82	Dunrobin .....	11·52	154
Brundall .....	4·18	87	Cardiff, Ely .....	8·80	90	Killarney .....	15·56	97
Alderbury .....	6·63	100	Haverfordwest .....	10·59	89	Waterford .....	9·45	95
Winterbourne .....	8·48	90	Gogerddan .....	12·02	122	Broadford .....	9·43	128
Torquay .....	7·59	89	Llandudno .....	7·20	111	Carlow .....	7·36	92
Polapit Tamar .....	9·87	108	Cargen .....	9·87	88	Dublin .....	5·38	90
Bath .....	5·11	78	Lilliesleaf .....	5·26	71	Mullingar .....	9·33	116
Stroud, Upfield .....	5·84	91	Golmonell .....	11·09	98	Ballinasloe .....	8·15	97
Woolstaston .....	7·24	102	Glasgow .....	7·47	92	Clifden .....	19·74	101
Bromsgrove .....	4·65	95	Inveraray .....	21·97	133	Crossmolina .....	14·85	115
Boston .....	2·95	66	Islay, Eallabus .....	14·22	119	Seaforde .....	7·62	83
Hodsock Priory .....	3·23	66	Mull .....	17·25	118	Londonderry .....	10·06	108
Derby .....	3·98	78	Dundee .....	4·30	70	Omagh .....	10·50	126

All observers reporting for March showed rainfalls in excess of the average, except in the neighbourhood of Newcastle, and at many long-established stations the month was the wettest March on record. The percentage excesses were greatest in the south-west of England, the fall over the greater part of the country south-west of a line drawn from the Mersey to Beachy Head being more than twice and at some points approaching three times the average. Along the east coast and in the north of England the excess was smallest, not exceeding 25 per cent. The excess in Scotland averaged about 50 per cent., and more than twice the average amount of rain fell in the south and centre of Ireland. The result of such a wet month was a considerable reduction in the remarkable shortage of rainfall, on which we dwelt at length in our last issue, and for the first quarter of the current year it practically made up the deficiency of the two preceding months. The condition of things for 1905 was that in London and for a distance of 100 miles or so to the north-east and the south-west the rainfall for the three months was exactly the average. In North Wales, the north-west of Ireland, and especially in the north-west of Scotland, it was well above the average, and in the south-east of Ireland but little below. Along the east coast of Great Britain from the Wash to Montrose there was still a marked deficiency of rainfall, that part of the country having received less than three-quarters of the average amount, and in some parts of Northumberland and Durham not quite one-half.



## Correspondence.

*To the Editor of Symons's Meteorological Magazine.*

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## THE HOTTEST PORTIONS OF THE EMPIRE.

THE summary of the climatological records of the British Empire for the year 1903, published in "Symons's Meteorological Magazine," for 1904, and repeated in "Nature," for January 26th, 1905, conveys an erroneous idea as to the hottest places in the British Empire. It is pointed out that it is impossible to represent the average conditions of the climate of the Empire by so small a number of stations, but according to the figures given this doubtful honour appears to lie between Adelaide, in South Australia, and Coolgardie, in this State. Now as a matter of fact there are places in the Empire very much hotter than either of these, and it would perhaps give a more correct impression if one or two of such places were included. In this State, for example, Marble Bar, in the N.W. division, is very much hotter than Coolgardie. The *mean* of the daily maximum temperatures for last month was  $109^{\circ}\cdot 8$ , and the highest reading  $120^{\circ}\cdot 5$ . In the Eastern States there are, I believe, places with similar records. At Jacobabad, in India, the *average* daily maximum temperature is  $111^{\circ}\cdot 6$  in May,  $112^{\circ}\cdot 7$  in June, and  $107^{\circ}\cdot 8$  in July. At Berber, in the Egyptian Sudan, the mean maxima for each month of 1902 were  $102^{\circ}\cdot 2$ ,  $102^{\circ}\cdot 9$ ,  $113^{\circ}\cdot 9$ ,  $112^{\circ}\cdot 6$ ,  $108^{\circ}\cdot 0$ ,  $109^{\circ}\cdot 8$ ,  $109^{\circ}\cdot 2$ ,  $102^{\circ}\cdot 7$ ,  $95^{\circ}\cdot 5$ , and  $91^{\circ}\cdot 4$ ; and the absolute maxima— $109^{\circ}\cdot 4$ ,  $114^{\circ}\cdot 8$ ,  $116^{\circ}\cdot 6$ ,  $116^{\circ}\cdot 6$ ,  $113^{\circ}\cdot 0$ ,  $116^{\circ}\cdot 6$ ,  $111^{\circ}\cdot 2$ ,  $109^{\circ}\cdot 4$ ,  $104^{\circ}\cdot 9$ , and  $95^{\circ}\cdot 0$ . At Duem, in the same district, the mean maximum for March, 1902, was  $114^{\circ}\cdot 4$ , and the absolute maximum was  $127^{\circ}\cdot 4$ .

There may be hotter places still, but compared with these the temperatures at Adelaide and Coolgardie are mild, although high temperatures are occasionally registered during the prevalence of a "heat wave."

W. E. COOKE, *Govt. Astronomer.*

*Perth Observatory, West Australia,  
February 28th, 1905.*

[We are sorry that an erroneous idea has been conveyed by our summary of the Climatology of the British Empire for 1903. We so clearly realize the tendency of the human mind to seize on deductions from a limited number of observations as if they expressed all truth, that we spend a considerable amount of space in each annual summary in beseeching our readers to bear in mind the small number of places represented in our pages, and the large number from which there are no records. On the occasion referred to above, fearing that some journalist might proclaim Coolgardie "the hottest place on earth," we followed the quotation of its maximum temperature by the caution—"It must be remembered, however, that we do not publish returns from any of the intensely

hot stations in the north-west of India." In previous years we have been prodigal in similar cautions. We shall try once more, when another annual summary is due, to discover some form of comprehensive repudiation of all possible misconceptions. We always welcome contributions from readers in the British Dominions beyond the seas, and would particularly value such an account of the Australian climate as was furnished in our volume for 1903 by Professor Stupat, for the Canadian climate.—ED. *S.M.M.*]

### LONG PERIOD RAINFALL AVERAGES.

I NOTICE that you consider the thirty years' average of rainfall for 1870—1899 to be nearly the same as that for a much longer period.

Here I have compared it with the 87 years, 1818—1904 inclusive, and find that they compare wonderfully nearly, as the following table shows :—

#### *Average Rainfall, Ross and neighbourhood.*

	1818—1904 (87 years).		1870—1899 (30 years).
January .....	2·59	.....	2·66
February .....	2·11	.....	2·16
March .....	1·86	.....	1·74
	— 6·56		— 6·56
April .....	2·05	.....	1·95
May .....	2·14	.....	2·10
June .....	2·28	.....	2·27
	— 6·47		— 6·32
July .....	2·59	.....	2·81
August .....	2·55	.....	2·62
September .....	2·66	.....	2·70
	— 7·80		— 8·13
October .....	3·17	.....	3·09
November .....	2·87	.....	2·95
December .....	2·65	.....	2·47
	— 8·69		— 8·51
Year .....	29·52	.....	29·52

#### *Variation in Average Rainfalls.*

				inches.
1818—1829	12 years.	Average	.....	29·27
1830—1844	15 "	"	.....	31·62
1845—1859	15 "	"	.....	28·85
1860—1874	15 "	"	.....	28·46
1875—1889	15 "	"	.....	32·32
1890—1904	15 "	"	.....	26·57

My own observations are from January 1, 1859 ; Captain Pendergrass, F.R.Met.Soc., observed from 1818 to 1842 ; and Judge Herbert, a very careful observer, from 1852 to 1881 ; but I have given my own from 1859. Another gentleman, a few miles to the north of this, is responsible for the years 1843 to 1851, inclusive.

The year (365 days) ending March 7, 1905, gave only 17·07 in. of rain at this station, the lowest for any similar previous period—the

nearest being 1854-5, with 17·55 in. 1903-4, on the contrary, showed the largest amount registered—namely, 41·75 in. The lowest or smallest falls in any calendar years were—

1864	.....	19·22 in.
1854	.....	19·42 „
1870	.....	20·18 „
1893	.....	20·13 „

but on three occasions of 365 days, ending at different periods of the year, these records were much lower—

1854	.....	16·48 in.
1864	.....	16·48 „
1893	.....	16·91 „

The following shows the periods when greatest deficits occurred—

	Days.	Rainfall.	Difference from Average, 1867—1897.
March 8 to July 18, 1904	133	5·22	—4·13
July 19 to Sept. 14, 1904	58	5·25	+ ·06
Sept. 15, 1904, to March 7, 1905	174	6·60	—8·86
	365	17·07	—12·93

Thus during what is normally the wettest part of the year, the difference was greatest, and consequently the effects on wells and springs proportionally greater.

In 1903 October gave 7·40 in., and in 1904 only ·55 in.—the one year yielding the absolute maximum recorded for the month, and the next year the absolute minimum.

H. SOUTHALL.

*The Graig, Ross, Herefordshire,  
April 3rd, 1905.*

### A PARALLEL CONTINUED.

YOU published in your February number, on page 6, some remarks from me on the resemblance between the Januaries of 1896 and 1905. I should like now to point out further that February and March of this year have continued to follow the pattern of 1896, with quite surprising closeness. February, 1st-25th, 1905, like February, 1896, had continuously high barometer, coupled with the calm and dryness that go naturally with high pressure, and also by a general mildness that does not usually accompany anti-cyclonic conditions at that time of year.

Again, February 26th—March 31st, 1905, like March, 1896, had a long series of depressions, some of them very deep, with violent gales, constant wind and rain, a most un-March-like prevalence of S.W. winds, and consequent mildness, noticeable absence of polar winds, and an unusual frequency of thunder and lightning.

Referring to back numbers of the Magazine, and examining the "Tables of Rainfall at 50 stations," which are published monthly, I notice for February, 1896, that every single station whose departure from a stated average is indicated by a + or a —, had in that

month a — sign. Also that in February, 1905, there is a very great preponderance of — signs. There is but one + for England (a small one in Yorkshire); one + for the extreme north of Ireland; and seven for the west and north of Scotland, some of which are evidently due to the break up of the anti-cyclone three or four days before the end of the calendar month. Again, the table for March, 1896, shews for England a + at all but two stations; and a considerable preponderance of + signs, both for Ireland and Scotland; and the March number in that year devotes half of page 38 to "Early Damage by Lightning in 1896," quoting instances of serious mischief done on March 4th, 16th, 24th, and 25th, in Jersey, Derbyshire, Yorkshire and Durham.

I am curious to see what comments upon this letter will be afforded by the records which you will be publishing along with it; but it would surely seem that for the first three months of 1896 and 1905, "the atmospheric conditions must have been *very similar* over a large area" (vide Mr. Bonacina's article on p. 7 of this volume); and it will be interesting to watch whether a dry April, and a still drier May, are going to keep up the parallel yet longer.

H. A. BOYS, F.R. Met. Soc.

*North Cadbury Rectory, Somerset, April 1st, 1905.*

[The Table published this month fully bears out Mr. Boys's expectations, every sign but one is a +.]

### THE THUNDERSTORMS OF MARCH 12th AND 15th.

ON the 12th, thunder-clouds (cumulo-nimbus) were first observed in the S.W. at 3.15 p.m., moving with considerable rapidity in a N.E. direction. Thunder was first heard at 3.30 p.m.; at 3.35 p.m. a very vivid flash of fork lightning was seen due N., torrential rain commencing, along the whole of the northern sky-line enormous mist wreaths were visible hanging from the storm pallium; several further loud thunder claps and flashes of fork lightning were noticed; at 3.45 p.m., on the cessation of the rain, the wind increased in force to a whole gale from the W.S.W., and blew furiously for about fifteen minutes; by 3.50 p.m. the sky had partially cleared, with bright sunshine. During the ten minutes that rain fell—viz., from 3.35 p.m. to 3.45 p.m.—0.11 in. was registered.

On the evening of the 15th, the sky being entirely thick and overcast, but no definite cloud forms visible, at 10.30 p.m. a thunder storm broke lasting to 11.5 p.m., the most remarkable feature being the almost continuous and very vivid display of sheet and fork lightning, with practically speaking little thunder but torrents of rain and hail. Between 4 a.m. and 4.15 a.m., on the same date, a violent hail squall had been experienced, a very rapid rise in the barometer being noted at 4.10 a.m.; 0.05 in. in 6 minutes. I believe that hail falling during the hours of darkness is somewhat rare.

SPENCER C. RUSSELL.

*Ashley Road, Epsom, March 25th, 1905.*

## THE LEGEND OF SAHARAN DUST FALLS.

WHEN the valiant Sir Francis Drake set forth, in 1577, on the famous buccaneering expedition during which he discovered Cape Horn, he carried a chaplain, the Rev. Francis Fletcher. This worthy man must have had a sore time of it—on one occasion his erratic master set him in irons on the quarter-deck with a parchment bound round his arm bearing the inscription, “frances fletcher y<sup>e</sup> falsest knave y<sup>t</sup> liveth”—but he was a faithful if somewhat credulous chronicler. In the narrative of the cruise, which he wrote under the title of ‘The World Encompassed by Sir Francis Drake,’ Mr. Francis Fletcher gives the following account of a dust-storm in the Atlantic, with the explanation of the phenomenon as narrated by a Portuguese pilot, who, it would appear, was not devoid of a quaint sense of humour, and could spin as good a yarn as any land-lubber might wish to preserve in print. As no fall of Saharan dust has to be chronicled this spring, we give the old story, spelling and all :—

“ After so long but a sweet pleasant travaile, before remembered, by the Providence of God we chanced and fell in the sight of Brasilia, where at the first the land seemed to make us a faire offer of opertunity to do that we had long desyred and now was most necessary for us, that is, to trim our shipp, being very fowle, for the land seemed to be verrey pleasant, a fare bay, and a sandy ground, fitt for our purpose, and to encourage the rather, som of the people being in sight did show themselves very joyful to see us in drawing to stand inward towards their land : but the case was quickly altered, sweet meates would have sower sawce, and long delights was likely to have sower gaule and bitterness, for we had not longer held our way inward but the sight of land was taken from us, and that sodainly, with such a lasynes as if it had been a most deadly fogg, with the palpabel darkeness of Egypt, that never a shipp could see another. In the neck whereof did follow such extreame storms as heaven and earth had gon together, and the routes of the rocks and the bottom of the sea should have been discovered, and that which was a signe of a desperat state to utter destruction, wee were upon a lee shore, and the shoales increased upon us. So that if the Portugall pilot had not ben apointed of God to do us good, we had perished without remembrance ; for he being well acquainted with the bloody government of the Portugalls, was not ignorant of this part of cuntrye ; and knowing the present danger, he presently cryed a returne as we could, or els no way but imminent death, wherein, though we made all possible speed, yet one of our shippes touched with the shoales, but by God’s Providence came cleere away, and being cast about to the seas, even against the streames, our fleet was so separated that in many monthes after we came not together againe. Now the pilot being in the Admiral, the question was whether he could give anny reason of so sodain an alteration, and so extreame an accident to fall out against us in this place ; whose answer was, that such was the tyranny of the Portugalls towards the naturall inhabitants, that rather than they would endure their intollerable and bloody cruelty, they willingly exile themselves and banish themselves from their naturall soile and inheritances, to dwell in the far remote and

unfruitfull partes of the land, where being settled, the unmercifull and murthering Portugalls could not be contented with the fatt of their land, but they must pursue the poore and harmles people to root them out, their wives and children, from the face of the earth. Wherefore this people, which before did live by the instinct of nature, were now driven to yelde themselves into the hands of divells, and took them for their patrons and protectors against their bodily enemies the Portugalls, haveing them allwayes their familiars; who, when they see any shippes upon their coasts, the shoare being sandy, they cast the saud up in the ayre, whereof ariseth sodainly such a haziness as a most gross and thick fogg, that there followeth a palpable darkenes that the land cannot be seen, no nor the heavens; besides this, they hurle the sand into the heavens, which as they increast, so the shoales increast in the way of the shippes in the seas to ground them; and withall such horrible, fearful, and intollerable winds, raines, and stormes, that there is no certainty of life one moment of tyme, whereof we had present experience, and had perished, if God had not in His mercy and power prevented the same. By this meanes did they continually overthrow the Portugalls, when they came with their armies of men, and their *armethos*, that is, their huge shippes of warr, against them; whereof many had been cast away, and non that ever came in the dance did ever escape; and they supposing us to be Portugalls, and therefore their deadly enemies, being not acquainted with anny other people to frequent their land, they did practise against us as against them."

### REVIEWS.

*United States Geological Survey. The Relation of Rainfall to Run-off,*  
by GEORGE W. RAFTER. Washington: 1903. Size 9 x 6.  
Pp. 104.

THE relation of rainfall to the flow of streams is here discussed somewhat fully, although hardly any definite conclusions seem to have been arrived at. In the words of the author:—

"No general formula is likely to be found expressing accurately the relation of rainfall to the run-off of streams, for streams vary widely in their behavior, and when they do agree the agreement is usually accidental. As a general proposition we may say that every stream is a law unto itself."

The writer is, however, greatly handicapped by the inadequate rainfall data available for the United States, and the unsatisfactory nature of many of the existing records. Streams are divided into classes with regard to the amount of rainfall, separating those in districts with exceptionally high evaporation, so that the relation may be roughly similar in each class, but it does not seem clear that this classification leads to any satisfactory result, and the author confines his remarks to detailing methods which he recommends should be avoided in any attempt to arrive at a solution of the problem.

The question of the effect of deforestation upon rainfall is likewise touched on, but abandoned for want of information. The paper, however, contains a large amount of detailed observational work for particular streams set forth in the form of diagrams.

*Indian Meteorological Memoirs. Vol. XVII., Normal monthly and annual means of temperature, pressure, wind, humidity, cloud, rainfall, and number of rainy days of stations in India*, by SIR JOHN ELIOT, F.R.S., K.C.I.E. Calcutta, 1904. Size  $13\frac{1}{2} \times 10$ . Pp. 288. Price 3 rupees.

THIS volume contains the normal data for the meteorology of India, a vast mine of statistics. The publications of the Indian meteorological department are in one way the worst in the world, not as to intrinsic merit, which is of the highest; but in the mode of forwarding the great quartos by post tightly rolled up and swathed in wrappings from which it is practically impossible to decorticate them uninjured, while to store the unrolled parts on a shelf is like trying to stow a set of compressed spiral springs into a drawer. This particular volume is not quite so springy as the rest, but it has touched the spring that lets forth our criticism like a meteorological jack-in-the-box.

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*Missions scientifiques pour la mesure d'un arc du méridien au Spitzberg entreprises en 1899-1902 sous les auspices des gouvernements Suédois et Russe. Mission Suédois, Tome II., Physique Terrestre. VIII. section. Météorologie. Observations régulières à la station d'hivernage*, par J. WESTMAN. Stockholm, 1904. Size  $12\frac{1}{2} \times 10$ . Pp. 222. Plates.

THIS volume contains the meteorological observations made at Treurenberg Bay in Spitzbergen in 1899 and 1900 by the Swedish men of science engaged in the joint determination of an arc of the meridian by the Swedish and Russian governments. The station was situated in  $79^{\circ} 55' N$ .

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*On the Tension of Carbonic Acid in natural waters and especially in the sea. . . . The abnormal  $CO_2$  percentage in the Air in Greenland and the general relations between Atmospheric and Oceanic Carbonic Acid*, by AUGUST KROGH, Ph.D. Reprinted from *Meddelelser om Grönland*, vol. 26. Copenhagen, 1904. Size  $9 \times 6$ . Pp. 333-434.

THE author employs a new method to attack an old problem. He found the percentage of oxygen in the air in Greenland to be practically the same as in Europe, but the carbonic acid, instead of varying from 0.02 to 0.04 with an average of 0.03 per cent., as in all other parts of the world away from towns, was found to vary in Greenland from 0.025 to 0.07. The percentage was higher with northern and western winds, lower with eastern and southern. The suggestion put forward is that this may be due to the liberation of carbonic acid from solution in sea water in that part of the world.

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## RAINFALL AND TEMPERATURE, MARCH, 1905.

| Div.   | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.] | RAINFALL.   |                              |                       |       | Days on which 40 or more fell. | TEMPERATURE. |        |      |        | No. of Nights below 32°. |       |       |
|--------|--------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------|-----------------------|-------|--------------------------------|--------------|--------|------|--------|--------------------------|-------|-------|
|        |                                                                                                                                      | Total Fall. | Diff. from average, 1870-99. | Greatest in 24 hours. |       |                                | Max.         |        | Min. |        |                          |       |       |
|        |                                                                                                                                      |             |                              | Depth.                | Date. |                                | Deg.         | Date.  | Deg. | Date.  |                          |       |       |
|        |                                                                                                                                      |             |                              |                       |       |                                |              |        |      |        |                          |       |       |
|        |                                                                                                                                      | inches      | inches.                      | in.                   |       |                                |              |        |      |        |                          | Shade | Grass |
| I.     | London (Camden Square) ...                                                                                                           | 3·00        | + 1·38                       | ·58                   | 15    | 21                             | 60·9         | 22     | 27·0 | 4      | 2                        | 12    |       |
| II.    | Tenterden .....                                                                                                                      | 3·62        | + 1·73                       | ·68                   | 10    | 20                             | 61·0         | 22     | 26·5 | 4      | 2                        | 12    |       |
|        | Hartley Wintney .....                                                                                                                | 3·92        | + 2·15                       | ·56                   | 15    | 17                             | 64·0         | 23     | 25·0 | 4      | 4                        | 7     |       |
| III.   | Hitchin .....                                                                                                                        | 2·81        | + 1·28                       | ·40                   | 15    | 24                             | 60·0         | 21     | 26·0 | 3      | 3                        | ...   |       |
|        | Winslow (Addington) .....                                                                                                            | 2·97        | + 1·35                       | ·41                   | 13    | 22                             | 59·0         | 24     | 25·0 | 4      | 4                        | 15    |       |
| IV.    | Bury St. Edmunds (Westley) ...                                                                                                       | 2·26        | + ·62                        | ·32                   | 14    | 20                             | 61·0         | 22a    | 24·5 | 5      | 5                        | ...   |       |
|        | Brundall .....                                                                                                                       | 1·82        | + ·17                        | ·27                   | 10    | 21                             | 60·0         | 22     | 24·0 | 4      | 3                        | 11    |       |
| V.     | Alderbury .....                                                                                                                      | 5·30        | + 3·52                       | ·91                   | 13    | 20                             | 64·0         | 22     | ...  | ...    | ...                      | ...   |       |
|        | Winterbourne Steepleton ...                                                                                                          | 6·27        | + 3·86                       | 1·10                  | 8     | 22                             | 60·5         | 21     | 24·3 | 4      | 2                        | 9     |       |
|        | Torquay (Cary Green) .....                                                                                                           | 5·33        | + 2·88                       | 1·42                  | 10    | 19                             | 58·5         | 18     | 31·5 | 15     | 1                        | 5     |       |
|        | Polapit Tamar [Launceston] ...                                                                                                       | 5·80        | + 3·39                       | 1·20                  | 10    | 24                             | 60·0         | 21     | 24·0 | 3      | 4                        | 9     |       |
|        | Bath .....                                                                                                                           | 3·64        | + 1·70                       | ·57                   | 10    | 21                             | 61·0         | 22     | 25·0 | 4      | 3                        | 18    |       |
| VI.    | Stroud (Upfield) .....                                                                                                               | 4·36        | + 2·50                       | ·57                   | 10    | 23                             | 64·0         | 28     | 30·0 | 3      | 1                        | ...   |       |
|        | Church Stretton (Woolstaston) ...                                                                                                    | 5·19        | + 3·18                       | ·67                   | 15    | 22                             | 58·0         | 22     | 31·0 | 2      | 3                        | ...   |       |
|        | Bromsgrove (Stoke Newington) ...                                                                                                     | 3·38        | + 2·02                       | ·45                   | 23    | 19                             | 59·0         | 22     | 23·0 | 3      | 6                        | ...   |       |
| VII.   | Boston .....                                                                                                                         | 1·60        | + ·24                        | ·26                   | 13    | 12                             | 63·0         | 22     | 26·0 | 4      | ...                      | ...   |       |
|        | Worksop (Hodsock Priory) ...                                                                                                         | 1·97        | + ·42                        | ·39                   | 28    | 19                             | 60·5         | 24     | 27·0 | 20     | 6                        | 22    |       |
|        | Derby (Midland Railway) ...                                                                                                          | 2·51        | + 1·02                       | ·37                   | 10    | 23                             | 60·0         | 22, 23 | 28·0 | 3      | 2                        | ...   |       |
| VIII.  | Bolton (The Park) .....                                                                                                              | 3·81        | + ·93                        | ·52                   | 17    | 22                             | 60·5         | 22     | 30·8 | 3      | 2                        | 13    |       |
| IX.    | Wetherby (Ribston Hall) ...                                                                                                          | 2·27        | + ·42                        | ·37                   | 26    | 17                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
|        | Arncliffe Vicarage .....                                                                                                             | 5·70        | + ·67                        | ·81                   | 11    | 25                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
|        | Hull (Pearson Park) .....                                                                                                            | 2·05        | + ·26                        | ·58                   | 28    | 19                             | 58·0         | 18, 28 | 30·0 | 19     | 3                        | 24    |       |
| X.     | Newcastle (Town Moor) ...                                                                                                            | 1·35        | — ·75                        | ·42                   | 25    | 13                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
|        | Borrowdale (Seathwaite) ...                                                                                                          | 11·10       | + ·59                        | 1·59                  | 11    | 23                             | 59·5         | 22     | 27·9 | 3      | 2                        | ...   |       |
| XI.    | Cardiff (Ely) .....                                                                                                                  | 5·99        | + 3·20                       | 1·27                  | 10    | 23                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
|        | Haverfordwest (High St.) ...                                                                                                         | 6·06        | + 3·03                       | 1·02                  | 10    | 22                             | 56·5         | 22     | 26·4 | 3      | 1                        | 17    |       |
|        | Aberystwyth (Gogerddan) ...                                                                                                          | 6·23        | + 3·30                       | ·70                   | 27    | 22                             | 67·0         | 22     | 19·0 | 2      | 5                        | ...   |       |
|        | Llandudno .....                                                                                                                      | 3·13        | + 1·16                       | ·55                   | 14    | 20                             | 61·0         | 22     | 29·5 | 3      | ...                      | ...   |       |
| XII.   | Cargen [Dumfries] .....                                                                                                              | 4·83        | + 1·82                       | ·58                   | 11    | 19                             | 58·0         | 22     | 28·0 | 3      | 2                        | ...   |       |
|        | Lilliesleaf (Riddell) .....                                                                                                          | 2·94        | + ·54                        | ·60                   | 25    | 25                             | 53·0         | 23     | 24·0 | 19     | 6                        | 15    |       |
| XIII.  | Edinburgh (Royal Observatory) ...                                                                                                    | 2·41        | ...                          | ·57                   | 25    | 19                             | 61·1         | 22     | 33·1 | 3      | 0                        | 19    |       |
| XIV.   | Colmonell .....                                                                                                                      | 4·16        | + ·98                        | ·85                   | 23    | 22                             | 57·0         | 22     | 29·0 | 2      | 3                        | ...   |       |
| XV.    | Tighnabruach .....                                                                                                                   | 6·61        | + 2·25                       | ·74                   | 23    | 26                             | 50·0         | 30     | 26·0 | 2      | 7                        | 7     |       |
|        | Mull (Quinish) .....                                                                                                                 | 7·93        | + 3·70                       | ·71                   | 20    | 26                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
| XVI.   | Dundee (Eastern Necropolis) ...                                                                                                      | 3·15        | + 1·23                       | ·80                   | 25    | 21                             | 54·0         | 19, 22 | 27·2 | 3      | 3                        | ...   |       |
| XVII.  | Braemar .....                                                                                                                        | 4·89        | + 2·47                       | 1·27                  | 15    | 22                             | 53·0         | 22     | 16·4 | 3      | 11                       | ...   |       |
|        | Aberdeen (Cranford) .....                                                                                                            | 3·56        | + 1·13                       | ·89                   | 25    | 20                             | 53·0         | 31     | 27·0 | 2      | 9                        | ...   |       |
|        | Cawdor (Budgate) .....                                                                                                               | 4·32        | + 2·16                       | 1·40                  | 11    | 19                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
| XVIII. | Invergarry .....                                                                                                                     | 6·88        | + 2·05                       | ·90                   | 15    | 24                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
|        | Bendampy .....                                                                                                                       | 10·01       | + 3·63                       | 1·08                  | 11    | 27                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
| XIX.   | Dunrobin Castle .....                                                                                                                | 4·41        | + 1·94                       | 1·58                  | 11    | 17                             | 55·5         | 31     | 30·0 | 10     | 2                        | ...   |       |
|        | Castletown .....                                                                                                                     | 3·77        | ...                          | ·70                   | 11    | 28                             | 54·0         | 21     | 31·0 | 17, 18 | 2                        | ...   |       |
| XX.    | Killarney .....                                                                                                                      | 8·24        | + 4·21                       | 1·22                  | 23    | 28                             | 59·0         | 22     | 31·0 | 24     | ...                      | ...   |       |
|        | Waterford (Brook Lodge) ...                                                                                                          | 5·58        | + 3·03                       | ·81                   | 14    | 25                             | 57·0         | 22     | 25·0 | 3      | 8                        | ...   |       |
|        | Broadford (Hurdlestown) ...                                                                                                          | 5·03        | + 2·86                       | ·59                   | 10    | 26                             | 52·0         | 22, 26 | 26·0 | 2      | 6                        | ...   |       |
| XXI.   | Carlow (Browne's Hill) .....                                                                                                         | 3·92        | + 1·66                       | ·69                   | 14    | 25                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
|        | Dublin (Fitz William Square) ...                                                                                                     | 2·73        | + ·88                        | ·70                   | 14    | 20                             | 61·4         | 22     | 29·7 | 3      | 1                        | 8     |       |
| XXII.  | Ballinasloe .....                                                                                                                    | 4·26        | + 1·81                       | ·70                   | 14    | 29                             | 63·0         | 22     | 25·0 | 3      | 15                       | ...   |       |
|        | Clifden (Kylemore House) ...                                                                                                         | 8·58        | + 2·91                       | ·90                   | 24    | 24                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
| XXIII. | Seaforde .....                                                                                                                       | 4·07        | + 1·51                       | 1·04                  | 23    | 21                             | 54·0         | 26, 27 | 27·0 | 2      | 7                        | 20    |       |
|        | Londonderry (Creggan Res.) ...                                                                                                       | 3·20        | + ·14                        | ·55                   | 23    | 25                             | ...          | ...    | ...  | ...    | ...                      | ...   |       |
|        | Omagh (Edenfel) .....                                                                                                                | 5·22        | + 2·75                       | ·50                   | 14    | 29                             | 58·0         | 22     | 30·0 | 2      | 7                        | 14    |       |

+ Shows that the fall was above the average; — that it was below it "—" and 23, 24.



## SUPPLEMENTARY RAINFALL, MARCH, 1905.

| Div.  | STATION.                      | Rain.<br>inches | Div.   | STATION.                     | Rain.<br>inches |
|-------|-------------------------------|-----------------|--------|------------------------------|-----------------|
| II.   | Dorking, Abinger Hall .....   | 4.20            | XI.    | New Radnor, Ednol .....      | 6.13            |
| „     | Ramsgate, West Cliff.....     | 1.98            | „      | Rhayader, Nantgwillt ...     | 8.76            |
| „     | Hailsham .....                | 5.55            | „      | Lake Vyrnwy .....            | 6.82            |
| „     | Crowborough .....             | 5.09            | „      | Ruthin, Plâs Drâw .....      | 3.30            |
| „     | Osborne.....                  | 5.24            | „      | Criccieth, Talarvor.....     | 4.17            |
| „     | Emsworth, Redlands.....       | 4.82            | „      | Anglesey, Lligwy .....       | 3.98            |
| „     | Alton, Ashdell .....          | 6.28            | „      | Douglas, Woodville .....     | 4.28            |
| „     | Newbury, Welford Park ...     | 5.77            | XII.   | Stoneykirk, Ardwell House    | 2.49            |
| III.  | Harrow Weald .....            | 3.30            | „      | Dalry, Old Garroch .....     | 6.98            |
| „     | Oxford, Magdalen College..    | 2.69            | „      | Langholm, Drove Road.....    | 5.86            |
| „     | Banbury, Bloxham.....         | 3.05            | „      | Moniaive, Maxwellton House   | 5.76            |
| „     | Pitsford, Sedgebrook.....     | 2.35            | XIII.  | N. Esk Reservoir [Penicuik]  | 4.00            |
| „     | Huntingdon, Brampton.....     | 2.08            | XIV.   | Maybole, Knockdon Farm..     | 3.77            |
| „     | Wisbech, Bank House .....     | 2.02            | „      | Glasgow, Queen's Park .....  | 3.17            |
| IV.   | Southend .....                | 2.15            | „      | Campbeltown, Redknowe...     | 3.83            |
| „     | Colchester, Lexden.....       | 1.81            | XV.    | Inveraray, Newtown.....      | 7.97            |
| „     | Saffron Waldon, Newport...    | 2.50            | „      | Ballachulish House.....      | 11.11           |
| „     | Rendlesham Hall .....         | 1.72            | „      | Islay, Eallabus .....        | 5.62            |
| „     | Swaffham .....                | 2.65            | XVI.   | Dollar .....                 | 4.43            |
| „     | Blakeney .....                | 2.06            | „      | Loch Leven Sluices .....     | 4.29            |
| V.    | Bishops Cannings .....        | 4.28            | „      | Balquhiddy, Stronvar .....   | 8.48            |
| „     | Ashburton, Druid House ...    | 9.17            | „      | Coupar Angus Station .....   | 3.07            |
| „     | Okehampton, Oaklands.....     | 7.31            | „      | Blair Atholl.....            | 4.76            |
| „     | Hartland Abbey .....          | 4.12            | „      | Montrose, Sunnyside.....     | 3.64            |
| „     | Lynmouth, Rock House ...      | 5.64            | XVII.  | Alford, Lynturk Manse ...    | 3.44            |
| „     | Probus, Lamellyn .....        | 5.03            | „      | Keith.....                   | 4.13            |
| „     | Wellington, The Avenue ...    | 4.88            | XVIII. | N. Uist, Lochmaddy.....      | 6.25            |
| „     | North Cadbury Rectory ...     | 3.44            | „      | Aviemore, Alvey Manse .....  | 3.43            |
| VI.   | Clifton, Pembroke Road .....  | 4.74            | „      | Loch Ness, Drumnadrochit.    | 3.09            |
| „     | Moreton-in-Marsh, Longboro'   | 3.66            | „      | Glencarron Lodge .....       | ...             |
| „     | Ross, The Graig .....         | 3.41            | „      | Fearn, Lower Pitkerrie.....  | 3.94            |
| „     | Shifnal, Hatton Grange.....   | 3.30            | XIX.   | Invershin .....              | 4.38            |
| „     | Wem Rectory .....             | 3.17            | „      | Altnaharra .....             | 4.59            |
| „     | Cheadle, The Heath House.     | 3.92            | „      | Bettyhill .....              | 5.15            |
| „     | Coventry, Kingswood .....     | 3.10            | „      | Watten .....                 | 3.12            |
| VII.  | Market Overton .....          | 2.53            | XX.    | Cork, Wellesley Terrace ...  | 6.82            |
| „     | Market Rasen .....            | 2.32            | „      | Darrynane Abbey .....        | 8.16            |
| „     | Bawtry, Hesley Hall.....      | 1.80            | „      | Glenam [Clonmel] .....       | 6.15            |
| VIII. | Neston, Hinderton.....        | 2.62            | „      | Ballingarry, Gurteen .....   | 4.39            |
| „     | Southport, Hesketh Park...    | 3.00            | „      | Miltown Malbay.....          | 5.67            |
| „     | Chatburn, Middlewood .....    | 3.15            | XXI.   | Gorey, Courtown House .....  | 4.48            |
| „     | Cartmel, Flookburgh .....     | 3.02            | „      | Moynalty, Westland .....     | 4.68            |
| IX.   | Langsett Moor, Up. Midhope    | 5.14            | „      | Athlone, Twyford .....       | 4.42            |
| „     | Scalby, Silverdale .....      | 2.38            | „      | Mullingar, Belvedere.....    | 5.22            |
| „     | Ingleby Greenhow .....        | 2.48            | XXII.  | Woodlawn .....               | 5.13            |
| „     | Middleton, Mickleton .....    | 1.99            | „      | Westport, Murrisk Abbey..    | 6.43            |
| X.    | Beltingham .....              | 2.48            | „      | Crossmolina, Enniscoie ..... | 6.52            |
| „     | Font Reservoir, Fallowlees.   | 1.47            | „      | Collooney, Markree Obsy...   | 5.34            |
| „     | Illderton, Lilburn Cottage... | 1.81            | XXIII. | Enniskillen, Portora .....   | 4.47            |
| „     | Keswick, The Bank .....       | 5.79            | „      | Warrenpoint .....            | 5.09            |
| XI.   | Llanfrechfa Grange.....       | 5.81            | „      | Banbridge, Milltown .....    | 3.57            |
| „     | Treherbert, Tyn-y-waun ...    | 11.39           | „      | Belfast, Springfield .....   | 3.92            |
| „     | Carmarthen, Friary .....      | 6.29            | „      | Bushmills, Dundarave .....   | 2.99            |
| „     | Castle Malgwyn .....          | 6.49            | „      | Stewartstown .....           | 4.10            |
| „     | Plynlimon.....                | 11.20           | „      | Killybegs .....              | 4.55            |
| „     | Tallyllyn .....               | 5.00            | „      | Horn Head .....              | 3.80            |

## METEOROLOGICAL NOTES ON MARCH, 1905.

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

## ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—Unsettled and rainy weather prevailed until 17th, with slight frosts in the first few days, and rough S. to W. winds during the second week. On 19th a change to more genial conditions took place and the latter part of the month was on the whole fine and dry. Duration of sunshine 86·0\* hours and of R 67·0 hours. Mean temp.  $45^{\circ}\cdot 2$ , or  $3^{\circ}\cdot 1$  above the average. Slight TS at 11 p.m. on 14th.

ABINGER HALL.—Stormy and wet, although R was much needed. Vegetation progressed fast with sunny days and warmer nights, but the ground was still cold. Short TSS on 11th and 18th.

TENTERDEN.—A warm and pleasant month, but very wet from 8th to 17th. High winds on 11th and 12th. Duration of sunshine 137† hours.

CROWBOROUGH.—A wet month, with more R than any March since 1870. Unusually mild, especially at night. A succession of gales, with occasional T, L and H, from 7 p.m. on 10th to the evening of 15th. Except on 3rd the month was entirely free from frost. Mean temp.  $43^{\circ}\cdot 3$ .

OSBORNE.—The wettest March for at least 47 years, the R being 3·40 in. above the average for that period.

HARTLEY WINTNEY.—The first two weeks were squally and tempestuous, with much R and T, making the wettest fortnight yet recorded here and also the wettest March. The latter part was drier, with absence of frost. Ozone every day, with a mean of 4·6. S.W. gales on 10th and 11th.

COLCHESTER.—Mild, with little E. wind and frequent showers. Several bright and warm days and everything looking well. Short but sharp TS on 14th, during which some houses were damaged.

TORQUAY.—Mean temp.  $46^{\circ}\cdot 4$ , or  $2^{\circ}\cdot 3$  above the average. Duration of sunshine 153·9\* hours, or 15·6 hours above the average. Mean amount of ozone 5·8.

ASHBURTON.—TSS on 11th and 14th, that on 14th consisting of a continuous series of flashes of L from midnight to 5 a.m. with torrents of R.

POLAPIT TAMAR.—Very wet, with a rough and stormy period from 9th to 16th. The total R was the largest for March for 36 years, except in 1903.

LYNMOUTH.—The wettest March since 1878, except 1903, when 7·30 in. of R fell. R 2·74 in. above the average. Much bright sunshine in the last 10 days. L on 11th and 20th.

WELLINGTON.—A great change from many previous months, the R during the first 17 days being exceedingly heavy, and the total for the month about double the normal. Very violent winds at times. TS on 15th, with H.

NORTH CADBURY.—Except on the first three days there were no polar winds and frosts were few and slight. The R, though much wanted, interfered with sowing. The worst gale of the winter occurred between 8 p.m. on 14th and noon on 15th. Trees were felled and a church window was blown in.

CLIFTON.—Wild weather from 10th to 17th, with a succession of gales and heavy R. The rest of the month was unsettled, with frequent showers. R exactly double the average and the greatest since 1867. TSS on 3 days and H on 4.

STROUD.—On 11th, during a furious H storm, between 6.30 and 7 a.m., an elm and a poplar were struck by L, about a mile from here. On 14th an elm was blown down in a S.W. gale. T, L and H on 7th.

ROSS.—Very warm, with fewer, and less severe, frosts than usual. The period of 365 days ending on March 7th gave 17·07 in. of R, against 41·75 in. in the year immediately preceding. The former was the smallest similar total in 87 years, whilst the latter was only exceeded two or three times.

BOLTON.—Remarkably bright, only two days being sunless. Total duration

82·3\* hours, or 2·8 hours above the average. Mean temp.  $43^{\circ}\cdot 0$ , or  $3^{\circ}\cdot 6$  above the average, and only once exceeded since observations commenced in 1887. The season was consequently very forward. Mean amount of ozone 2·0, being ·5 above the average. T on 4 days and L on 2.

LILBURN.—Changeable, with frequent showers, but fine on the whole. Vegetation forward.

HAVERFORDWEST.—Stormy and wet, especially on 15th, when much damage was done. Mild generally, with a good deal of sunshine. Agricultural operations were well advanced and vegetation forward. Duration of sunshine 128·9\* hours.

DOUGLAS.—Wet and generally mild, with much wind. An extremely severe W. gale on 15th did much damage. From 17th to 23rd was fine and spring-like, and vegetation was not backward at the end. H, S, L and T on 9th. Hills covered with S for some days from 24th.

### SCOTLAND.

LANGHOLM.—R 1·60 in. above the average of 29 years.

LILLIESLEAF.—Very windy, with continuous and sometimes heavy showers. "Summer all day, winter each night," the min. temp. keeping near freezing point.

COLMONELL.—Strong winds or gales on 3rd, 10th, and 13th to 15th, and very frequent but seldom heavy R. Mean temp.  $42^{\circ}\cdot 9$ , or  $2^{\circ}\cdot 3$  above the average.

INVERARAY.—Wet and stormy, with R chiefly in heavy showers, and a good deal of H. Too wet for sowing and the usual March work.

COUPAR ANGUS.—Mean temp. almost  $3^{\circ}$  above the average. R nearly an inch above the average, this being the first month with a surplus since August, 1904. Frost on 10 mornings.

DRUMNADROCHIT.—R 1·1 in., and rainy days 3, above the average. Remarkable absence of frost.

CASTLETOWN.—Cold and continuously wet until 18th. Latter part warmer, but still very wet. The ground was too wet for farmers to complete ploughing, and no cereal seed was in by the end.

### IRELAND.

CORK.—The wettest March for at least 27 years, the R being nearly three times the average. Great storm on 14th and 15th, in which the bar. fell to 28·14 in. L on 11th and 14th.

DARRYNANE ABBEY.—A great contrast to the two previous months, the R being 4·85 in. more than the average of 25 years, and 1·91 in. more than the next heaviest fall in that period.

MILTOWN MALBAY.—Cold, wet, stormy and squally, with T, L and H. All tillage work stopped.

† DUBLIN.—Unsettled, squally and showery, with S.W. and W. winds. Mean temp.  $45^{\circ}\cdot 2$ , or  $1^{\circ}\cdot 6$  above the average. Duration of sunshine 159\* hours. H on 9 days. On 15th, at 5 a.m., the bar. fell to 28·077 in., the lowest pressure since December 8th, 1886, when 27·758 in. was recorded.

MARKREE OBSERVATORY.—R, H, sleet and some S fell frequently till 17th, with high winds and gales at times. Fine and showery after, and generally mild.

OMAGH.—It would be difficult to find in the record a more unfavourable March for agricultural purposes. The ground became entirely unfit to receive seed of any kind, and no sowing seems to have been attempted in any part of the country.

\* Campbell-Stokes.

† Jordan.

## Climatological Table for the British Empire, October, 1904.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver. |        |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|-------|--------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |       | Cloud. |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |            |       |       |        |
|                                                                  |           |       |          |       |          |      |               |           |                 |                   |            |       |       |        |
| London, Camden Square                                            | 67·1      | 18    | 32·7     | 15    | 57·7     | 44·7 | 47·9          | 90        | 98·7            | 22·9              | 1·56       | 11    | 6·3   |        |
| Malta.....                                                       | 81·7      | 8     | 53·7     | 10    | 72·8     | 61·8 | 59·8          | 80        | 133·8           | 48·3              | 6·34       | 15    | 4·6   |        |
| Lagos.....                                                       | 86·0      | 25a   | 70·0     | 13c   | 84·0     | 73·7 | 72·8          | 77        | 148·0           | 68·5              | 6·37       | 12    | 7·2   |        |
| Cape Town .....                                                  | 93·0      | 30    | 41·6     | 12    | 67·2     | 52·5 | 51·9          | 74        | ...             | ...               | 2·83       | 10    | 5·4   |        |
| Durban, Natal .....                                              | 96·1      | 23    | 53·3     | 16    | 77·0     | 61·6 | ...           | ...       | 159·2           | ...               | 2·52       | 19    | 5·2   |        |
| Johannesburg .....                                               | 82·5      | 6     | 37·8     | 13    | 72·9     | 50·8 | 41·3          | 57        | ...             | 35·8              | ·79        | 7     | 3·7   |        |
| Mauritius.....                                                   | 87·1      | 31    | 54·6     | 10    | 80·4     | 64·0 | 61·4          | 71        | 149·6           | 46·9              | ·93        | 13    | 6·7   |        |
| Calcutta.....                                                    | 92·4      | 1     | 63·1     | 27    | 88·0     | 73·4 | 72·2          | 77        | 155·8           | 57·4              | ·98        | 3     | 4·6   |        |
| Bombay.....                                                      | 93·1      | 4     | 75·1     | 21    | 89·3     | 77·6 | 75·1          | 77        | 141·1           | 66·8              | ·56        | 4     | 3·4   |        |
| Madras .....                                                     | 94·5      | 4     | 67·3     | 29    | 90·2     | 74·7 | 72·7          | 78        | 146·5           | 63·9              | 2·33       | 15    | 5·2   |        |
| Kodaikanal .....                                                 | 67·2      | 19    | 45·3     | 31    | 62·2     | 51·1 | 51·2          | 86        | 135·8           | 41·9              | 12·29      | 20    | 6·4   |        |
| Colombo, Ceylon.....                                             | 87·6      | 2     | 72·0     | 5d    | 85·5     | 75·1 | 71·6          | 79        | 154·6           | 68·0              | 21·73      | 24    | 5·7   |        |
| Hongkong.....                                                    | 85·1      | 2     | 67·4     | 31    | 80·1     | 73·3 | 49·6          | 74        | 137·0           | ...               | 2·01       | 8     | 5·8   |        |
| Melbourne.....                                                   | 88·7      | 31    | 38·2     | 3     | 68·1     | 48·9 | 47·8          | 72        | 147·9           | 31·0              | 2·72       | 11    | 5·0   |        |
| Adelaide .....                                                   | 95·7      | 18    | 43·6     | 7     | 73·4     | 52·7 | 48·0          | 60        | 149·0           | 39·5              | 2·11       | 13    | 5·2   |        |
| Coolgardie .....                                                 | 94·2      | 30    | 38·4     | 9     | 71·9     | 49·5 | 44·7          | 55        | 159·1           | 35·7              | 1·87       | 10    | 4·8   |        |
| Sydney .....                                                     | 86·4      | 30    | 43·9     | 1     | 71·4     | 56·0 | 51·7          | 67        | 125·0           | 36·3              | 2·33       | 17    | 4·5   |        |
| Wellington .....                                                 | 66·2      | 31    | 39·9     | 13    | 57·4     | 46·4 | 43·7          | 74        | 127·0           | 37·0              | 12·94      | 17    | 7·4   |        |
| Auckland .....                                                   | 67·0      | 24b   | 44·0     | 8     | 61·0     | 50·0 | 47·5          | 75        | 137·0           | 39·0              | 3·80       | 17    | 5·8   |        |
| Jamaica, Negril Point..                                          | 87·9      | 8, 12 | 70·9     | 5e    | 85·1     | 73·6 | 75·5          | 86        | ...             | ...               | 5·07       | 11    | ...   |        |
| Grenada .....                                                    | 91·4      | 31    | 73·2     | 8     | 85·6     | 75·0 | 71·8          | 73        | 156·2           | ...               | 1·57       | 16    | 3·0   |        |
| Toronto .....                                                    | 71·0      | 10    | 23·0     | 31    | 54·2     | 37·8 | 39·9          | 78        | 98·2            | 16·8              | 2·48       | 11    | 6·1   |        |
| Fredericton .....                                                | 67·8      | 21    | 19·9     | 28    | 53·5     | 34·2 | 30·9          | 58        | ...             | ...               | 2·81       | 9     | 5·8   |        |
| Winnipeg .....                                                   | 66·0      | 16    | 20·7     | 6     | 51·8     | 35·3 | ...           | ...       | ...             | ...               | 1·51       | 12    | 6·9   |        |
| Victoria, B.C. ....                                              | 66·2      | 2     | 40·2     | 28    | 57·5     | 47·9 | ...           | ...       | ...             | ...               | ·88        | 8     | 7·1   |        |
| Dawson .....                                                     | 55·0      | 10    | 8·2      | 23    | 36·5     | 21·3 | ...           | ...       | ...             | ...               | ·36        | 3     | 4·2   |        |
| Lagos (July) .....                                               | 84·0      | 9     | 69·0     | 26    | 80·9     | 72·7 | 71·6          | 82        | 140·0           | 65·0              | 12·27      | 14    | 8·0   |        |
| „ (August) .....                                                 | 85·0      | 26    | 69·0     | 5     | 82·1     | 72·3 | 69·6          | 75        | 141·0           | 65·0              | ·08        | 2     | 7·7   |        |
| „ (September).....                                               | 87·5      | 4     | 70·5     | 18    | 83·3     | 73·2 | 72·6          | 80        | 148·0           | 66·0              | 7·06       | 20    | 8·2   |        |

a—and 26. b—and 25. c—and 28. d—and 21, 26. e—and other days.

MALTA.—Mean temp. of air 66°·3, or 3°·1 below average, mean hourly velocity of wind 8·2 miles, or 0·6 below average. Mean temp. of sea 73°·9. TSS on 3 days.

MAURITIUS.—Mean temp. of air 0°·5, dew point 0°·4, and rainfall ·63 in., below averages. Mean hourly velocity of wind 9·4 miles, or 1·6 miles below average.

KODAIKANAL.—Bright sunshine 149 hours.

COLOMBO.—Mean temp. of air 80°·0, or 0°·2 below, of dew point 1°·4 below, and R 7·27 in. above, averages. Mean hourly velocity of wind 6·1 miles; prevailing direction S.W.

HONGKONG.—Mean temp. of air 76°·5. Bright sunshine 191·2 hours. Mean hourly velocity of wind 14·1 miles; mean direction E. 11° N.

ADELAIDE.—Mean temp. of air 63°·0, or 0°·9 above, and R ·39 in. above, averages.

SYDNEY.—Mean temp. of air 0°·2, above, R ·65 in. below, and humidity 1·4 p.c. below averages.

WELLINGTON.—Mean temp. of air 2°·3 below, and R 9·01 in. above, averages.