

S Y M O N S ' S

# METEOROLOGICAL MAGAZINE.

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## DUST SHOWERS IN THE SOUTH-WEST OF ENGLAND.

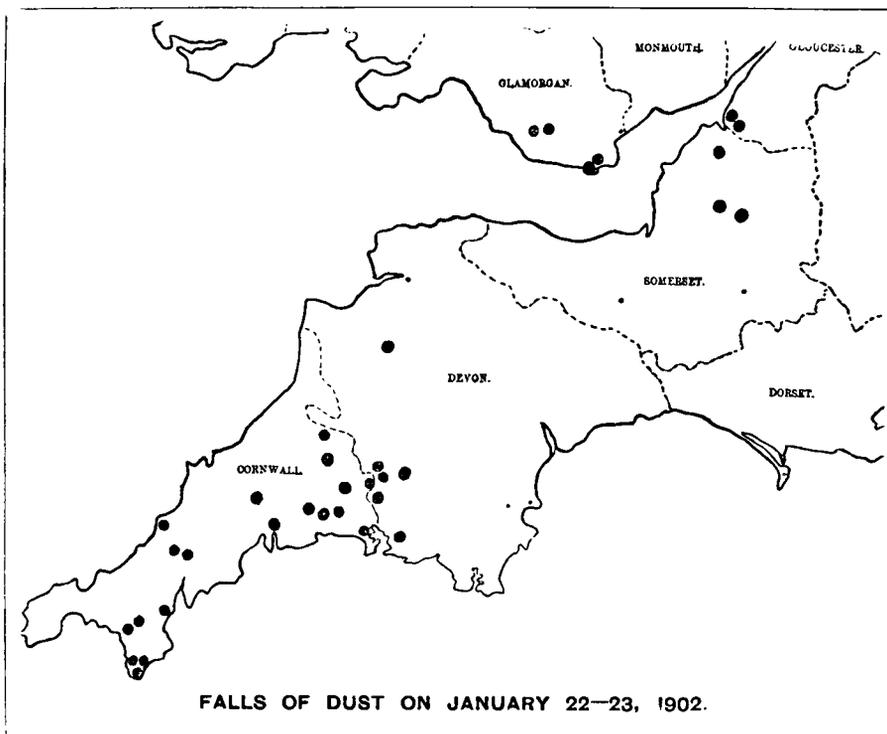
THE "blood-rains" of March last in southern Europe produced so much excitement where they fell and were commented on so fully in the daily press, that it is somewhat strange to have to record a very similar occurrence in our own country which seems to have called forth no comment whatever in any London newspaper. On January 22nd or 23rd, many people in the extreme south-west of England had their attention attracted by a peculiar deposit of reddish or yellowish dust, which lay on exposed objects or the surface of the ground, and appeared to have fallen from the sky. Such a phenomenon is not unprecedented, but it is so rare as to be worth investigating, and we publish this preliminary notice in the hope of obtaining additional information as to the extent and the nature of the showers. It would be a favour if every reader who has observed the phenomenon would write a short account, stating exactly what was seen, with date and place and any other facts bearing on the subject, and send it to Dr. H. R. Mill, 62, Camden Square, London, N.W.

The accompanying map shows by a large black dot every place at which we have ascertained that the appearance was noticed. It will be seen that the dust fell over practically the whole of Cornwall, but only attracted attention near the western border of Devon, reappearing again at a few points in Somerset, the extreme south of Gloucester and Glamorgan. There are thus two areas in which the dust fell abundantly—the Cornish area, measuring roughly 80 by 40 miles, and the Bristol Channel area, measuring perhaps 60 by 30 miles. The most northerly and easterly point in the former area, Black Torrington, is 50 miles from the nearest points in the latter area, Bridgend and Barry. Of course, the dust may have fallen in the intervening districts and have escaped notice, a probability which will appear the greater when we remember that the large unpeopled tracts of Dartmoor and Exmoor lie there. But, on the other hand, we have ascertained by enquiries specially addressed to rainfall observers, who are not likely to have overlooked so interesting an appearance, that nothing of the kind was noticed at Barnstaple, Taunton, Newton Abbott, Torquay, Portland, or North Cadbury (near Wincanton). These places are

marked on the map by a small circle. Hence, there is some evidence for believing that two different falls took place, but we cannot at present say whether they were simultaneous or successive. With regard to this question, notes as to the hour when the dust was first observed would be of value.

An enquiry addressed to Mr. Dorrien Smith, of Tresco Abbey in the Scilly Islands, elicited the fact that splashes of muddy rain had been observed there on January 21st, but no general fall of dust.

An examination of the Daily Weather Charts shows that, from the 20th to the 23rd, the weather of the south of England was controlled by a high-pressure area, the centre of which lay over the west of France and the Bay of Biscay until the 23rd, when it moved a little eastward. The wind over the whole of the west and south of England was westerly, with a southerly component, and light; and the rainfall was very slight, a little snow lying in some places.



The actual appearances observed may be judged from the following extracts from local newspapers, and from our correspondence:—

A correspondent of the *Western Morning News*, writing from Bere Alston, says:—“A labourer here speaks of a slight hail shower on Thursday last [23rd], which was accompanied by a dust fog. His account somewhat resembles the descriptions we have of those fine

dust showers which, at a distance of 400 or 500 miles from the coast of Africa, envelop vessels in a thick fog."

Rev. J. A. Wix, of Quethwick, speaks of a washing hung out to dry on the night of the 23rd being found next morning, "splashed to such an extent by some yellowish 'mess' that all had to be re-washed," while the cabbages were covered with a dust resembling Peruvian guano.

Mr. E. W. Waite, the Waterworks' Engineer of the Barry Urban District Council, writes us:—

"The fall of rain, ending on Thursday the 23rd at 9 a.m., was a light one, only .03 in., the wind very light from W.N.W. The deposit, like a very fine dust, coated the iron railings and fences with a pale salmon-pink colour. I was very much struck with some ordinary wire-netting which appeared to have been painted with a brush. The deposit was particularly noticeable on Barry Island, although I found it to a lesser extent at Barry itself."

Earl Waldegrave, writing from Chewton Priory, to the *Western Daily Press*, says:—

"Wednesday the 22nd was with us very warm, with wet mist, only measuring .02 in. of rain. Afterwards the glass and woodwork of the greenhouses and frames were covered with a rust-coloured dust, which has left stains on the paint."

Sir Edward Fry, writing to *Nature* of February 6th, from Failand, near Bristol, says:—"My men here noticed on Thursday last, the 23rd instant, that the leaves, glasses of the frames and iron-work of the gates were smeared with a reddish mud; one hedge in particular they describe as almost covered with the substance, and the pinafores of a cottager's children which were hanging out to dry were so stained with the deposit that they had to be re-washed. When the substance fell no one here knows, nor is it clear whether it fell as dust or mud; from the firm way in which it has attached itself to the iron-work, I should think that it fell as mud."

Dr. A. A. Rambaut, F.R.S., informs us that although no fall of dust was noticed at the Radcliffe Observatory, Oxford, a singular appearance in the sky attracted attention on the morning of January 21st, and led a workman engaged in the Observatory grounds to ask whether there was "going to be a dust-storm."

Several correspondents of the western papers suggest that an explosion of dynamite, which occurred at Nobel's Explosives Factory at Perranporth, near Truro, on January 16th, might have thrown a sufficient quantity of dust into the air to account for its fall a week later over a wide area. It seems improbable that less than several thousand—possibly hundreds of thousand—tons of dust have fallen during these showers, although as yet we have no data for a quantitative estimate, and, on enquiring as to the extent of the explosion, we have been favoured by the following interesting communication from Mr. J. V. Turner, the Works' Manager:—

"The explosion took place about 1 ft. 4 in. above ground level;

a crater was made measuring 20 ft. by 15 ft. by 3 ft. deep, but the earth was not all dislodged. I should say that not a single atom of earth or matter was thrown outside our own property, not by many hundreds of yards. The column of smoke, fumes and *débris* did not ascend more than 100 feet high, and from eye-witnesses we know that the fumes or smoke were all condensed within a quarter of a mile from us in the direction of Truro, this would mean that the wind was N.W. at the time. The deposit referred to was perceived on the morning of January 22nd. . . . I have often noticed such deposits off the coast of Africa whilst at a great distance from land."

Mr. Waite was good enough to send us a sample of the dust collected on Barry Island, and this we submitted to Sir John Murray, F.R.S., of the "Challenger" Expedition, and to Mr. W. E. Prior, of the British Museum, both of whom very kindly examined it microscopically. They agree in regarding it as a very fine grained inorganic dust, containing grains of quartz and portions of micaceous minerals or of felspar, with a few fragments of diatoms. Sir John Murray considers it resembles a clay coloured by the higher oxides of iron, and containing some minute magnetic spherules, possibly of cosmic origin. Mr. Prior concludes: "The dust appears to be of the same nature as the dust or so-called "blood-rain," which is often carried over from Africa to Europe, even as far north, it is stated, as Hamburg."

A memoir on the dust rains of last March, by Drs. Hellmann and Meinardus, with maps showing the distribution of the phenomenon, has reached us just in time to mention the fact here, and we hope to give some account of it next month.

We trust to the co-operation of the observers in the west of England to obtain additional information, which may enable a really satisfactory account to be given of the extent and origin of the sprinkling of yellowish-pink dust reported by so many observers.

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#### THE HIGH PRESSURE IN JANUARY.

THE highest barometric pressure recorded in the British Isles, so far as we can ascertain, was 31.108 inches at Ochtertyre, on January 9th, 1896, at 9 a.m., this figure representing the value reduced to 32° F. and sea level. On January 31st, 1902, the pressure at Aberdeen, as given in the Daily Weather Report, was 31.11 inches, and this is possibly higher than the previous "record;" although, until the reading is given to the third decimal place, we cannot say so with certainty. Throughout January the atmospheric pressure has been unusually high over the extreme west of Europe, and we have received numerous communications on the subject. The highest readings in the south occurred in the middle of the month; those in the north, at the end. The following instances may be cited:—

At Cam Len Square the corrected barometer reading had exceeded 30.800 inches on only six occasions since 1859, and, observing at

9 p.m. on January 14th that this limit was being exceeded for a seventh time, Mr. SOWERBY WALLIS carried out a series of half-hourly readings until 5 a.m. on the 15th, when the maximum seemed to have passed. However, at 9 a.m., the highest reading was recorded—30·874—a value only exceeded on three previous occasions, viz. :—

30·927 in.	on January 30th,	1896,	at 11 a.m.
30·934	„ „	9th,	1896, at 9 p.m.
30·975	„ „	18th,	1882, at 10.30 a.m.

The pressure remained above 30·800 inches continuously for 19 hours.

Mr. G. VON U. SEARLE reports an equally high reading at West Kensington, 30·876 inches at 9 a.m. on the 15th.

Mr. E. L. M. COLVILLE, at Bournemouth, carried out half hourly observations, and he reports a maximum pressure of 30·927 at 10.30 a.m. on the 15th; the pressure at 8 a.m. having been 30·916, and at 9 a.m. 30·921. Mr. Colville's barometer is on Fortin's pattern, and he sends us the readings corrected to 32° and sea level.

The high pressure at the end of the month was much less pronounced in the south, the maximum at Camden Square being 30·703 at 9 a.m. on the 31st. In the north, however, very high readings were the rule. Writing from Harewood Lodge, Meltham, Yorkshire, Mr. C. L. BROOK sends us a series of barometer readings from 5.30 p.m. on January 30th, when the pressure corrected and reduced was 30·734, to 10 a.m. on February 1st, when it was 30·863. The highest reading observed was 30·951 on January 31st at 11 a.m., a value only exceeded in Mr. Brook's record by 31·021 on January 9th, 1896.

The highest reading of a standard barometer of which we have heard was the 31·11 inches recorded by the Meteorological Office observer at Aberdeen at 10 p.m. on January 31st. From the Daily Weather Reports we observe that an anticyclone spreading from the south caused a rise of pressure with few fluctuations from the beginning of the month, until on the 11th the whole of the British Isles had pressures over 30 inches, and on the 14th no place had a pressure lower than 30·5 inches. There was a considerable fall of pressure from the 24th to 28th, and then a rapid recovery, until on February 1st the 8 a.m. weather chart showed the greatest concentration of air that has been observed since the great anticyclone of January 9th, 1896, when pressure over the whole of our islands exceeded 30·8 inches. On February 1st, 1902, the pressure ranged from 30·5 inches in the south of England to more than 31·0 inches over the northern half of Scotland.

The popular belief that a high barometer involves calm weather was somewhat rudely shaken by the memorable easterly gale which raged over the southern part of the North Sea and the Channel on Friday, Saturday, and Sunday (January 31st to February 2nd) as the

masses of air piled up in the north swept over the surface towards the low pressure area in southern Europe.

In referring to the occurrence of abnormally high barometric readings, Mr. Brook, of Harewood Lodge, points out that they show a tendency to occur in pairs, and cites the following examples :—

Year.	Dates.	Interval, Days.
1821 .....	Jan. 3rd and Feb. 5th .....	33
1825 .....	Jan. 9th ,, Jan. 23rd .....	19
1834-35 .....	Dec. 15th ,, Jan. 2nd .....	19
1882 .....	Jan. 18th ,, Feb. 1st and Feb. 19th	14, 18
1896 .....	Jan. 9th ,, Jan. 30th .....	21
1902 .....	Jan. 14th ,, Jan. 31st .....	17

To this we may add from the Camden Square record :—

1887 .....	Feb. 7th and April 17th .....	69
1891 .....	Jan. 11th ,, Feb. 4th .....	24

Omitting the year 1887, the average of the eight cases shows an interval between the maxima of exactly three weeks. It must be noted, however, that since 1858 the Camden record shows 21 cases of maxima exceeding 30·7 inches, and thirteen of these were certainly unpaired.

The rainfall of January naturally falls considerably below the average in all parts of the country, except in the track of the depressions of the 1st and 28th, on account of the prevailing anticyclonic conditions, and the fact of so severe a gale as that at the end of the month being entirely without rain was very impressive to those who experienced it.

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## Correspondence.

### INCENDIARY LIGHTNING.

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

THUNDERSTORMS are rare on the Cape Peninsula, and never severe. Yesterday evening a storm passed directly over Table Mountain, and the clouds seemed to be 500 feet higher than the mountain, or about, say, 4,000 feet. The lightning was very beautiful; some flashes were momentary, others lasted an appreciable time. I saw one flash actually hit the mountain about 20 feet from the top of the precipice, and whilst the flash continued I saw the part struck grow a brilliant red. It thought at the instant it was molten rock. The glow vanished with the flash; but smoke now appeared, in fact a bush had evidently been ignited, and I had been fortunate enough to see it. Many other flashes struck the summit, but from my station I did not again see the actual point struck.

R. T. A. INNES.

*Royal Observatory, Cape of Good Hope, 26th Oct., 1901.*

## DEFINITION OF A RAINY DAY.

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

Is it not about time that the definition of a *rainy day*, as a day on which  $\cdot 01$  in., or more, of moisture is deposited, should be altered? For it contains an absurdity. How many days on which  $\cdot 01$  in. only of moisture is deposited in the gauges have one drop of real rain? I venture to say not 10 per cent. The deposition on all the other occasions is due either to wet fogs, or to dew. Now how misleading this is! You tell a man, for instance, that in November last there were fifteen rainy days, and he will laugh in your face, and naturally too, for there were only seven days throughout the month on which the measurement was more than  $\cdot 01$  in.; on almost, if not all the others, the moisture was caused entirely by dew. And yet all these  $\cdot 01$  in. days get added in when considering the climate of any place, so that it is not only certain that all places appear much rainier than they ought in meteorological records, but also that those places in valleys, by rivers &c., that have copious and frequent dews, appear the wettest of all; and not only so, but the dryer and more settled their weather, the more rainy they appear, because it is just under those conditions that dew forms most copiously. Hence it is quite conceivable that such a place might have an entirely rainless month with thirty *rainy* days. Which is absurd.

Now, how much more true it would be to give as a definition of a *rainy day*, one on which  $\cdot 02$  in. or more of moisture is deposited. This quantity of dew is hardly ever measured, and the few occasions on which it is would about balance those few days on which  $\cdot 01$  in. of rain only really does fall. We should then know truly on how many days per month, or per year, rain *does* fall at any given place, which at present we certainly cannot do. Of course the dews would be measured and added into the monthly totals in the ordinary way, but would no longer be able to convert a large proportion of our most beautiful days and nights into *rainy* ones.

I hope that by means of your influential paper, you may be able to effect this much-needed reform.

ALBT. E. WATSON, B.A., F.R.Met.Soc.

[We hope that our paper may be influential for the good of meteorology, but we trust that it will not, by publishing the foregoing letter, lead to any departure from the accepted definition of a rainy day (or a rain day, as the Meteorological Office call it, with less room for ambiguity). We need only refer readers curious on the subject to the long and careful discussion which led Mr. Symons to adopt the minimum value for a day on which measurable rain falls. The word "rain" is used in relation to measurement, as a contraction for "any form of aqueous precipitation or condensation from the atmosphere," and dew has no more right to be excluded than snow. In India a rainy day is officially defined as one on

which at least 10 in. of rain falls; in Scotland we have heard a shepherd indignantly repel the suggestion that a day on which half-an-inch fell was rainy, though he "wadna say it was no a bit saft." We cannot satisfy everyone, but by stating the definition adopted we can at least deceive no one.—ED. *S.M.M.*]

### ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held on Wednesday, January 15th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

Mr. F. C. Bayard read the Report of the Council for the past year, which showed that the Society was in a satisfactory condition, there being an increase of 28 in the number of Fellows. The Council had willingly accepted the transfer of the Symons's Memorial Fund, subject to the recommendations of the subscribers as to the award of the medal. After adopting the regulations respecting the award, the Council at their meeting on November 20th designated Dr. Alexander Buchan, F.R.S., as the first recipient of the medal. The Society's Howard Silver Medal has been awarded to Cadet C. de V. Le Sueur, of H.M.S. *Worcester*, for the best essay on "The Meteorology of the Antarctic regions."

The Report having been adopted, and the usual votes of thanks passed, the President proceeded to read from the Council minutes the formal statement of Dr. Buchan's services to meteorology, and then with a few appropriate words presented to him the Symons's Gold Medal, a photograph of which appeared in our number for January.

The President in his Address dwelt with the "Theory of Probability applied to various Meteorological problems." He considered that for all practical purposes weather conditions may be looked upon as purely accidental, and that we may apply to them the laws of chance. They are not by any means in reality a matter of chance, for although we cannot discover it, there is doubtless a cause for each kind of weather, normal or abnormal. At the present time the work of forecasting weather conditions in the British Isles involved estimating various degrees of probability, and foretelling that sort of weather which, on the whole, seemed to be the most likely. Forecasting was based upon the probable course of barometric depressions, and it was hardly too much to say that if we could have barometric charts covering a large area of the temperate latitudes drawn for them a month in advance, we could foretell the weather for that month with very fair accuracy. With regard to the question—How long a time is required to obtain a true average? he had come to the conclusion that 10 years temperature observations give a mean of which the probable error is a little under one degree, 30 years reduce this to half a degree, 50 years to one-third of a degree, and 100 years to one-quarter of a degree. After dealing with

barometer observations and rainfall, he proceeded to speak of weather almanacs, cycles, &c. Mr. Dines, in conclusion, said, "Meteorology is far more than a statistical science, and is very closely dependent upon theoretical mechanics and thermodynamics, and in the application of these subjects to meteorology lies the best hope of its advance. Unfortunately this application often requires the possession of very exceptional mathematical skill, and but few of those who possess the skill have been willing to turn their attention to the subject. But with the comparatively limited knowledge of mathematics to which I can lay claim, it is possible to answer many meteorological questions, and also, I am afraid it must be added, impossible not to see that many current explanations of meteorological phenomena are in fundamental opposition to well established mechanical and dynamical laws."

A vote of thanks having been passed to the President for his address, the scrutineers of the ballot announced that the following gentlemen had been elected the Officers and Council for the ensuing year :—

*President*.—Mr. W. H. Dines, B.A. *Vice-Presidents*.—Capt. M. W. C. Hepworth, Mr. R. Inwards, Mr. Baldwin Latham, and Mr. E. Mawley. *Treasurer*.—Dr. C. Theodore Williams. *Secretaries*.—Mr. F. C. Bayard and Dr. H. R. Mill. *Foreign Secretary*.—Dr. R. H. Scott, F.R.S. *Council*.—Mr. R. Bentley, Capt. W. F. Caborne, C.B., Capt. A. Carpenter, R.N., D.S.O., Mr. R. H. Curtis, Mr. H. N. Dickson, Mr. W. Ellis, F.R.S., Mr. C. Hawksley, Pres.Inst.C.E., Mr. J. Hopkinson, Mr. H. Mellish, Sir J. W. Moore, M.D., Mr. W. N. Shaw, F.R.S., and Capt. D. Wilson-Barker.

The above meeting was preceded by a brief ordinary meeting, at which the following were elected Fellows of the Society :—J. T. Abraham, F. Armstrong, W. J. Brown, H. L. Cannon, W. T. Creswell, W. H. Curtin, F. A. De La Motte, C. W. Edwards, W. S. Harmer, H. L. Jaques, I. P. Jones, C. H. Lawton, F. B. Lewis, D. M. Nesbit, H. M. H. Newby, the Hon. Lady Peek, A. E. Powell, J. F. Stow, F. D. Stuart, S. Walkden, H. W. S. Walwyn, and S. S. Wherley.

## REVIEWS.

*Meteorologische Optik*. [Meteorological Optics.] Von J. M. PERNTER. I. *Abschnitt*. Wien und Leipzig, W. Braumüller. 1902. Size 10 × 6½. Pp. 1-54, Illustrations.

THIS book, which is being issued in parts, deals with a subject which, as the author observes, the meteorologist usually leaves to the physicist, and the physicist to the meteorologist. The distinguished Director of the Imperial and Royal Meteorological Institute in Vienna has worked through all the available data, and now publishes, after revision, the substance of the lectures delivered by him in the Universities of Innsbrück and Vienna. Part I. deals with the

apparent form of the vault of the heavens, the apparent size of the sun, moon and stars at different altitudes, and the oval form of lunar and solar halos, a form which probably few casual observers have detected. He points out that no one who sees the sun or moon larger at the horizon than on the meridian sees the sky as a hollow hemisphere, but always as a flattened vault, and, by this fact, he explains the whole group of phenomena. He points out that the direction of the line of vision has everything to do with the conception formed in the mind of the figure of the sky.

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*Ice Caves and Frozen Wells as Meteorological Phenomena.* By H. H. KIMBALL. Reprinted from the "Monthly Weather Review" for August, 1901. Size 9 × 6. Pp. 16. Plates.

PERMANENT ice caves or frozen wells are explained thus—"The cold air of winter circulates to unusual depths below the surface and freezes the small quantity of water with which it comes in contact. In summer this subterranean circulation of the air ceases, and heat finds its way to the ice only by the slow process of conduction."

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*Regenkarte der Provinzen Brandenburg und Pommern, u.s.w.* [Rainfall maps of the provinces of Brandenburg and Pomerania, &c.] Von PROFESSOR DR. G. HELLMANN. Berlin: 1901, Dietrich Reimer (Ernst Vohsen). Size 10½ × 7. Pp. 40. Map.

HAVING commenced his series of rainfall maps of North Germany in the extreme east, Professor Hellmann has now reached the central group of provinces containing Berlin, a region of monotonous surface, with little variety of configuration beyond what is supplied by the low hills of the Baltic Lake Ridge. The map shows the average rainfall for 1891-1900. A small area in the centre, in the valley of the Oder, has a rainfall very slightly under 20 inches, while in the extreme east, the extreme south and the extreme west, the rainfall on other small areas slightly exceeds 26 inches; the whole resembling, so far as the total annual fall is concerned, the portion of England between the North Downs and the Yorkshire Wolds. Speaking generally, the rainfall was smaller in amount and the extremes were more pronounced the further the stations lay from the North Sea or the Baltic coast. A comparison of a few long-period sets of observations showed that the decade 1891-1900 had a rainfall very close to the average, and the examination of the long records (for 45 years) showed, as the average of five stations, a variation of the yearly total between 130 and 65 per cent. of the average. Professor Hellman deals at considerable length with maximum falls on rainfall days and heavy falls in short periods, on the importance of which to engineers, farmers and all out-door workers, he lays just stress. The greatest fall in 24 hours recorded at any of the 308 stations considered was 5.87 in., which fell at Sommerfeld on July 7th, 1899, while only twelve stations showed a

maximum fall greater than 2·85 in. in the ten years. Classifying the falls in short periods, he shows that the average fall per minute is twice as great for falls lasting from 46 to 60 minutes, and four times as great for falls lasting less than 15 minutes, than it is for falls exceeding three hours in duration.

METEOROLOGICAL NEWS AND NOTES.

A MEMORIAL METEOROLOGICAL STATION is proposed to commemorate the late eminent physicist, Dr. J. P. Joule, at Sale, near Manchester. It is proposed to erect a tower 40 or 50 feet in height provided with a combined public clock and meteorograph, and a set of the ordinary meteorological instruments. The tower will be erected in a public park, but we hope that the rain-gauge may be provided with a place apart, and not accommodated on the top of the tower

THE COCOS KEELING ISLANDS in the middle of the Indian Ocean, formerly one of the most desolate of British possessions, are now linked by the new cable with Cape Colony and Australia, and the *Melbourne Argus* states that arrangements have been made by the Telegraph Company to forward meteorological observations free of charge, so that Australia may profit to the full by this tropical advance-guard. This stands in cheerful contrast with the action of the British Post Office, which charges a rate of postage on meteorological observations exactly double that for any other description of copy for the press.

AN ASPIRATION METEOROGRAPH has been devised by Herr Assmann, in order that the self-recording instruments enclosed in the "Meteorological Pillars," so common in German towns, may show the real condition of the air, and not that of the hot-house atmosphere of the glass case in which they are contained. The barograph, thermograph, and hygrograph, are arranged to write on one sheet, and a strong current of the outer air is drawn through the small glass case in which they are enclosed, the current being kept up by a small electric fan. The apparatus is described and figured in *Das Wetter* for November, 1901.

ERRATUM.

Vol. 36, p. 202, last column of Table, lines 2 and 3 *should read*, 70·4 and 30·4 respectively, *not* 91·8 and 5·7 as given.

ERRATA IN 1900.—SUPPLEMENTARY TABLE.

			in.	in.
VI.	Clifton, Pembroke Rd., Aug., total rain	<i>should be</i>	2·48,	<i>not</i> 2·34.
XIV.	Glasgow, Queen's Park, " "	" "	4·36,	" 4·42.
XVII.	Forres, H.R.S., ..... Sept., " "	" "	1·90,	" 1·85.
XXI.	Gorey, Courtown House, April " "	" "	1·53,	" 1·28.
"	" " " July " "	" "	2·89,	" 2·83.
XXIII.	Horn Head ..... Nov. " "	" "	6·20,	" 6·14.

JANUARY, 1902.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours.		Days on which -01 or more fell.	Max.		Min.		in shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	.76	— .95	.18	1	11	52·9	10	23·8	15	10	13
II.	Tenterden .....	.99	— 1·00	.36	1	12	51·0	1, 2	25·5	15	8	16
„	Hartley Wintney .....	.81	— 1·14	.28	26	7	55·0	5	20·0	15	9	13
III.	Hitchin .....	.53	— 1·18	.13	4	8	52·0	4, 10	22·0	15	12	...
„	Winslow (Addington) .....	.49	— 1·22	.14	26	9	54·0	21	19·0	15	11	16
IV.	Bury St. Edmunds (Westley) .....	.91	— .78	.27	1	10	52·0	10a	24·5	30	9	...
„	Norwich (Brundall) .....	1·18	...	.26	29	17	52·4	4	25·4	30	11	16
V.	Winterborne Steepleton .....	1·08	...	.30	1	10	51·3	2	21·2	15	10	17
„	Torquay (Cary Green) ... ..	1·32	...	.47	1	13	56·0	2	28·9	15	2	10
„	Polapit Tamar [Launceston]..	2·40	— .93	.54	26	13	51·9	2	19·4	15	9	10
VI.	Stroud (Upfield) .....	1·18	— 1·03	.35	1	12	51·0	4, 10	24·0	14	12	...
„	Church Stretton (Woolstaston)	1·51	— .95	.29	27	14	56·0	10	22·5	30	11	13
„	Worcester (Diglis Lock) .....	.77	— 1·09	.29	26	17	...	...	...	...	...	...
VII.	Boston .....	.80	— .58	.39	4	8	56·0	7	25·0	29	...	...
„	Hesley Hall [Tickhill].....	.73	— .68	.15	3	9	53·0	9, 10	25·0	15	12	...
„	Derby (Midland Railway).....	.93	— .67	.21	26	13	53·0	21	21·5	15	14	...
VIII.	Manchester (Plymouth Grove)	2·49	+ .17	.70	27	18	53·0	8	23·0	29	14	14
IX.	Wetherby (Ribston Hall) ...	1·04	— .62	.60	1	6	...	...	...	...	...	...
„	Skipton (Arneliffe) .....	...	...	...	...	...	...	...	...	...	...	...
„	Hull (Pearson Park) ... ..	1·15	— .52	.16	1	17	52·0	9, 10	23·0	27	14	18
X.	Newcastle (Town Moor) .....	.89	— .92	.23	20	13	...	...	...	...	...	...
„	Borrowdale (Seathwaite).....	12·55	— 2·30	2·18	20	22	51·0	3	20·4	14b	11	...
XI.	Cardiff (Ely) .....	2·24	— 1·32	.48	26	18	...	...	...	...	...	...
„	Haverfordwest .....	2·68	— 1·94	.39	1	16	51·9	2	23·3	15	6	11
„	Aberystwith (Gogerddan) ...	3·23	— 1·02	.67	26	17	50·0	9, 10	18·0	14	12	...
„	Llandudno .....	2·32	— .21	.31	3, 10	21	53·5	3	27·0	14	4	...
XII.	Cargen [Dumfries] .....	2·84	— 1·74	.66	1	9	52·0	3	19·0	14	10	...
XIII.	Edinburgh (Royal Observatory)	.89	...	.32	20	10	53·4	3	21·4	30	12	12
XIV.	Colmonell .....	5·30	+ .46	1·34	20	16	52·0	3	20·0	30	10	...
XV.	Tighnabruaich .....	5·57	...	.85	23	19	47·0	3	17·0	29	13	...
„	Mull (Quinish) .....	5·71	— .52	1·33	1	21	...	...	...	...	...	...
XVI.	Loch Leven Sluices .....	2·03	— 1·27	.39	2, 5	12	...	...	...	...	...	...
„	Dundee (Eastern Necropolis)	1·00	— 1·53	.30	1	14	53·6	6	16·8	31	13	...
XVII.	Braemar .....	2·33	— .45	.64	4	18	48·2	16	3·0	27	16	22
„	Aberdeen (Cranford) .....	1·87	— .85	.50	1	20	53·0	6	10·0	30	19	...
„	Cawdor (Budgate) .....	1·60	— .62	.37	19	16	...	...	...	...	...	...
XVIII.	Strathconan [Beaul] .....	5·83	+ 1·29	1·65	6	10	...	...	...	...	...	...
„	Glencarron Lodge .....	12·42	+ 2·03	2·97	19	27	56·5	2	12·9	30	13	...
XIX.	Dunrobin .....	2·18	— .44	.37	19	17	52·2	3d	15·0	27	...	...
„	S. Ronaldshay (Roeberry) ...	2·93	— .36	.40	5	25	50·0	6, 7	22·0	29	13	...
XX.	Darrynane Abbey .....	1·34	— 3·92	.33	23	18	...	...	...	...	...	...
„	Waterford (Brook Lodge) ...	1·98	— 1·54	.46	1	13	52·0	2	22·0	15	9	...
„	Broadford (Hurdlestown) ...	3·42	+ .29	.55	24	23	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill) .....	2·21	— .86	.54	1	13	...	...	...	...	...	...
„	Dublin (FitzWilliam Square)	1·61	— .53	.69	10	12	55·6	3	26·9	30	7	12
XXII.	Ballinasloe .....	3·42	— .09	.60	10	23	62·0	3, 22	22·0	26c	12	...
„	Clifden (Kylemore) .....	6·38	— 1·59	1·34	23	20	...	...	...	...	...	...
XXIII.	Seaforde .....	2·09	— 1·32	.53	26	15	52·0	3, 22	20·0	29	12	13
„	Londonderry (Creggan Res.)..	2·93	— .73	.35	26	20	...	...	...	...	...	...
„	Omagh (Edenfel) .....	3·29	— .22	.45	9	21	51·0	2	21·0	30	11	17

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

a—and 21. b—and 30. c—and 31. d—and 20.

SUPPLEMENTARY TABLE OF RAINFALL,  
JANUARY, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·85	XI.	Castle Malgwyn .....	2·22
II.	Dorking, Abinger Hall..	·98	„	Builth, Abergwesyu Vic.	4·30
„	Sheppey, Leysdown .....	·58	„	Rhayader, Nantgwilt ...	...
„	Hailsham .....	1·44	„	Lake Vyrnwy .....	4·29
„	Crowborough.....	1·58	„	Ruthin, Plás Dráw ...	1·53
„	Ryde, Beldornie Tower..	·83	„	Criccieth, Talarvor .....	2·22
„	Emsworth, Redlands ...	1·08	„	I. of Anglesey, Lligwy..	2·61
„	Alton, Ashdell .....	1·12	„	Douglas, Woodville.....	2·41
„	Newbury, Welford Park	·93	XII.	Stoneykirk, Ardwell Ho.	2·29
III.	Oxford, Magdalen Coll..	·62	„	Dalry, Old Garroch .....	5·30
„	Banbury, Bloxham .....	·94	„	Mousaive, Maxwellton Ho.	3·20
„	Pitsford, Sedgebrook ...	1·06	„	Lilliesleaf, Riddell .....	1·62
„	Huntingdon, Brampton..	·69	XIII.	N. Esk Res. [Penicuick]	2·70
„	Wisbech, Bank House...	·77	XIV.	Glasgow, Queen's Park..	3·47
IV.	Southend .....	·54	XV.	Inveraray, Newtown ...	7·10
„	Colechester, Lexden .....	·40	„	Ballachulish, Ardsheal...	9·63
„	Saffron Waldon, Newport	·60	„	Islay, Eallabus.....	3·70
„	Rendlesham Hall .....	·63	XVI.	Dollar .....	2·79
„	Swaffham .....	1·02	„	Balquhitter, Stronvar...	7·99
V.	Salisbury, Alderbury ...	·76	„	Coupar Angus Station...	1·12
„	Bishop's Cannings .....	1·18	„	Blair Atholl .....	2·07
„	Blandford, Whatcombe ..	1·19	„	Montrose, Sunnyside ...	·85
„	Ashburton, Druid House	2·91	XVII.	Keith H. R. S. ....	1·02
„	Okehampton, Oaklands.	3·34	XVIII.	Fearn, Lower Pitkerrie..	1·17
„	Hartland Abbey .....	2·16	„	S. Uist, Askernish .....	...
„	Lynmouth, Rock House	2·58	„	Invergarry .....	2·23
„	Probus, Lamellyn .....	2·60	„	Aviemore, Alvie Mansr.	2·41
„	Wellington, The Avenue	1·67	„	Loch Ness, Drumadrochit	2·58
„	North Cadbury Rectory	1·13	XIX.	Invershin .....	2·13
VI.	Clifton, Pembroke Road	1·91	„	Bettyhill .....	1·80
„	Ross. The Graig .....	·78	„	Watten H. R. S. ....	2·09
„	Snifnal, Hatton Grange	1·03	XX.	Dunmanway, Coolkelure	5·75
„	Wem, Clive Vicarage ...	1·28	„	Cork, Wellesley Terrace	1·64
„	Cheadle, The Heath Ho.	1·41	„	Killarney, District Asyl.	3·27
„	Coventry, Priory Row ...	1·20	„	Caher, Duneske .....	...
VII.	Market Overton .....	·90	„	Ballingarry, Hazelfort...	2·76
„	Grantham, Stainby .....	·70	„	Miltown Malbay .....	2·75
„	Horncastle, Bucknall ...	·75	XXI.	Gorey, Courtown House	1·29
„	Worksop, Hodsck Priory	·84	„	Moynalty, Westland ...	2·94
VIII.	Neston, Hinderton .....	1·81	„	Athlone, Twyford .....	3·16
„	Southport, Hesketh Park	2·33	„	Mullingar, Belvedere ...	2·94
„	Chatburn, Middlewood.	4·17	XXII.	Woodlawn .....	3·42
„	Duddon Val., Seathwaite Vic.	7·06	„	Westport, Murrisk Abbey	4·72
IX.	Baldersby .....	·72	„	Crossmolina, Enniscoe ..	4·99
„	Scalby, Silverdale .....	...	„	Collooney, Markree Obs.	3·83
„	Ingleby Greenhow Vic..	1·26	XXIII.	Enniskillen, Model Sch.	...
„	Middleton, Mickleton ...	1·68	„	Warrenpoint.....	3·19
X.	Beltingham .....	2·16	„	Banbridge, Miltown.....	1·94
„	Bamburgh .....	1·23	„	Belfast, Springfield .....	2·40
„	Keswick, The Bank .....	4·12	„	Bushmills, Dundarave..	3·20
„	Llanfrechfa Grange .....	2·17	„	Stewartstown .....	2·43
XI.	Treherbert, Tyn-y-waun	5·54	„	Killybegs .....	5·26
„	Llandovery .....	2·70	„	Horn Head .....	4·63

## METEOROLOGICAL NOTES ON JANUARY, 1902.

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.

LONDON, CAMDEN SQUARE.—Dry and rather mild, with no severe frost and no S, except a shower on 26th, which did not lie. Unsettled and showery weather prevailed until the 12th. Frost from 12th to 15th, and on 19th. Rainy from 22nd to 24th, and alternate frost and thaw till the end. Mean temp.  $41^{\circ}\cdot 1$ , or  $3^{\circ}\cdot 0$  above the average. Mean barometer  $30^{\circ}\cdot 172$ , or  $0^{\circ}\cdot 190$  in. above the average.

ABINGER HALL.—Very dry, but somewhat fickle as regards temperature. The winter aconite and some Olympian primroses were in bloom.

TENTERDEN.—Dry, with but little frost. Duration of sunshine 63 hours. S on 30th; fog on 12th.

HARTLEY WINTNEY.—A black January; little R and many mild days, with light westerly winds. Fog from 17th to 19th. No severe weather and absence of frosts till 26th. Ozone on 15 days, mean  $6^{\circ}\cdot 5$ . Daisy and violet in flower on 5th, snowdrop on 18th; brimstone butterfly seen on the wing on 6th.

WINSLOW, ADDINGTON.—The early part was mild with high wind. No frost till 13th. The end of the month was extremely cold, with rough E. and N.E. winds. R the smallest since January, 1880, when  $\cdot 45$  in. fell.

PITSFORD, SEDGEBROOK.—Very changeable, with several spells of severe frost. R  $\cdot 60$  in. below the average. Mean temp.  $39^{\circ}\cdot 5$ . S on 26th.

NORWICH, BRUNDALL.—Very mild till 24th; winterly during the last week. Thick fog on 17th. L on 25th. Snowdrop in bloom on 2nd, winter aconite on 6th, and crocus on 12th.

WINTERBORNE STEEPLETON.—Generally fine, with high temp. in the early part. From 13th to 20th, and from 25th to 31st, were cold.

TORQUAY, CARY GREEN.—R  $1\cdot 98$  in. below the average. Mean temp.  $3^{\circ}\cdot 4$  above the average. Duration of sunshine  $6^{\circ}\cdot 5$  hours below the average; 13 sunless days. Mean amount of ozone  $4^{\circ}\cdot 8$ ; highest  $9^{\circ}\cdot 0$  on 2nd, with W. wind, lowest  $1^{\circ}\cdot 0$  on 15th and 19th, with N. wind, and on 23rd with W. wind.

POLAPIT TAMAR [LAUNCESTON].—A very calm dry period prevailed from 6th to 20th. Thick fog on 17th.

LYNMOUTH, ROCK HOUSE.—Dull, with very few sunny days. Wind during the last three days very strong, varying between N. and E., but no snow.

NORTH CADBURY RECTORY.—The first 13 days were extremely mild. The last two days were cold, though not with very low minima. No heavy R, and only one slight shower fell between 5th and 20th. Some S on 24th.

ROSS, THE GRAIG.—The spell of warm weather which set in on December 29th continued, with one or two severe frosts, until January 28th. The R was about one-quarter of the average, balancing the surplus last month. The amount of bright sunshine was much above the average, and white almond was in blossom on 22nd.

CHURCH STRETTON, WOOLSTASTON.—Violent westerly gales on 20th, and two succeeding days. Very changeable on the whole. S on 25th and 29th.

HULL, PEARSON PARK.—Generally overcast or cloudy, but with a small R, and fairly even and high temp. until 26th, after which there were frost and S.

## WALES AND THE ISLANDS.

ABERYSTWITH, GOGERDDAN.—Rather wet, but a few hard seasonable frosts.

DOUGLAS, WOODVILLE.—Very like January, 1901; damp with comparatively little R. Cold generally, with several slight frosts. High winds on 10 days; reaching the force of a gale on 8. S and H on 6 days. Mild from 19th to 22nd.

SCOTLAND.

LILLIESLEAF, RIDDELL.—Max. temp. varied from 49° to 28°. R 26 in. below the average.

COLMONELL.—Mean temp. 5°·3 below average of 26 years. H and S on 24th.

TIGHNABRUAICH, CRAIGANDARAICH.—Half the month was of a spring-like temperature, the remainder decidedly wintry, with S on 4 days.

INVERARAY, NEWTOWN.—The frost at the end of the month was the most severe for years, the temp. falling to zero in the Castle gardens. S on 4 days.

COUPAR ANGUS.—Min. temp. 9°·0 on 31st, max. bar. 31·15 on 31st.

MONTROSE, SUNNYSIDE.—Remarkably dry. Fine from 15th to 24th, cold later.

DRUMNADROCHIT.—The great feature of the month was the very keen frost which prevailed from 26th to the end. S on 11 days. T on 4th.

S. RONALDSHAY, ROEBERRY.—Very changeable. Two S storms, from 10th to 14th, and from 25th to end. Mean temp. 37°·7, or 0°·7 below average.

IRELAND.

DARRYNANE ABBEY.—Very dry; warm and foggy to 12th, and 19th to 24th. Gale and showers of H and frozen S on 24th and 25th. S on 28th and 29th.

WATERFORD, BROOK LODGE.—The driest January since 1896. Fog on 22nd and 23rd; S on 24th and 25th; H on 24th.

DUBLIN, FITZWILLIAM SQUARE.—Very mild and open, with predominant W. and S.W. winds, and a moderate E. First passing frost on 14th; persistent "cold snap" from 24th to 31st, with H, sleet and S. Mean temp. 43°·0, or 1°·6 above the average. High winds on 13 days, reaching the force of a gale on 3. S or sleet fell on 4 days, and H on one. Fog on 6 days.

COLLOONEY, MARKREE OBSERVATORY.—R below, and temp. above, the average, but little bright sunshine. S on 3 days.

OMAGH, EDENFEL.—Mild and wet for the first 10 days, followed by a dry period, with sharp night frosts, then 10 days still milder and wetter, giving way on 24th to S storms and frost of considerable intensity.

GENERAL WEATHER IN GLEN NEVIS, JANUARY, 1902.

By R. C. MOSSMAN, F.R.S.E.

Deduced from observations at 9 a.m. and 9 p.m.	<i>Ben Nevis.</i>	<i>Achariach.</i>	<i>Fort William.</i>
Height .....	4407 feet.	150 feet	42 feet
Rainfall .....	24·75 ins.	11·02 in.	9·46 in.
No. of days .....	26	27	26
Max. fall in 24 hours .....	2·46 in., 4th	2·19 in., 23rd	2·42 in., 19th
Highest temp. in shade .....	36°·5, 3rd	53°·5, 3rd	51°·2, 6th
Lowest " " .....	6°·0, 26th	6°·3, 30th	11°·9, 31st
Mean temp(Mean daily max.& min.) .....	23°·6	38°·2	38°·0
Temp. in shade below 32° .....	on 31 nights	11 nights	12 nights
Below 32° on grass .....	?	13	13
Bright sunshine .....	32·4 hours	0·0 hours*	27·7 hours
Sunless days .....	20	31	21
Mean relative humidity .....	89	83	84
Mean amount of cloud .....	8·6	8·2	8·0

\* No possible sunshine; sun cut off all month by surrounding hills.

Highest barometric pressure at Achariach corrected to 32° and reduced to mean sea level, 31·097 in., at 10.30 p.m. on 31st.

Rainfall at head of Glen Nevis, and 357 feet above the sea, 10·13 in.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1901.

STATIONS.  <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.									
London, Camden Square	85·3	9	45·2	28	74·8	53·9	52·5	69	134·8	40·1	inches 1·79	9	5·0
Malta	93·8	1	64·4	8	86·2	70·9	67·8	73	148·7	62·5	·16	1	1·3
Lagos, W. Africa	86·0	30 <sup>a</sup>	71·0	2	82·8	76·6	73·3	83	144·0	71·0	7·65	17	4·8
Cape Town	88·0	20	38·2	26	66·4	49·7	49·4	72	...	...	·58	11	4·3
Mauritius	78·0	4 <sup>b</sup>	57·1	11	75·0	62·4	59·1	74	136·0	47·5	2·41	23	6·1
Calcutta	93·2	21	75·5	13	88·4	78·8	78·0	85	150·9	74·2	13·30	13	8·4
Bombay	86·6	27	75·2	29	84·1	77·4	76·0	87	136·5	74·3	14·27	29	8·9
Colombo, Ceylon	90·0	14	75·5	15	88·5	78·0	74·4	80	151·0	73·0	·46	10	4·5
Melbourne	65·0	15	33·9	2	56·8	44·1	43·3	79	123·4	26·0	1·89	9	8·0
Adelaide	72·2	15	35·2	1	61·1	43·8	43·3	73	130·5	26·1	1·19	13	6·1
Sydney	73·2	16	39·5	3	60·4	47·1	44·7	80	117·0	30·3	4·75	16	4·7
Wellington	59·3	31	32·0	7	54·3	41·4	38·3	71	102·0	23·0	3·55	13	4·1
Auckland	62·0	22	39·5	17	57·0	43·5	41·3	67	127·0	37·0	3·22	13	5·3
Jamaica, Halfway Tree	94·0	16	70·0	30	87·9	72·0	71·5	80	...	...	2·81	12	3·4
Trinidad	90·0	3, 4	67·0	2	85·1	71·3	74·8	86	164·0	59·0	7·53	17	...
Grenada	87·2	19	71·0	16 <sup>c</sup>	83·5	74·5	72·1	80	150·2	...	9·90	27	3·6
Toronto	87·4	22	49·7	9	78·2	59·9	61·6	80	110·2	46·0	3·86	10	5·2
St. John, N.B.	81·0	31	52·0	19	70·3	56·6	57·3	81	...	...	1·47	11	5·3
Winnipeg, Manitoba	92·0	16	39·5	8	77·7	51·4	...	...	...	...	1·70	11	3·8
Victoria, B.C.	79·2	15	48·2	20	69·6	52·4	...	...	...	...	·00	0	2·3

a—and 31. b—and 21. c—and 20.

## REMARKS.

MALTA.—Mean temp. of air 77°·5, or 0°·4 below the average. Mean hourly velocity of wind 8·2 miles, or 0·9 above the average. Mean temp. of sea 78°·5. TS on 5th; L on 4 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3, and of dew point 0°·3, and E ·03 in. below their respective averages. Mean hourly velocity of wind 12·1 miles, or 0·2 miles below the average; extremes, 31·3 on 10th and 1·8 on 19th; prevailing direction E. S. E. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 82°·4 or 1°·8 above, dew point 74°·4 or 1°·3 above, and E ·46 inches or 3·33 in. below, their respective averages. Mean hourly velocity of wind 7·6 miles; prevailing direction S. W. W. C. S. INGLES.

Adelaide.—Mean temp. of air 1°·5 below the average. Very cold at night, mean minima having been only twice lower in 44 years. Good rains over Northern agricultural and pastoral areas, but deficient over S. parts. Adelaide 1·20 in. under 44 years' average. C. TODD, F. R. S.

Sydney.—Mean temp. of air 1°·1 below, E 1·60 in. above, and humidity 5·9 above their respective averages. H. C. RUSSELL, F. R. S.

Wellington.—Generally fine in early and most of latter parts of month; but showery during the middle; prevailing N. W. and S. winds moderate. H on 3 days; fog on 21st. Smart shock of earthquake on 12th at 1.52 a.m. R. B. GORE.

Auckland.—Mean temp. close to the average, E 1·00 in. below the average. Showery and unsettled in early part of month, fine and dry later. T. F. CHEESEMAN.

TRINIDAD.—E 2·79 in. below the 30 years' average. J. H. HART.