

SYMONS'S METEOROLOGICAL MAGAZINE.

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THE RAINFALL OF 1903.

THE usual cumulative table of rainfall differences from the average of 1890-99 assumes this month the form of a summary of the rainfall of the year. The 51 stations included in it are not sufficient to allow us to calculate the difference of the rainfall of the country as a whole from the average, but it suffices to show that, speaking generally, the excess was greatest in England and Wales and least in Scotland and Ireland. It shows also that the British Isles were very wet from north to south and from east to west. The largest excesses were recorded at London, Hitchin and Hartley Wintney, where they averaged over 60 per cent. ; but it must be remembered that in the south of England the ten years employed for an average in these pages was drier than the thirty years' average by nearly ten per cent. The north-west of Scotland also showed large excesses, more than 50 per cent. in several places, and there the average for the ten years used does not differ appreciably from the long period average.

In discussing the rainfall of the country on the basis of 62 stations with 30 years averages in a letter to *The Times* of January 11th, we pointed out that the excess of rainfall for England seemed to be about 28 per cent., for Wales (and this was due especially to the mountainous part of North Wales) 33 per cent., for Scotland 26 per cent., for Ireland 29 per cent., and for the British Isles 28 per cent. These, of course, are preliminary figures liable to correction. The heavy rainfall of the Thames basin, and especially of London, seems to be quite unprecedented, but taking a wider sweep we must recognise that the year was not so wet as 1872 or as 1852. There does not seem to be any recent year, with those exceptions, approaching 1903, unless 1877 may possibly have some claim to consideration. The driest areas relatively to the average, and probably the driest absolutely for the year, seem to have been in Norfolk and in a narrow strip of country running from south of Leicester through Lincolnshire to Hull; the excess there not exceeding ten per cent. of the thirty years' average.

Speaking generally, we may say that 1903 was wetter than any year since 1872, and was not previously excelled for wetness since 1852.

*Rainfall of the year 1903, showing excess on the average of the
ten years 1890-99.*

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+	15·32	167	Arnccliffe ...+	20·25	133	Braemar ...+	9·40	127
Tenterden+	6·03	123	Hull+	4·23	117	Aberdeen ...+	8·32	126
Hartly W'ntn'y +	13·94	156	Newcastle...+	8·56	133	Cawdor+	3·57	112
Hitchin+	14·31	162	Seathwaite +	31·89	124	Glencarron +	14·44	115
Winslow+	11·10	147	Cardiff+	15·23	139	Dunrobin ...+	6·22	120
Westley+	6·19	124	Haverf'dwest+	13·50	131	Darrynane +	4·40	109
Brundall+	4·45	118	Gogerddan +	16·54	137	Waterford +	11·32	129
Alderbury+	12·26	145	Llandudno +	7·95	126	Broadford ..+	13·29	140
Ashburton+	16·61	133	Dumfries ...+	16·96	139	Carlow+	10·97	133
Polapit Tamar +	15·41	142	Lilliesleaf ...+	11·90	139	Dublin+	4·29	116
Stroud+	13·07	149	Colmonell...+	9·14	121	Mullingar ...+	11·70	132
Woolstaston ...+	14·61	150	Glasgow ...+	19·33	153	Ballinasloe +	10·30	128
Boston+	9·49	147	Inveraray ...+	16·47	123	Clifden ... +	7·70	110
Hesley Hall ...+	5·38	125	Islay+	11·21	124	Crossmolina +	12·69	124
Derby+	8·53	138	Mull+	12·96	123	Seaforde ...+	12·42	134
Bolton+	10·03	124	Loch Leven +	16·36	146	Londonderry+	5·56	113
Wetherby+	13·95	159	Dundee+	7·10	126	Omagh+	15·20	138

AN UNEXPECTED USE FOR SUNSHINE RECORDERS.

It is only a commonplace remark that some of the most important discoveries of science have been the unexpected results of investigations made with quite different objects in view. It is perhaps to descend from great things to small—and it is certainly without wishing to suggest that the “discovery” is likely to rank as more than an interesting one—to point out that something analogous to this has occurred in connection with the Campbell-Stokes sunshine recorder, since it has quite recently been found that that instrument, designed to record bright sunshine, is also capable of registering the presence in the air of substances likely to obstruct the passage of the sun's rays.

Our readers will no doubt remember the paper on the great dust fall of February 21st, 1903, which Dr. Mill read before the Royal Meteorological Society at its November meeting. From a large body of evidence it was shown that over a large part of the British Isles, and also over a considerable portion of the Continent, a great quantity of dust had been deposited, after having been borne on the wings of the wind over land and sea for vast distances. This evidence was obtained from various sources. In many instances the dust was found as a deposit in the rain water collected in rain gauges. In others it was seen on window-panes, upon which the

rain had beaten ; and in others the fall had been sufficiently large to be seen upon the ground, or upon objects open to the sky, and sometimes without the agency of rain for its deposition. Amongst other sources of information were the cards which had been exposed in sunshine recorders, on many of which the red dust had left indelible marks, as well as specimens of the dust itself.

Since then similar evidence has been found of another dust fall which occurred on the 27th of November last, and which seems to have extended itself over a great part of England, but to have been specially well marked in the south-eastern districts. In this instance, as in the former, not only were the cards stained by the wetted dust, but unmistakable specimens of the dust itself had been left attached to the cards. In both falls, however, cases were noticed in which those who removed the cards had tried to remove the stains also, evidently because it was thought to be "dirt" which had no business there ; and the chief object of this note is to call the attention of sunshine observers to the fact that records of such dust falls may be expected, and will certainly be useful, and to get them to handle the cards at such times as it may be noticed carefully, and to record their appearance before the dust, or the stains of the dust if it has fallen in conjunction with rain, has been partially removed or obliterated by rubbing.

One noteworthy fact in connection with the records may be mentioned, namely that in nearly every instance, in both falls, it was found upon the *eastern* side of the card, as a result of the dust having been carried along by a *westerly* wind. During the severe gale of February 26th-27th, 1903, the sunshine card at Blackpool, although exposed on a stand on high ground a couple of miles back from the coast, was *thickly* encrusted over its eastern half with sand and salt brought from the shore by the westerly wind ; and not only did a similar thing occur at other places on that coast, but traces of a similar deposit were also found on cards from a few places many miles to the eastward, a fact which proves that sand can travel through the air for considerable distances. In the case of the dust falls which Dr. Mill and Mr. Lempfert have discussed, a good deal of light has been thrown upon the general circulation of the air, which has proved to be extremely interesting and instructive when considered in conjunction with the views of Dr. W. N. Shaw, F.R.S., as to the actual motion of the air in a travelling storm. It is possible, and indeed probable, that with more precise observations of dust falls, and with more reliable continuous records of pressure, our knowledge respecting atmospheric circulation may be considerably extended and improved.

R. H. C.

ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of this Society for the present session was held on Wednesday evening, November 18th, at the Institution of Civil Engineers, Great George Street, Westminster, Capt. D. Wilson-Barker, F.R.S.E., President, in the chair.

The following gentlemen were elected Fellows of the Society :— Mr. H. L. Attridge, Rev. D. C. Bates, Mr. C. Lowthian Bell, Mr. W. Cleeve Edwards, Assoc.M.Inst.C.E., Captain R. Ford, Dr. R. D. Fulton, Mr. T. M. Guest, Mr. R. T. A. Innes, F.R.A.S., Mr. T. N. Leslie, F.G.S., Captain C. H. Ley, R.E., Dr. J. D. Macdonogh, Dr. E. Mather, Mr. W. Morris, M.Inst.C.E., Mr. G. E. J. Rose, Captain W. R. Rowe, and Captain L. H. Tamplin.

Dr. H. R. Mill and Mr. R. G. K. Lempfert gave a Report on "The Great Dustfall of February, 1903, and its Origin."

Dr. Mill read extracts from many of the letters which he had received bearing on the enquiry, and exhibited maps showing the distribution of the dust, from which it appeared that the dust reported on February 21st or 22nd fell over nearly all parts of England and Wales to the south of a line drawn from Anglesey through Wrexham and Northampton to Ipswich, except in parts of northern Cornwall, Somerset, Wilts and Mid Wales. To the north of that line there was an apparently isolated fall in northern Norfolk, and at a few remotely isolated stations, at most of which the fall did not attract the attention of any observers, but is believed to have taken place, on account of distinct marks of yellow dust detected on the sunshine cards sent in to the Meteorological Office. The dust usually attracted attention either in the form of a dense yellow haze, like a London fog, or as a reddish yellow powder lying thickly on trees or roofs, or adhering to windows. In some instances it was noticed in the form of drops of muddy rain, in others the circumstance which struck the observer was the soapy appearance of the water in a rain gauge, a water butt, or, in one case at least, in an open leet carrying the water-supply of a town. The fall was often accompanied by temperatures considerably above the average and by remarkably low relative humidities. In order to ascertain whether the composition of the dust threw any light on its origin about fifty samples, including some from the Continent and some collected at sea, were submitted to the Geological Survey and examined by Dr. J. S. Flett.

Mr. Lempfert exhibited maps showing the meteorological conditions prevailing during the period when the dust appeared. With the help of these isobaric charts he endeavoured to trace the source from which the air was being supplied to north-west Europe on the morning of February 22nd. Trajectories of the air had been drawn from a number of points in a manner similar to that employed in Dr. W. N. Shaw's paper on the Storm of February 26-27, 1903. The trajectory which reached the southern part of England could be traced backwards in a south-westerly direction to the neighbourhood

of the Azores, but here it turned to the south, and finally to the south-east, and was carried back to the north-west coast of Africa on the morning of the 19th. He was, therefore, of opinion that there is reason to believe that the air which reached the southern half of England on the 22nd started from the north-west coast of Africa on the 19th, and he considered this afforded strong evidence of the African origin of the dust, and of its having travelled to north-west Europe by a path not very different from that indicated by the trajectories.

Dr. J. S. Flett said that the result of his examination of the specimens of the dust was to show that the bulk of each consisted of comparatively coarse particles of mineral and organic origin derived from the locality where it was collected. These coarser particles consequently presented a great variety of composition, some being mainly calcareous, others made up of sand or clay, in fact, just such local dust as might be expected to be mixed with the finer particles falling from the air. In addition to the coarser particles all the samples contained a very fine grained reddish clay, the particles of which were too minute to be satisfactorily determined mineralogically. This clay was certainly derived from some source beyond the British Isles, but it was not distinctive enough to afford much evidence as to its place of origin.

The President, Mr. R. H. Curtis, Mr. F. Druce, Mr. F. J. Brodie, and Mr. C. Harding took part in the discussion, and Dr. H. R. Mill and Mr. R. G. K. Lempfert replied.

The second monthly meeting of this Society for the present session was held on Wednesday evening, December 16th, at the Institution of Civil Engineers, Great George Street, Westminster, Captain D. Wilson-Barker, F.R.S.E., President, in the chair.

Mr. C. O. Baines, Mr. J. N. Beadles, Mr. R. Brown, Assoc.M.Inst.C.E., Mr. F. J. Finglah, Mr. V. Smith, Mr. J. H. Taylor, M.Inst.C.E., Mr. T. G. Taylor, Mr. T. J. Thomas, Assoc.M.Inst.C.E., and Mr. C. T. R. Wilson, F.R.S., were elected Fellows of the Society.

Mr. W. Marriott gave an account of the meteorological work of the late Mr. James Glaisher, F.R.S., who was the founder of the Society, in 1850, and who died on February 7th last at the advanced age of 93 years. Mr. Glaisher was appointed Superintendent of the Magnetic and Meteorological Department of the Royal Observatory, Greenwich, on its formation in 1840. He soon became interested in and conversant with all kinds of meteorological investigations, and through his instrumentality numerous meteorological stations were equipped in various parts of the country. He supplied quarterly the results from those stations to the Registrar General from 1847 up to March, 1902. He prepared various Tables of Corrections for the use of these observers, the principal of which were his "Hygrometrical Tables," which have passed through nine editions. He was a juror of the Great Exhibition of 1851, and as such he caused a

great stimulus to be given to the manufacture of reliable meteorological instruments. Mr. Glaisher was best known to the public by the twenty-eight balloon ascents which he made for scientific purposes in 1862-66 on behalf of a British Association Committee. Mr. Marriott illustrated his address with numerous lantern slides and also exhibited the instruments, used by Mr. Glaisher in his balloon ascents, which by the courtesy of his son, Dr. J. W. L. Glaisher, F.R.S., had recently come into the possession of the Royal Meteorological Society.

A paper by Mr. J. R. Sutton, M.A., on "Certain Relationships between the Diurnal Curves of Barometric Pressure and Vapour Tension at Kenilworth (Kimberley), South Africa," was, in the absence of the author, read by the Secretary. The author referred to the views of a number of leading meteorologists on the part played by "vapour tension" as a component of barometric pressure, and brought forward a series of observations at Kimberley designed to throw light on the still unsolved problem of the cause of the diurnal barometric wave. The paper elicited some discussion, in which Dr. W. N. Shaw and Mr. Dines took part.

Correspondence.

GREENWICH RAINFALL OF 1821 AND 1824.

To the Editor of Symons's Meteorological Magazine.

Will you kindly permit me to point out an error of some importance in your article on "The Unexampled London Rainfall of 1903." In that article (p. 181) the following values marked "doubtful records" are given for Greenwich Observatory for the years 1821 and 1824—viz., 34·5 in. and 36·3 in. These values are not correct, the amounts recorded in the Observatory Journals being 31·53 in. and 32·98 in. Dines, in his paper on the "Rainfall of the London District, 1813—1872," gives rainfall for 1821 as 31·69 in. and for 1824, 32·43 in. (*Quarterly Journal, Meteorological Society, 1873.*)

W. C. NASH.

*Mycena Road, Westcombe Park, S.E.,
7th January, 1904.*

[We think it right to publish this letter at once, so that it may appear in the same volume as the original statement; but the figure for 1824 quoted by Mr. Nash coincides with that observed by Mr. J. H. Belleville, at Park Row, Greenwich, and not, we understand, at the Observatory itself. We have a copy of a record for "Greenwich Observatory," giving the figures quoted in our article, but there is a note attached by Mr. G. Dines which seems to cast doubt upon it, hence the mark "doubtful." We shall look into the matter further at a less busy period of the year.—*Ed. S.M.M.*]

THE CLIMATE OF KODAIKÁNAL.

BY C. MICHIE SMITH.

THE Kodaikánal Observatory is situated on the Palani Hills in South India, in about latitude $10^{\circ} 14'$ N. and longitude $77^{\circ} 30'$ E. The height of the barometer cistern above sea level is taken as 7,688 feet, but this may be in error by several feet. Observations of the barometer, wet and dry bulb thermometers, and of rainfall, were begun in May, 1899, and complete observations were begun in January, 1900, except for wind direction and force, which were not made in a satisfactory way till the completion of the anemometer tower early in 1902. As usual in India the thermometers are exposed in an open shed covered with six inches of thatch. The means are determined from Richard records standardised by four eye readings of the thermometers daily. It may be thought that the observations have continued for so short a time that the means cannot be taken to be of much value, and for this reason they are given only to the nearest degree. At the same time it may be noted that the differences between the several years are so small in the case of pressure and temperature that, I believe, the provisional means given below are very near the truth. As regards wind and rain, and perhaps sunshine, this is not the case, and though the means are given in the table they cannot be considered to be satisfactory.

The outstanding feature of the climate is, undoubtedly, the remarkable uniformity of the temperature throughout the year—the range of the mean monthly temperature being only 7° F. The extreme range from highest shade maximum to lowest shade minimum is 37° . In the shed, four feet above the ground, the temperature has never fallen below 39° , but on the grass outside it has fallen as low as $23^{\circ} \cdot 4$. Hoar frost is not uncommon in the early mornings from November to February, but this is largely an effect of evaporation. It is most intense on low-lying, damp ground, and on very dry mornings when the relative humidity (as calculated by the ordinary tables) may fall as low as 5 %.

Kodaikánal is, during the summer months, a fairly popular health resort. Most of the houses lie near the lake, which is some 800 feet below the Observatory, and are sheltered by hills and woods. The soil is mainly gravel, so that the ground dries quickly even after a heavy shower of rain. The most unpleasant part of the year is usually from the middle of October till towards the end of December, when heavy mist and rain may be expected at frequent intervals. The first three months of the year are usually very fine, but the station is then nearly deserted, since the heat of the plains has not yet driven people up to the hills. After that, though the mornings and evenings are usually fine, there are frequent showers in the afternoons. With its fine scenery and splendid climate Kodaikánal has probably a great future before it as a health resort, especially for persons of moderate means or for those who shun the excessive gaieties of stations like Simla and Ootacamund.

Mean Monthly and Annual Meteorological Averages (provisional) for Kodakáanal Observatory.

	BAROMETER.		DRY BULB THERMOMETER.			WET BULB.		Tension of Vapour.		Relative Humidity.		Sun Max. in Vac.		Min. on Grass		WIND.			RAIN.		Clear Sky.	Bright Sunshine hours.
	Reduced to 32°.	Daily Range.	Mean.	Max.	Min.	Range.	Mean.	Min.	By Blandford's Tables.	cents.	Sun Max. in Vac.	Min. on Grass	Daily Velocity.	points.	Mean Direction.	points.	Amount.	Days.	No.			
																				in.		
Jan.....	22·853	0·071	54	63	47	16	47	41	0·261	63	120	38	368	6	E. N. E.	6	*4·12	5	5	67	238	
Feb....	·878	·070	55	65	48	17	48	42	·271	61	129	39	292	6	E. N. E.	6	*2·20	4	60	202		
March..	·867	·068	58	68	51	17	49	42	·255	53	134	43	346	6	E. N. E.	6	2·69	4	69	251		
April ...	·833	·071	59	69	53	16	54	48	·358	70	138	46	260	5	N. E. by E.	5	4·99	10	46	202		
May ...	·822	·068	60	69	55	14	55	51	·386	73	136	50	250	2	N. N. E.	2	4·36	11	42	194		
June ...	·779	·057	58	66	54	12	54	50	·363	77	132	50	355	28	N. W.	28	3·54	12	29	144		
July ...	·765	·056	57	63	52	11	53	49	·380	83	128	49	400	27	N. W. by W.	27	4·38	13	24	103		
August..	·777	·063	57	64	53	11	54	50	·394	84	130	49	302	29	N. W. by N.	29	3·95	12	27	118		
Sept. ...	·812	·071	57	64	52	11	56	50	·396	85	132	49	287	31	N. by W.	31	7·52	15	33	106		
Oct.....	·827	·076	55	62	51	11	54	49	·386	86	127	47	252	4	N. E.	4	11·16	20	31	118		
Nov. ...	·835	·070	54	61	49	12	52	47	·373	87	121	45	243	3	N. E. by N.	3	6·60	16	32	88		
Dec. ...	·845	·074	54	62	48	14	49	44	·307	73	118	42	247	5	N. E. by E.	5	5·73	10	51	156		
Annual ..	22·824	0·068	56	65	51	14	52	47	0·344	75	129	46	300	2	N. N. E.	2	61·24	132	43	1920		
																					160	

* Rainfall certainly abnormally high. Sun passes through zenith April 16th and August 26th.

Extreme Monthly Meteorological Results at Kodaiknal, 1899-1902.

	Barometer.		Dry Bulb Thermometer.		Wet Bulb.	Hu- midity	Sun Ther- mom.	Grass Ther- mom.	Wind, miles per day.		Rain.
	High- est.	Low- est.	High- est.	Low- est.	Low- est.	Low- est.	High- est.	Low- est.	High- est.	Low- est.	Great- est Fall.
	In.	In.	°	°	°	%	°	°			In.
Jan.....	22·953	22·751	71	39	30	5	147	27	569	105	4·08
Feb.	·989	·781	71	43	33	5	147	29	544	113	1·23
Mar.	·994	·782	75	45	35	6	154	32	562	113	3·74
April ...	·921	·730	74	49	40	16	155	37	882	102	1·59
May	·955	·733	76	51	43	25	150	41	441	88	1·53
June....	·905	·654	72	50	41	36	157	43	790	80	1·67
July	·886	·660	69	49	41	5	148	42	722	82	1·58
Aug. ...	·865	·656	69	49	42	40	157	39	758	88	2·16
Sept. ...	·927	·710	68	48	42	36	151	42	682	77	2·66
Oct.....	·960	·682	68	44	37	37	148	37	720	55	1·81
Nov.....	·948	·720	67	39	33	13	149	28	554	72	2·25
Dec.	·944	·730	70	42	33	7	141	23	700	52	3·21

METEOROLOGICAL NEWS AND NOTES.

THE DAILY WEATHER REPORT for January 1st achieved a record in up to date information by publishing the annual totals of rainfall for 1903 at all the telegraphic reporting stations on the very day on which the last readings of the gauges were taken.

THE SCOTTISH ANTARCTIC EXPEDITION, after cruising in high latitudes in Weddell Sea and carrying out important oceanographical investigations, wintered in the South Orkneys, where Mr. Mossman remained behind while the *Scotia* went north to the Falklands and Buenos Aires to obtain supplies and communicate with home. Mr. Mossman, writing from the South Orkneys, informs us that he has obtained very interesting meteorological observations, a report of which we hope soon to receive. It is gratifying to see from the daily press that Mr. Bruce, the leader of the expedition, has obtained additional funds, which justify him in returning to Antarctic waters before the close of the present summer.

THE SWEDISH ANTARCTIC EXPEDITION, under Dr. Otto Norden-skiöld, spent the southern winter of 1903 in the exploration of the Antarctic Archipelagoes south of South America. The main party wintered on Seymour Island and experienced terrible weather, an unceasing succession of gales with very low temperatures. Their ship, the *Antarctic*, was crushed in the ice and lost, and the expedition was rescued by the very successful voyage of a vessel equipped by the Argentine Government and commanded by an Argentine naval officer.

A METEOROLOGICAL CHRISTMAS CARD sent to us by an esteemed correspondent succeeded in being both artistic and apposite. It represents a person closing an umbrella marked "1903," and the legend runs—

“ We bid you farewell without much regret ;
You'd have been a fine year if you hadn't been wet.”

THE TEMPERATURE OF 1903 IN LONDON.

The following table gives a summary of the mean and extreme shade temperatures at Camden Square during the past year as compared with the average of 45 years.

Mean and Extreme Shade Temperature in 1903 at Camden Square.

	Mean Temp.	Diff. from Average	Mean Max.	Diff. from Average	Mean Min.	Diff. from Average	Absol- ute Max.	Absol- ute Min.
January	40 ^o ·8	+2 ^o ·7	45 ^o ·2	+2 ^o ·2	36 ^o ·0	+2 ^o ·7	53 ^o ·8	22 ^o ·1
February	45·1	+5·3	50·8	+5·3	40·0	+5·3	59·0	25·7
March	46·4	+4·3	53·9	+3·7	39·5	+4·0	67·9	29·9
April	45·2	-2·9	53·6	-4·5	37·1	-2·6	61·1	27·8
May	55·0	+1·0	65·1	+0·4	45·8	+1·4	80·9	34·9
June	57·6	-2·8	67·5	-3·8	48·6	-2·3	85·9	39·7
July	63·2	-0·1	73·1	-1·0	54·5	-0·5	87·2	45·2
August	60·7	-1·4	70·1	-2·5	52·4	-0·9	80·6	45·4
September	58·4	+0·7	67·6	+0·3	50·8	+1·1	83·7	38·1
October	53·1	+3·3	59·1	+1·6	47·8	+4·5	67·4	36·0
November	44·8	+1·8	50·2	+1·5	39·7	+2·0	57·2	29·9
December	39·0	-0·2	42·6	-1·4	35·5	-1·1	52·3	26·1
Year	50·8	+1·0	58·2	+0·1	44·0	+1·4	87·2	22·1

The most notable point is the extremely mild character of the year as a whole. This seems to be chiefly the result of high minima during the winter months, although in February and March, relatively the warmest months of the year, high maxima were almost equally prominent. The first three months all showed temperatures exceeding the average to an extraordinary extent, but this was in some measure balanced by cold weather in April, June and August. The summer was, as a whole, cold, June in particular being exceedingly unseasonable in this respect. A return to milder conditions in the autumn and the almost entire absence of frost until December, brought the mean temp. for the year to 50^o·8, a degree above the average, and a figure not often reached in London.

REVIEWS.

Knowledge Diary and Scientific Handbook for 1904. London: Knowledge Office, 1903. Size, $9\frac{1}{2} \times 6$. Pp. (text) 108.

A CONVENIENTLY arranged diary for the desk, with letterpress of interest to scientific amateurs.

The Production and Prediction of Magnetic and other Storms. By HUGH CLEMENTS. London: Wm. Hutchinson & Co. 1903. Size, $7\frac{1}{2} \times 5$. Pp. 16. Price 1s.

How to Predict the Weather, Winds, and Magnetic Storms and Sunspots, by HUGH CLEMENTS. (No publisher's name). 1904. Size $7\frac{1}{2} \times 5$, pp. 16 + 26. Price 1s.

WE are unable to make anything of these pamphlets. Such of our readers as are interested in meteorological paradoxes may like to read the assertions they contain; but the misprints often render the arguments obscure. The assertion is very plainly made that the author can forecast the weather from astronomical considerations; but, unfortunately, he has not succeeded in making the method of so doing intelligible to a reader of ordinary scientific education.

Hints to Meteorological Observers in Tropical Africa, with Instructions for taking Observations and Notes on Methods of recording Lake Levels. Published by the Authority of the Meteorological Council. London: H.M. Stationery Office, 1902. Size, 10×6 . Pp. 16. Plate. Price 9d.

A REVISED edition of the "Hints" published by the British Association Committee on the climate of Tropical Africa, with the addition of notes on lake levels supplied by the Admiralty. We congratulate the Meteorological Office on interesting the Hydrographic Office in African fresh water lakes, a task which has frequently been attempted in vain for home waters. We note with interest that in his preface, dated November, 1902, Dr. Shaw states that the Meteorological Council have in view the publication of meteorological observations from the outlying parts of the British Empire. On a small scale we have published such reports in this Magazine for 23 years.

The Meteorological Office has also issued a list of 62 Colonial and Foreign Returns received by them in MS., mainly from tropical Africa and the islands of the Atlantic Ocean. We are surprised that the Pacific Islands are not better represented, as we believe observations are taken at a good many islands occupied by British firms engaged in the copra industry. A list of printed records follows which cannot fail to be useful. We note as a trifling error the omission of "'s Meteorological" in the title of this Magazine, which shrivels into "*Symons' Magazine*."

RAINFALL AND TEMPERATURE, DECEMBER, 1903.

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) ...	1.30	— .63	.34	10	12	52.3	9	26.1	31	9 18		
II.	Tenterden	1.75	— .48	.46	7	15	51.5	9	22.0	31	10 19		
III.	Hartley Wintney	2.68	+ .54	.66	11	11	52.0	9, 10	25.0	30	10 13		
IV.	Hitchin	1.90	— .04	.63	10	15	50.0	9	22.0	30	13 ...		
V.	Winslow (Addington)	1.20	— .81	.35	12	13	50.0	9, 22	24.0	3, 31	10 18		
VI.	Bury St. Edmunds (Westley)	1.23	— .88	.30	10	10	49.0	9	24.5	29	...		
VII.	Norwich (Brundall)	1.28	— .80	.26	10	15	49.0	14	26.0	5	9 18		
VIII.	Winterborne Steepleton	5.06	...	1.37	12	18	51.1	8	20.0	3	12 15		
IX.	Torquay	5.20	...	1.14	12	20	53.0	7	29.9	1	4 12		
X.	Polapit Tamar [Launceston]	4.64	+ .98	.74	12	21	51.3	8	20.9	2	12 13		
XI.	Stroud (Upfield)	1.66	— .57	.47	12	14	...	...	25.0	2, 31	11 ...
XII.	Church Stretton (Woolstaston)	2.68	+ .13	.56	12	20	47.5	22	22.0	30	15 ...		
XIII.	Worcester (Diglis Lock)	1.15	— .77	.20	8	16	...	...	...	...	...
XIV.	Boston	1.11	— .44	.25	8	7	48.0	22	24.0	2	13 ...		
XV.	Hesley Hall [Tickhill] .....	.88	— .98	.17	7	17	49.0	22	20.0	30	15 ...	
XVI.	Derby (Midland Railway)	1.23	— .63	.40	8	15	49.0	9, 22	26.0	56	12 ...		
XVII.	Bolton (The Park)	2.07	— 1.61	.62	3	16	48.4	22	25.1	2	8 18		
XVIII.	Wetherby (Ribston Hall) ...	1.37	— .55	.26	7	18	...	...	...	...	...
XIX.	Arncliffe Vicarage	4.96	— 1.50	1.10	3	21	...	...	...	...	...
XX.	Hull (Pearson Park) .....	.80	— 1.40	.19	7	12	49.0	22	26.0	1	11 24	
XXI.	Newcastle (Town Moor)	1.94	— .49	.40	24	21	...	...	...	...	...
XXII.	Borrowdale (Seathwaite)	12.46	— 2.47	4.13	3	17	...	...	...	...	...
XXIII.	Cardiff (Ely)	4.75	+ .66	.75	12	20	...	...	...	...	...
XXIV.	Haverfordwest	4.84	+ .13	.61	3	20	52.7	22	22.0	2	10 18		
XXV.	Aberystwith (Gogerddan) ...	3.23	— 1.32	.58	3	16	52.0	21	19.0	1	22 ...		
XXVI.	Llandudno	2.71	— .19	.90	3	18	56.2	22	27.5	30	4 ...		
XXVII.	Cargen [Dumfries]	3.74	— .98	.46	9	17	52.0	22	21.0	2, 30	16 ...		
XXVIII.	Edinburgh (Royal Observatory)	1.08	...	.20	3, 13	16	53.1	22	25.6	1	11 25
XXIX.	Colmonell	4.90	+ .05	.85	6	17	56.0	9	18.0	29	14 ...		
XXX.	Tighnabraich	4.93	...	.82	21	18	46.0	21a	27.0	1, 30	12 14
XXXI.	Mull (Quinish)	5.70	— .55	1.49	2	16	...	...	...	...	...
XXXII.	Loch Leven Sluices	3.27	— .38	.50	3	17	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	2.50	— .31	.60	13	22	53.0	22	23.0	30	12 ...		
XXXIV.	Braemar	2.91	— .10	.79	22	19	47.8	22	13.8	2	24 29		
XXXV.	Aberdeen (Cranford)	2.81	— .17	.74	7	24	50.0	22	19.0	1c	18 ...		
XXXVI.	Cawdor (Budgate) .....	.63	— 1.98	.12	1, 11	10	...	...	...	...	...
XXXVII.	Strathconan (Dalbreac)	1.09	— 4.86	...	...	...	...	...	...	...	...
XXXVIII.	Glencarron Lodge	4.37	— 6.06	1.73	2	16	...	...	...	...	...
XXXIX.	Dunrobin	1.42	— 2.04	.40	2	12	47.0	21a	24.5	30	17 ...		
XL.	Castletown	2.26	...	.48	2	21	48.0	23	22.0	30d	19 ...
XLI.	Darrynane Abbey	3.66	— 1.67	.42	6	24	...	...	29.0	2	...
XLII.	Waterford (Brook Lodge) ...	5.87	+ 2.00	.83	14	23	52.0	21	24.0	5	13 ...		
XLIII.	Broadford (Hurdlestown) ...	5.28	+ 2.02	.65	11	20	48.0	9	22.0	1	11 ...		
XLIV.	Carlow (Browne's Hill)	2.99	— .39	.44	22	18	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	1.59	— .76	.29	12	16	55.8	21	27.1	2	8 15		
XLVI.	Ballinasloe	3.36	— .23	.72	7	21	61.0	3	21.0	30	22 ...		
XLVII.	Clifden (Kylemore)	8.09	— .13	1.33	21	17	...	...	...	...	...
XLVIII.	Seaforde	4.48	+ 1.05	.96	6	19	48.0	21a	25.0	...	1 14 18		
XLIX.	Londonderry (Creggan Res.)	2.69	— 1.43	.61	7	22	...	...	...	...	...
L.	Omagh (Edenfel)	4.24	+ .30	.54	6	21	51.0	21	13.0	1	16 20		

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

a and 22. b and 6, 29. c and 2, 5. d and 31.

SUPPLEMENTARY RAINFALL, DECEMBER, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Harrow Weald	2·06	XI.	Llandefaelog-fach.....	...
II.	Dorking, Abinger Hall .	3·13	..	New Radnor, Ednol.....	4·46
..	Sheppey, Leysdown	1·03	..	Rhayader, Nantgwillt ...	6·44
..	Hailsham	2·08	..	Lake Vyrnwy	5·70
..	Crowborough.....	2·84	..	Ruthin, Plâs Drâw ...	2·59
..	Ryde, Beldornie Tower..	2·47	..	Criccieth, Talarvor	3·83
..	Bournemouth, Kempsey	2·71	..	I. of Anglesey, Lligwy..	4·94
..	Emsworth, Redlands ...	2·33	..	Douglas, Woodville.....	4·58
..	Alton, Ashdell	3·77	XII.	Stoneykirk, Ardwell Ho.	3·09
..	Newbury, Welford Park	2·05	..	Dalry, Old Garroch	6·86
III.	Oxford, Magdalen Coll..	1·02	..	Montaive, Maxwelton Ho.	4·73
..	Banbury, Bloxham	1·50	..	Lilliesleaf, Riddell	1·83
..	Pitsford, Sedgebrook ...	1·10	XIII.	N. Esk Res. [Penicuick]	1·80
..	Huntingdon, Brampton.	1·31	XIV.	Dalry, Blair .....	...
..	Wisbech, Bank House...	·88	..	Glasgow, Queen's Park..	3·20
IV.	Southend	1·12	XV.	Inveraray, Newtown ...	6·49
..	Colchester, Lexden	1·20	..	Ballachulish, Ardsheal ...	7·52
..	Saffron Waldon, Newport	1·33	..	Campbeltown, Reidknowe	5·46
..	Rendlesham Hall	1·06	..	Islay, Eallabus.....	4·41
..	Swaffham	1·14	XVI.	Dollar.....	2·58
V.	Salisbury, Alderbury ...	3·30	..	Balquhider, Stronvar...	8·06
..	Bishop's Cannings	2·34	..	Coupar Angus Station...	2·81
..	Ashburton, Druid House	7·18	..	Blair Atholl .....	...
..	Okehampton, Oaklands.	7·35	..	Montrose, Sunnyside ...	3·20
..	Hartland Abbey	4·43	XVII.	Alford, Lynturk Manse..	2·89
..	Lynmouth, Rock House	6·18	..	Keith H. R. S.....	1·48
..	Probus, Lamellyn	6·95	XVIII.	Fearn, Lower Pitkerrie..	1·21
..	Wellington, The Avenue	4·19	..	S. Uist, Askernish	4·41
..	North Cadbury Rectory	3·30	..	Invergarry.....	4·80
VI.	Clifton, Pembroke Road	3·13	..	Aviemore, Alvey Manse.	·40
..	Ross, The Graig	2·11	..	Loch Ness, Drumnadrochit	1·26
..	Shifnal, Hatton Grange	1·86	XIX.	Invershin	1·53
..	Wem Rectory	1·64	..	Bettyhill	1·22
..	Cheadle, The Heath Ho.	1·93	..	Watten H. R. S.....	1·55
..	Coventry, Kingswood ...	1·45	XX.	Cork, Wellesley Terrace	4·67
VII.	Market Overton	1·31	..	Killarney, District Asyl.	5·11
..	Grantham, Stainby	·82	..	Glenam [Clonmel]	5·63
..	Horncastle, Bucknall ...	·88	..	Ballingarry, Hazelfort...	3·07
..	Worksop, Hodsck Priory	·93	..	Miltown Malbay	6·51
VIII.	Neston, Hinderton	1·56	XXI.	Gorey, Courtown House	4·26
..	Southport, Hesketh Park	2·98	..	Moynalty, Westland ...	3·36
..	Chatburn, Middlewood.	3·18	..	Athlone, Twyford	2·70
..	Duddon Val., Seathwaite Vic.	7·77	..	Mullingar, Belvedere ...	2·57
IX.	Langsett Moor, Up. Midhope	2·71	XXII.	Woodlawn	3·54
..	Baldersby	1·29	..	Westport, Murrisk Abbey	4·54
..	Scalby, Silverdale	1·50	..	Crossmolina, Enniscoe ...	5·47
..	Ingleby Greenhow Vic..	1·32	..	Collooney, Markree Obs.	3·22
..	Middleton, Mickleton ...	1·83	XXIII.	Enniskillen, Portora ...	3·22
X.	Beltingham	1·87	..	Warrenpoint.....	3·93
..	Bamburgh	2·32	..	Banbridge, Milltown ...	2·26
..	Keswick, The Bank	4·53	..	Belfast, Springfield	3·07
..	Melmerby Rectory	3·00	..	Bushmills, Dundarave..	2·42
XI.	Llanfrefcha Grange	3·95	..	Stewartstown	3·47
..	Treherbert, Tyn-y-waun	8·81	..	Killybegs	4·16
..	Castle Malgwyn	3·91	..	Horn Head	3·52

METEOROLOGICAL NOTES ON DECEMBER, 1903.

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.—Extraordinarily sunless and gloomy throughout. There was little frost except during the first week and the last few days. The R was comparatively slight, and almost all fell in the earlier part of the month. Mean temp. $39^{\circ}\cdot 0$, or $0^{\circ}\cdot 2$ below the average.

TENTERDEN.—Cold at the beginning and end, and showery in the second week. The rest of the month was generally dull and fairly dry. Duration of sunshine 32 hours; 14 sunless days.

CROWBOROUGH.—Cold and dull with several misty days. Frost on first six and last seven days, with a partial thaw on the 4th. Light S on 25th, 26th and 27th. Mean temp. $36^{\circ}\cdot 8$. Wind chiefly E. and N.

HARTLEY WINTNEY.—The first 15 days were wet and cold, and the following fortnight warmer and more genial with slight fog. Snap of frost and biting E. winds in the last week. Ozone was registered on 14 days with a mean of 3·1.

WINSLOW, ADDINGTON.—Dull and dark. Sharp frost on 2nd and 3rd, and again at the end. Dense fog on 5th and 17th. The meadows were covered with water on 13th.

PITSFORD, SEDGEBROOK.—Wet, dull and uncomfortable, although the R was $1\cdot 02$ in. below the average of 10 years. Fog on 20th, and S on 25th. Mean temp. $36^{\circ}\cdot 9$.

COLCHESTER, LEXDEN.—Almost sunless and very dry, except from the 7th to 12th. The first and last weeks were cold.

BURY ST. EDMUNDS, WESTLEY.—A dull dry month, without severe frost. On 6th there was a very heavy rime frost, which was black on the points of the crystals, and when melted showed a deposit of soot. It probably came from the Midland counties. This extended for miles, and looked like ink and water when the thaw came.

BRUNDALL.—Much cloud, mist and gloom. Mean temp. $0^{\circ}\cdot 7$ below the average, and range of temp. smaller than usual, there being no very mild days and no exceptionally cold nights.

WINTERBOURNE STEEPLTON.—R rather less than the average of 10 years. Mean temp. $39^{\circ}\cdot 1$, or $2^{\circ}\cdot 2$ below the average.

TORQUAY, CARY GREEN.—R $1\cdot 35$ in. above the average. Duration of sunshine 44·6 hours, being 9·3 hours below the average. Mean temp. $43^{\circ}\cdot 0$, or $0^{\circ}\cdot 5$ below the average. Mean amount of ozone 3·8.

OKEHAMPTON, OAKLANDS.—A wet and mild month, with the last week dry and frosty.

WELLINGTON, THE AVENUE.—The month opened cold, then followed a wet and fairly mild period until the 24th, the last few days being very cold, R about the normal.

NORTH CADBURY.—Very cloudy and very damp. Unusually quiet, though rough on 3rd and 12th. Most of the R fell between the 7th and 13th, $1\cdot 76$ in. falling between 9 a.m. on 12th and about 3 p.m. on 13th. Mean temp. a little below the normal.

CLIFTON, PEMBROKE ROAD.—The first two days were fine with sharp frost; then R nearly every day till 17th. The remainder was dull and gloomy, with E. winds, and the last few days very cold. R $\cdot 25$ in. under the average.

ROSS, THE GRAIG.—The first 7 days were very cold; then scarcely any frost till 27th, when there was sharp frost and bleak E. winds to the end. The R was considerably below the average, and almost all fell from 8th to 17th. The sky was overcast, or nearly so, for no less than 22 days, and from 15th to 29th was hardly seen. Mean temp. below the average.

WEM, THE RECTORY.—Very dark and gloomy. Not very cold until E. wind and frost set in on 25th.

BOLTON, THE PARK.—Slight R, but very little sunshine, the total duration being only 3·2 hours, or 12·2 hours below the average. The temp. was low to the 3rd, milder from 8th to 27th, and cold from 29th to the close.

SEATHWAITE VICARAGE.—Mild and almost continuously wet till the third week, when frost prevailed to the close with keen N.E. wind.

HULL, PEARSON PARK.—A dull and depressing month, exceptionally dry, the R being the lowest December record since 1885. A great amount of cloud and frequently fog or mist. On the 1st 3·2 hours' sunshine were recorded, and none afterwards.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Very dark, with thick damp fog. Temp. low till 6th, then much warmer till 27th, when frost set in with cold N.E. winds.

HAVERFORDWEST.—Commenced with cold sharp weather, especially for the first three days. The cold lasted until the 7th, after which R fell constantly more or less till 25th. No R in the last 6 days, but an increasingly severe frost.

ABERYSTWITH, GOGERDDAN.—The early part was rather wet, with cold winds and cold nights. Very little sun throughout, and a little fog.

DOUGLAS, WOODVILLE.—Generally mild, with strong winds, and almost daily R till 23rd. The remainder was fine and dry, with some slight frost. Bitterly cold N.E. winds from 27th to 31st.

SCOTLAND.

LILLIESLEAF, RIDDELL.—The month was day after day just the same—dull, calm, foggy and dark, with occasional light showers. The temp. for the most part was just round about freezing point, but rather higher at the beginning. There was practically no S.

COUPAR ANGUS.—Practically normal R, and persistent wet days. Mean temp. 34°·0, or 0°·6 below the average. The month began and closed cold.

ABERDEEN, CRANFORD.—S and hard frost in the first week. R more or less every day for the last three weeks, with light winds and overcast sky.

DRUMNADROCHIT.—R 2·19 in. below the average of 17 years.

CASTLETOWN, THE CLETT.—Very changeable, sometimes cold and dry, sometimes sharp and keen frosts, and the latter part especially dry, clear and frosty. The greater part of the potato crop was still in the ground, and in some cases there was corn still uncut on 15th.

IRELAND.

CORK, WELLESLEY TERRACE.—R ·22 in. over the average. Mean temp. 5°·3 over the average. Gale from S. on 21st.

HURDLESTOWN.—A wet month till Christmas. Then dry frost with cold E. wind.

MILTOWN MALBAY.—Cold, rainy and boisterous for nearly all the first three weeks. The last week was frosty and dry, with overcast sky and strong icy cold wind from S.E.

DUBLIN, FITZWILLIAM SQUARE.—Cold spells of considerable intensity at the beginning and end, separated by a wave of warmth, which culminated in temperatures of 55°·8 and 55°·7 on 21st and 22nd. R was frequent, but deficient in amount. Mean temp. 40°·9, or 0°·8 below the average. High winds on 9 days, attaining the force of a gale on three.

MARKREE OBSERVATORY.—The first part of the month was very wet, with strong or fresh winds from S. or S.W., a few gales and 5 or 6 days with fogs. The end turned cold, with gloomy and dull days. Bright sunshine small, the total being only 32·7 hours.

OMAGH, EDENFEL.—The month opened with N.E. wind and frost; but with a change of wind to S.W. sharp frost never recurred, although polar winds were not infrequent. On the whole the mean temp. was rather below, and the rainfall again above the average, resulting in a month of general rawness, without any striking characteristic.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1903.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	87.2	10	45.2	8	73.1	54.5	53.4	71	128.1	40.4	5.20	13	6.1
Malta	...	...	...	...	...	...	...	...	...	...	...	...	...
Lagos, W. Africa	88.0	3	69.0	20	81.8	73.8	72.4	83	141.0	68.0	8.75	14	6.5
Cape Town	73.6	8	37.7	1, 25	61.2	45.9	47.2	80	...	...	2.49	14	5.4
Durban, Natal	80.3	14	47.4	2	72.4	54.1	...	...	126.3	...	1.16	8	3.9
Mauritius	79.4	1	55.1	13	76.4	61.5	58.7	71	135.5	47.8	1.51	16	5.3
Calcutta	94.1	5	75.6	11	90.7	79.4	78.4	83	158.5	74.8	6.35	15	7.7
Bombay	88.0	7	75.1	17	84.2	77.7	77.2	88	137.5	74.2	24.82	29	9.2
Madras	99.1	3	74.4	8	94.0	78.2	72.8	72	141.4	71.7	3.82	19	7.4
Kodaikanal	67.1	4	51.7	25	61.7	53.2	51.8	85	141.6	46.2	5.42	16	8.5
Colombo, Ceylon	89.4	8	73.3	13	87.6	77.4	74.6	82	145.2	70.0	5.02	14	6.8
Hongkong	92.4	31	73.8	18	86.2	78.1	76.5	84	147.5	...	11.16	21	7.0
Melbourne	68.2	1	28.4	11	55.6	41.3	41.3	80	121.2	20.5	1.14	13	6.7
Adelaide	65.0	22	32.2	11	57.7	44.2	43.6	79	118.0	27.5	3.47	16	6.4
Coolgardie	66.2	20	35.8	8	57.5	41.3	41.2	73	131.5	34.1	1.29	8	6.3
Sydney	68.0	1	41.9	8	57.5	46.7	41.0	76	93.8	29.8	5.34	15	5.8
Wellington	60.0	4, 8	34.0	26	52.0	45.3	40.6	79	95.0	25.0	7.48	20	6.5
Auckland	61.5	13	34.0	16	56.0	46.1	43.2	75	120.0	32.0	3.46	20	5.5
Jamaica, Negril Point.	91.8	9	69.4	18	88.0	73.8	72.6	75	...	...	6.99	17	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	85.4	31	71.6	16	83.4	74.3	72.1	80	144.2	...	10.00	29	4.8
Toronto	91.5	8	46.9	15	79.1	59.2	59.8	74	110.7	43.2	4.34	12	4.9
St. John's, N.B.	80.0	2	48.2	27	68.0	53.8	...	...	...	...	2.31	17	7.4
Winnipeg	93.8	23	35.5	31	77.8	52.9	...	...	...	...	3.05	12	5.4
Victoria, B.C.	75.1	20	47.0	15	64.5	51.9	...	...	...	...	.46	6	4.4
Dawson	85.5	26	38.8	23	73.3	47.5	...	...	...	...	1.11	7	4.0

Mauritius.—Mean temp. of air 0°·5 above, dew point 1°·1 and R .71 in., below averages. Mean hourly velocity of wind 10.7 miles, or 1.1 below average; extremes, 31.9 on 21st and 1.8 on 20th; prevailing direction E.S.E.

MADRAS.—R normal, TSS on 3 days, T on 9 other days and distant L on 5 other days. Bright sunshine 99.6 hours, or 25.2 per cent. of possible.

KODAIKANAL.—Mean temp. of air 56°·1. Mean velocity of wind 618 miles per day. Bright sunshine 73.9 hours.

COLOMBO.—Mean temp. of air 81°·5 or 0°·9 above, of dew point 1°·1 above, and R .56 in. above averages. Mean hourly velocity of wind 8.5 miles, prevailing direction S.W.

HONGKONG.—Mean temp. of air 81°·7. R 4.82 in. below average. Bright sunshine 208.1 hours. Mean hourly velocity of wind 11.4 miles, prevailing direction E. by S.

Adelaide.—Mean temp. of air 0°·5 below normal. R .95 in. above 46 years' average.

Sydney.—Mean temp. of air 0°·2 below, humidity 1.0 below, and R .74 in. above, averages.

Wellington.—Cold and disagreeable, foggy towards the end. Mean temp. of air 0°·2 below, and R 1.14 in. above, averages; prevailing wind N.W.

Auckland.—A mild July. Total R 1.25 in. under the average of 35 years.