Symons's

Meteorological Magazine.

No. 464. SEPTEMBER. Vol. XXXIX.

METEOROLOGY AT THE BRITISH ASSOCIATION.

The meeting of the British Association for the Advancement of Science, at Cambridge, in 1904, will rank amongst the very best of the long series since these gatherings began. The place lends itself remarkably to the occasion. The meeting-rooms were adequate, and in almost every case pleasantly as well as conveniently situated. The Colleges were thrown open with a dignified hospitality worthy of their splendid halls and gardens, while private hosts vied with them in the generous reception and entertainment of visitors. The weather was neither bad nor good, but of a fair average, permitting outdoor functions, but rarely permitting them to be altogether perfect.

The President of the Association is this year the most popular statesman in the country, and since the Association permits itself to stray beyond the votaries of science in its choice, it could not secure a better head than the present Prime Minister, for Mr. Arthur Balfour alone amongst parliamentary leaders is admired and esteemed for his great learning and attractive personal qualities no less warmly by his political opponents than by his supporters. He delivered an address on the philosophic aspects of some fundamental scientific facts, in a manner altogether agreeable.

A special International Committee on the relation between meteorological and cosmical phenomena, brought together several meteorologists from other countries. The sub-section of Section A devoted to Cosmical Physics, including astronomy and meteorology, was presided over by Sir John Eliot, F.R.S., part of whose address, admirably summarising his work of a lifetime as the head of the Indian Meteorological Service, we reprint in the present number. Numerous papers on meteorological subjects were read, and the more important of these will be reprinted in abstract in our pages, so that it is unnecessary to give a list of titles here.

The annual Meteorological Breakfast was held on Tuesday, 23rd August, at 9 a.m., when forty-three meteorologists and observers sat down. The names of those who took part are :—

Ackroyd, W.
Aitken, J., F.R.S.
Amery, Fabyan S.
Angot, A., Central Meteorological Institute, Paris.
Ashworth, Dr. J. R.
Backlund, Dr. O., Pulkovo, Russia.
Biggs, J. H. W.
Bolton, John
Boys, C. V., F.R.S.
Chree, Dr. C., F.R.S.
Cohen, R. Waley.
Cotton, G., Lagos, West Africa.
Creak, Capt. E. W., C.B., F.R.S.
Crowley, F.
Eliot, Sir John, K.C.I.E., F.R.S.
Guillemard, Dr. F. H. H.
Harmer, F. W.
Hepworth, Capt. Campbell, C.B.
Hettner, Prof. Dr. A., Heidelberg.
Hopkinson, J.
Knott, Dr. C. G.
Lempfert, R. G. K.
Lockyer, Sir Norman, K.C.B., F.R.S.
Lockyer, Dr. W. J. S.
Matthews, D. J.
Mill, Dr. H. R.
Milne, Prof. J., F.R.S.
Moncrieff, Col. Sir C. Scott, K.C.M.G.
Parker, Rev. Dr. J. D.
Plummer, W. E.
Ricco, Prof. A., Cantania, Sicily.
Rotch, A. Lawrence, Blue Hill Observatory, Massachusetts.
Shaw, Dr. W. N., F.R.S.
Smyth, J.
Southall, H.
Steen, Aksel S., Meteorological Institute, Christiania
Symons, Dr. W. H.
Tabor, H. S.
Varley, W. M.
Warner, A.
Wilson, C. T. R., F.R.S.
Wilson, W.
Wind, Dr. C. H., Meteorological Institute, de Bilt, Holland.

The key-note of this breakfast is its absolute informality. Sir John Eliot, as President of the Section dealing with Meteorology, expressed in a few words the welcome of the English-speaking meteorologists to their brethren from the continent. Dr. H. R. Mill made a few remarks on the origin and motive of the breakfast, pointing out that it was a spontaneous meeting of those interested in the same things and desirous of becoming acquainted with each other. No invitations were issued, but foreign guests were entertained by such of the British meteorologists as cared to share the trifling expense. An intimation was sent to all those likely to be interested whose names appeared in the first list of members, but as the identification marks in that list are often not very clear, omissions might occur inadvertently, but all who understood the tradition of the breakfast and heard it was to take place came of their own initiative.

Address to the Sub-Section Cosmical Physics,

By Sir John Eliot, K.C.I.E., M.A., F.R.S.

India is the most typical example of monsoon conditions, that is, of opposite air movements of six-monthly period which, in its case, depend on the annual temperature changes in the sea and land areas of the Indian Ocean and continent of Asia. The monsoon conditions in India are intensified by its unique position and topography. It projects southwards into the Indian seas over 15° of latitude, and is protected northwards by the vast barrier of the Himalaya Mountain range and Tibetan plateau. The axis of the Himalayan range is at least 2000 miles in length and has an average elevation of over 20,000 feet. The extent of country over 10,000 feet in elevation to the north of India is from 300 to 500 miles in width.

These figures will give some idea of the magnitude of India's northern barrier.

During one period of the year there is an outflow in the lower atmosphere from land to sea. The direction of the lower air drift in India is determined in part by the lie of the mountains and river valleys, and is from north-east over the greater part of the Indian seas. January is the month most typical of this air movement and of the accompanying weather conditions.

During another portion of the year the lower horizontal air movement is from sea to land. This movement is much steadier and more powerful and influential in every respect than the former. July and August are the months most representative of the totality of the weather conditions of this period.

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The regions of rainfall indicate the areas of upward movement terminating the lower advance of the current. The circulation is undoubtedly maintained in large part by the release or addition of energy due to the condensation of its enormous stores of aqueous vapour. The lower air movement is of very considerable elevation, estimated at 15,000 to 20,000 feet in India. Above it is the outward upper return movement, in part only compensatory, and in part probably slowly filling up the Central and Southern Asian low-pressure region. The movement exhibits some interesting features in India, due to the fact that of the three areas to which it is mainly determined India alone is subject to a double influx from two sea areas in opposite directions. The current from the Arabian Sea passes eastwards across the Malabar, Konkan, and North Bombay coasts, the peninsula and Central India. The Bengal current is deflected in the north of the Bay and Bengal, and advances in a westerly direction up the Gangetic plain. Between the areas or two fields of the two currents (roughly proportional to their relative strength and importance—viz., about 2 to 1) is a debatable area of variable winds and low pressure. This trough of low pressure varies in position with the relative strengths of the two currents. The cyclonic storms of the period, which are of comparatively frequent occurrence, advance along the trough. It is hence a factor of considerable importance in determining the distribution of the rainfall of the period. The trough is purely a resultant of the peculiar conditions of the air movement, and is not the cause of that movement; in other words, it is determined by it, and does not determine it.

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The year in India may hence be divided into two monsoons of nearly equal length,—(*a*) The north-east or dry monsoon; (*b*) The south-west or wet monsoon.

The first terms are based on the general direction of the air movement in the Indian seas during the periods, and the second on the most prominent feature of the weather in India itself. Of an average annual total rainfall of 41 inches (according to the most trustworthy calculation), at least 85 per cent. falls during the wet season, and only 15 per cent. during the dry season.

The dry monsoon in India is subdivided into—(1.) The cold-weather period. (2.) The hot-weather period or transitional period of preparation for the south-west monsoon.

The wet monsoon is subdivided into—(1.) The south-west monsoon proper, or period of general rains. (2.) The period of the retreating south-west monsoon and gradual slow establishment of the dry monsoon.

One of the most noteworthy features of the meteorology of India is that the storms of each period—viz., the cold-weather period, the hot-weather period, and the wet monsoon—are characteristic and special to the period. They are all in the broadest sense of the word cyclonic in character; but they originate under different conditions and exhibit very different features in each of those periods.

The disturbances of the cold weather are large shallow depressions which originate in the upper humid return current of the north-east monsoon circulation, chiefly in the Persian plateau region, and which drift eastward with a slight southing across extra-tropical India. Storms do not occur south of the Deccan or peninsula-dividing ranges during this period. These storms are chiefly remarkable for the frequent development of stationary secondary depressions in the Punjab, usually of much greater intensity than the primaries; a feature of which, I believe, there is no parallel elsewhere. They are of great importance, as they give the main snow supply to the Western Himalayas and the light but general occasional rain required for the wheat and other cold-weather crops of Northern India.

The storms of the hot weather are local disturbances of very limited extent, usually in large areas of slight depression, and are occasionally of remarkable intensity and great violence. In the areas to which the local sea winds of the period extend (more especially Bengal and Assam) they occur chiefly as local thunderstorms with violent winds and brief heavy downpours of rain, but sometimes as tornadoes rivalling those of certain districts of the United States in intensity and destructiveness. In the dry interior they occur as dust-storms, usually without rain, and are most violent in the driest districts, including Sind, the Punjab, and Rajputana. Occasionally, when the convective movement is especially vigorous, they develop into hailstorms of great intensity. The rainfall accompanying these hot-weather storms is of little general agricultural value except in the tea districts of Assam and Bengal.

Finally, the wet monsoon is characterised by the frequent occurrence of cyclonic storms of every degree of intensity and of very varying extent. The great majority of them originate in sea areas of nearly uniform temperature as disturbances in a massive current highly charged with aqueous vapour and subject to large variations of intensity and extension. The more prominent features of these storms, more especially of the most violent, including the hurricane winds, excessive rainfall, and the phenomena of the central calm and the accompanying storm wave, are too well known to require description. The chief importance of these storms, of which an average of about ten (of different degrees of intensity) occurs every year during this period, arises from the manner in which they modify the distribution of the rainfall, discharging it abundantly over the districts traversed by the storms at the expense of the districts outside of their field.

The most important and variable feature of the weather in India from the practical standpoint is rainfall. Its value depends upon its amount and occurrence in relation to the needs of the staple crops. The measurement of rainfall is carried out, on a uniform system, at upwards of 2500 rain gauge stations. The average distribution of rainfall, month by month and for each season, has been determined from the data of about 2000 stations. It should, however, be recognised that the probability that the rainfall will conform exactly to this distribution in any year is *nil*. Average rainfall charts represent a distribution about which the actual varies from district to district more or less considerably, the local variation for prolonged periods being practically compensatory. Such mean or normal data and charts are undoubtedly of value, more especially for the determination of rainfall anomalies and their relations to pressure, temperature, and other anomalies. There is apparently a tendency to assign a greater value to these charts of mean rainfall distribution than they deserve. Charts showing the amount and time distribution of the rainfall best suited for the requirements of the staple crops would—for India at least—be more interesting and valuable. This is a work that I regret has, for various reasons, not yet been carried out by the Indian Meteorological Department.

In most regions in India a moderate variation (positive or negative) in the amount of the rainfall is of comparatively small importance, more especially if the precipitation occurs in amount and at intervals suited to the requirements of the crops. During the thirty-year period 1874–1903 there were six years in which the distribution of rainfall affected to a serious extent the crop returns over large areas, and the rainfall was not compensatory. In four of these years the drought was so severe and widely spread as to occasion famine, with its attendant calamities, over large areas. Severe droughts and famines occur at very irregular intervals. A noteworthy feature is that they frequently follow in pairs separated by intervals of two to four years.

The following important inferences are based upon the preceding presentation of facts and the experience of the past thirty years :—

(1.) The lower air movement of the south-west monsoon is the northward extension of the lower movement of the south-east trades. The latter is a permanent feature of the Indo-oceanic region, and the former a periodic invasion of the Southern Asian seas and peninsulas initiated over equatorial regions and propagated northwards to the southern mountain barrier of the Central Asian plateau.

(2.) The primary factors determining this impulse across the equator (the first stage of the establishment of the south-west monsoon) are to be sought in the permanent field of the south-east trades, and are not due to actions in the heated areas of Southern or Central Asia.

(3.) The pressure conditions in the heated areas of Southern Asia and North-East Africa determine the direction, volume, and intensity of the advance over the Indian seas to what may be termed three competing areas for rainfall (viz., Abyssinia, India, and Burma). These conditions are hence important factors in the third stage of the advance of the south-west monsoon current.

(4.) The movement when fully established by these actions over the Southern Asian seas and peninsulas is continued—1st, by the momentum of the lower circulation ; 2nd, by the release of energy accompanying aqueous vapour condensation ; and 3rd, by thermal actions in Southern Asia, due to direct solar activity. The termination of the lower horizontal current by vertical movement occurs irregularly over the areas of frequent heavy rain in Southern Asia and Abyssinia, and not over a heated area in Central Asia.

(5.) The total volume of aqueous vapour brought up by this circulation not only varies in amount from month to month during the season, but also from year to year. The largest variations (seasonal and annual) depend chiefly, if not entirely, upon actions in the source of supply—viz., the Indian Ocean. If those actions determine an increased or diminished supply across the equator into the Indian seas, there is a corresponding variation in the total precipitation of the three competing areas. Amongst such causes and actions may be prolonged and untimely diversion of the south-east trades into East Africa, as in 1896, or general weakness of the air movement over the Indian Ocean, probably accompanying a displacement and decreased intensity of the southern anticyclone, as in 1899.

(6.) The relative distribution of the total rainfall in the three areas of discharge of the aqueous vapour of the monsoon currents probably depends upon the relative intensities of the pressure conditions established during the hot weather, which are continued for a part or the whole of the monsoon by actions depending on the rainfall resulting from the initial pressure conditions—an example of the persistence of meteorological conditions and actions which is a prominent feature of Indian meteorology. The total rainfall of each of the three areas may differ considerably from the normal, but there may be partial or complete compensation on the whole. Thus it is the general (but not the invariable) rule that the rainfall variations in Burma and Assam are usually inverse to those of North-Western India and also of India as a whole.

(7.) The distribution of the rainfall in any one of the three competing areas (but more especially in India as the largest) may vary widely from the normal—considerable deficiency in some areas accompanying considerable excess in others. This in India is undoubtedly due to local conditions —*e.g.*, local excess or deficiency of pressure at the commencement of the period and established during the previous hot weather. These pressure variations usually accompany abnormally prolonged and heavy snowfall, or very scanty snowfall, in the Western Himalayas.

(8.) Local or general drought in India during the south-west monsoon may hence be due to—(*a*) General weakness of the south-east trades circulation. (*b*) Diversion of an unusually large proportion of the south-east trades to South-east or East Africa during the monsoon period. (*c*) Larger diversion than usual of the monsoon currents to Burma or Abyssinia. (*d*) Very unequal distribution in India itself, due to local conditions established during the antecedent hot weather.

(9.) Scanty rainfall or drought during the dry season or north-east monsoon in Northern India results from absence or unusual feebleness of the cold weather storms which are the sources of rainfall at that time.

(10.) The most prolonged and severe droughts in North-western and Central India are due to the partial or complete failure of the rainfall of at least two seasons in succession.

(11.) As the two circulations in the Indian oceanic region have a common goal in the dry season (more especially from December to March), it is probable that variations in the strength of one circulation (more especially the larger) will modify the field and strength of the other circulation. It appears that this relation would be shown most strongly between the southern circulation and the upper movement of the northern circulation. And, as cold weather storms are disturbances in that upper movement, it is possible—if not probable—that the larger variations in the number and intensity of the cold-weather storms and the amount of the cold weather precipitation may be related to conditions in the south-east trades regions.

(12.) There appears to be little or no relation between the position and intensity of the Central Asian anticyclone and the number of the cold-weather storms and rainfall of Northern India in any season.

The meteorology of the period 1892—1902 is of especial interest for its confirmation of the above inferences, more especially the phenomena of the variations of rainfall in India and the causes to which they are due.

The period 1895—1902 was characterised by more or less persistent deficiency of rainfall over practically the whole Indo-oceanic area (including Abyssinia). The economic results in the dry interior districts of India, South Africa, and Australia, were the same—large loss of cattle and money. The drought in Southern Asia was as marked in the north-east as in the south-west monsoon, and hence the variation was not seasonal but general.

The variations of temperature, humidity, and cloud in India during the whole period were large and in direct accordance with the rainfall. In other words, during the period 1892-94 the air was damper with lower temperature than usual, and cloud above the normal. On the other hand, from 1895 to 1902 temperature was steadily in excess, and cloud and humidity less than usual.

The most interesting feature of the meteorology of the period 1892—1902 is that the variations of the solar insolation are the inverse of those which might have been expected from the cloud and humidity data. In other words, solar radiation was in excess in the period of increased humidity and cloud, and in defect during the greater part of the period of drought, decreased humidity, and cloud.

(*To be continued*).

Report of Kite Committee.

Investigation of the Upper Atmosphere by Means of Kites in co-operation with a Committee of the Royal Meteorological Society.—Third Report of the Committee, consisting of DR. W. N. SHAW (*Chairman*), MR. W. H. DINES (*Secretary*), MR. D. ARCHIBALD, MR. C. VERNON BOYS, DR. A. BUCHAN, DR. R. T. GLAZEBROOK, DR. H. R. MILL, *and* Professor A. SCHUSTER. (*Drawn up by the Chairman and Secretary.*)

THE Committee have acted throughout in conjunction with the Committee of the Royal Meteorological Society.

Since the date of the last report an account of the observations made in the summer of 1903 has been communicated to the Royal Meteorological Society and published in their *Quarterly Journal.*

In the interval between the meeting of the Association at Southport and the beginning of June experimental observations have been made at Oxshott; kites, of which various details have been altered, have been sent up almost every day on which the wind-force equalled or exceeded six on the Beaufort scale. The object of these experiments was to ascertain if the behaviour of the kites could be improved by alteration of shape, size, &c., more particularly with regard to uniformity of pull and stability in winds of varying force.

As regards the first of these qualities considerable improvement has been effected by arrangements which will be described subsequently.

A new form of meteorograph has been designed for kite experiments by which the records of pressure, temperature, and humidity are traced upon a revolving disc of paper instead of a drum. (See this Magazine for July, p. 109.) It is made by Mr. Hicks, of Hatton Garden, under the supervision of Mr. Dines.

From the beginning of February till June ascents were made at Oxshott on every day specified by the President of the International Aëronautical Committee unless the wind was too light for work with kites.

As reported last year, an application made by the Royal Society to the Admiralty for the loan of a vessel for experiments with kites became inoperative in consequence of the accident to the ship which their lordships intended to place at the disposal of the Committee for the purpose. At the desire of the Royal Meteorological Society the Royal Society renewed the application for the loan of a vessel with a view to experiments in the summer, and their lordships assigned H.M.S. "Seahorse," a special service vessel of 600 tons and 1,000 horse-power, for the service, under the command of Staff-Captain F. W. A. Crooke, R.N., for six weeks from the middle of June. Mr. Dines visited Portsmouth to make preliminary arrangements, and the "Seahorse" arrived at Crinan on June 16th. The fitting of the winding engine was completed on June 18th, and the operations commenced on Monday, June 20th, and were continued daily until July 29th, with the exception of Sundays and the two days, July 9th and 11th, when the vessel was at Oban for the purpose of coaling. The approximate heights of the several ascents were as follows :—

Date.	Height reached. feet.	Date.	Height reached. feet.
June 20	3,250	July 8	5,000
,, 21	4,000	,, 13	8,500
,, 22	5,340	,, 14	1,750
,, 23	3,320	,, 15	8,060
,, 24	4,100	,, 16	{6,050 6,760*
,, 25	3,750	,, 18	1,200
,, 27	2,300	,, 19	4,200
,, 28	7,300	,, 20	2,680
,, 29	4,900	,, 21	5,500
,, 30	5,600	,, 22	5,900
July 1	5,500	,, 23†	—
,, 2	4,400	,, 25	5,310
,, 4	6,300	,, 26	5,280
,, 5	7,200	,, 27†	—
,, 6	5,300	,, 28	8,000
,, 7	7,350		

* Afternoon.
† No ascent owing to want of wind. Persistently calm weather prevailed on and after July 18.

The Committee take this opportunity of recording their thanks to the Royal Society for their action in the matter, to the Lords of the Admiralty or the loan of the "Seahorse," and to Staff-Captain Crooke and the officers

and men of his vessel for the manner in which they contributed to the carrying out of the observations. An account of the results of the experiments will be published later.

In the course of correspondence with Mr. E. W. L. Holt, of the Fishery Branch of the Irish Board of Agriculture Technical Instruction, Dr. Shaw learned that there was a prospect of occasional kite observations on board the s.s. "Helga," belonging to the Board, provided that the Department was not called upon to defray the expenses of the necessary apparatus and materials. Dr. Shaw reported the matter to the Committee, and reported, further, that if the Committee were willing to supply apparatus and gear for the experiments on the "Helga" the Meteorological Council were prepared to make arrangements with Mr. Dines to initiate the experiments and explain the method of working the apparatus.

The meeting of the Committee of Section A of the British Association formed a resolution desiring the Council to take steps to urge upon the Government the provision of means for co-operating in an organised union with the Continental nations and with India and America in the investigation of the upper air by means of balloons and kites. The decision of the Government with regard to the matter is nevertheless intimately connected with the action intended with regard to the Report of the Meteorological Grant Committee of the Treasury. The Committee's report was published in June, and refers in favourable terms to the proposed investigation, but suggests no specific grant for the purpose. The action of the Government with regard to the finding of the report has not yet been made known.

Nothing is therefore ascertained as to the prospects of an investigation of the upper air of this country upon an official basis. In the meantime Mr. Dines is likely to be able with the apparatus in hand to obtain kite observations on the fixed days of the Meteorological Committee, and to make further investigations with regard to improvements of the kites and apparatus. With regard to the latter an easy means of calibrating the meteorograph is required, and this involves the use of a suitable air-tight inclosure which might be used for similar operations in future. The Committee therefore ask for re-appointment, with a grant.

On Upper Currents and their Relation to the Hearing of Far Sound. By JOHN M. BACON.

INVESTIGATIONS carried out during a long series of balloon ascents have revealed a very remarkable complexity in the upper air-currents which, from their nature, would escape the notice of the observer on earth. A number of light bodies, of varying sizes and differently constituted, have been prepared and allowed to float away into space at different heights and under different circumstances; and these, carefully watched, have shown the existence of minor but headlong currents, holding determined courses frequently at variance with that of the balloon. It has been proved that dominant but diverse air-streams will glide one above another in juxtaposition without commingling, and that upper currents maintaining the same level will occasionally alter their course, presumably in obedience to some configuration of the earth below; while, at all heights, ascending or descending air-streams, greater or lesser, will obtrude themselves in a way which is often wholly unaccountable.

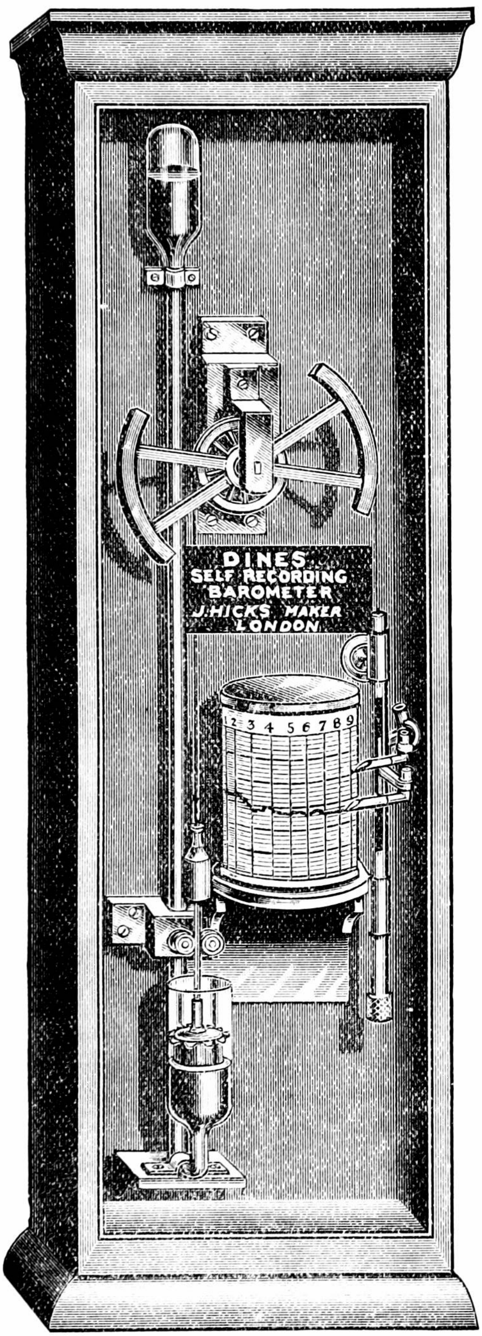
In a manner equally capricious, and apparently dependent on the above, sounds conveyed through the upper air will be carried sometimes to abnormal distances in directions at variance with the ground current, being borne to earth over far but favoured plots of ground, while they may pass unheard over districts which might be considered well within sound range. These results, which have been obtained largely by organised observation of the hearing of aerial bombs, will presumably account for the occasional surprisingly far travel of sound signals; or, again, their failure at short ranges.

THE DINES RECORDING BAROMETER.

THE accompanying illustration shows so clearly the mechanism of the new recording barometer devised by Mr. W. H. Dines and made by Mr. J. J. Hicks, that it is unnecessary to describe the parts in detail. It will be observed that the lower and upper cisterns are of very wide bore compared with the connecting part of the tube. The motion of the float in the lower, or open, cistern is magnified and transmitted to the pen by the system of levers shown. The second pen is at a fixed height, and draws a standard line upon the paper, so that there may be no doubt whether the chart has been correctly adjusted on the cylinder. There is only one point of difficulty: that is with regard to the application of a correction for temperature, and on this Mr. Dines has kindly supplied the following explanation:—

In a self-recording barometer when the pen is actuated by a float in the lower cistern it is easy to apply a temperature compensation, and the convenience of doing away with the necessary correction is well worth the small additional expense.

In cases where the barometer consists of an upper and a lower cistern connected by a smaller tube, the effect of a rise of temperature is to lower the level in the bottom cistern and to raise it in the upper one. The volume of mercury in the connecting tube being small, its expansion with heat has but a trifling effect upon the level in the cisterns, but owing to its decreased density, a longer column is required to balance the air pressure, and this is obtained by the mercury sinking in the lower and rising in the upper cistern. Compensation can be obtained by any plan that will raise the mercury in the cistern, or raise the float in the mercury, when the temperature rises. Either effect is easily produced. If the vacuum chamber be a large one, and sufficient air to produce a few tenths of an inch pressure be left in it, compensation by the raising of the mercury level can be obtained; and the sizes being given, the calculation of the pressure that must be left presents no difficulty.



It is perhaps more convenient to employ a float containing air, the expansion of which raises the level at which the float swims in the mercury. An inverted iron cylinder hermetically sealed at the top and floating mouth downwards serves the purpose. The length of the column of enclosed air that must be left can be obtained by calculation, and a syphon trap can be arranged which affords an exit for the air until the desired amount is left, the trap being then sealed by the mercury. An increase of temperature reduces the density of the mercury in the barometer tube, and hence lowers the level in the bottom cistern, but at the same time it expands the air in the float, and if the correct amount has been left, the total result is that there is no change in the position of the float. Of course the compensation is not theoretically perfect, since the expansion of mercury per degree is practically constant, whereas the expansion of air varies as the absolute temperature — *i.e.*, the temperature measured from —460° F., but for all practical purposes the difference is inappreciable. The height at which the float swims is also influenced by the barometric pressure prevailing at the time, since this also alters the volume of the enclosed air, but the result is only a small alteration in the magnitude of the scale.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE WETTEST SPOT IN THE UNITED KINGDOM.

WITH regard to the suggestion made by Mr. Gethin-Jones in his interesting and lucid article of last month, on the wettest spot in Wales, that there may be places among the mountains of south-west Ireland possessing a higher mean annual rainfall than the Stye Head Pass, this may, of course, prove to be the fact, but it is scarcely likely to prove so, inasmuch as Cumberland lies farther into the low-pressure region of the north Atlantic than Kerry, with the consequence that during the westerly type of weather which so often prevails over the United Kingdom, a cyclonic system, situated to the north of these islands, which may be causing a deluge in Scotland and northern England, will occasion a more moderate rainfall in the south of Ireland, and perhaps only a few passing showers in the south of England. We are so accustomed to associate the distribution of rainfall in this country with the relief of the land, that we are apt to overlook the fact that some regions experience the full influence of a greater number of cyclonic systems in the course of a year than others.

The exaggerated difference between the mean annual rainfalls of two such places, for example, as the Stye Head Pass and Hampstead Heath, though primarily due to the situation of the former place in the heart of the Cumbrian mountains, is also, in some measure, to be accounted for by the fact that Middlesex is spared the ravages of a greater number of cyclones in the course of a year than Cumberland. In the relatively cold climate of England the bulk of the rain which falls is occasioned by powerful external causes, like cyclones (the actual amount of precipitation being, of course, enormously increased in the mountainous districts), and even in the south-east of England, where the summers are warmer than in any other part of Britain, the thunder rains of local origin are not remarkably pronounced, either in frequency or intensity; whereas in northern Italy, where thunder and hail storms of great severity are at times in summer of almost daily occurrence, three or four inches of rain in twenty-four hours is no unusual amount; in London the fall during the same period very rarely exceeds two inches. Thus the "home-made" summer rains of Britain that show such a tendency to develope about 3 p.m., on sultry days, are quite insignificant compared with the enormous autumn and winter precipitation of the mountainous districts of the north and west. The wettest spot in the British Isles, be it in Kerry, Carnarvon, Cumberland, Argyll or Skye, will obviously be found on the leeward side of some mountainous mass, which, situated in a district influenced by a large number of rainy atmospheric depressions, is able to enhance in the most efficient manner the upward movement of the moisture-laden winds which strike against it.

L. C. W. BONACINA.

BALL LIGHTNING.

I ONCE saw ball lightning during a heavy thunderstorm at Aber, N. Wales, on 21st August, 1898. I was sitting with a friend in the porch of the Railway Hotel, watching the storm, when, at about 10 p.m., a brilliant flash revealed small balls of fire along a low line of clouds. The effect, though of course instantaneous, was very pretty.

C. S PRINGLE.

Whitekirk, Southbourne, Hants, August 17th, 1904.

[The appearance described by Mr. Pringle is well-known, but is not the phenomenon usually described as ball lightning. The question in dispute is whether lightning in the form of a ball of fire enters a house or rolls along the ground, and finally bursts in a manner capable of doing damage.—ED. *S.M.M.*]

A SHARP thunderstorm was experienced here on the 22nd inst., between 11.30 a.m. and noon. After a loud peal of thunder, a ball of light of a molten glowing yellow colour became visible in the S.E. at 11.40 a.m. The ball was estimated to be about $\frac{1}{2}°$ in diameter, and appeared about 5° above the surface of the sea. To the top of the ball was attached a narrow, pear-shaped appendage, extending upwards about $1\frac{1}{2}°$. The ball remained visible for nearly five seconds, when it was swallowed up in a dense blue-black mist, which hung over the sea during the storm. The cumulus clouds in the early morning were remarkable for their immense size and strong electrical appearance.

SPENCER C. RUSSELL.

Dawlish, S. Devon, August 27th, 1904.

[At the time when this interesting discussion is going on in these pages, the above recent observation of the phenomenon cannot fail to be of interest.]

FORMATION OF A WATER SPOUT.

I WISH to direct your attention to a meteorological phenomenon that delighted me for a short time last Tuesday, near midday. As I travelled by train from Harrogate to Lancaster, when less than an hour from the latter place, I noticed a large cumulus cloud in the west, apparently moving slowly in an easterly direction; it was ragged below, dark and smooth-like near the middle. From what I could estimate it may have been 30 or 40 miles distant, and about

30° in depth. From about 7° or 8° above the lower edge there was distinctly seen a water spout. This soon extended down to a jagged edge of the cloud, then trailed down in front of sky with only thin whitish cloud, or with none. It soon attained a length of 7° or 8°, then it departed gradually from the perpendicular until it was finally seen as a slightly irregular tube at an angle of about 60° to 70°, the upper, attached end, travelling faster than the lower part. It must, after ten minutes, have attained a length of something like 10°, but it lengthened by assuming the form of a rat's tail, as if spun out, the lower part ending in a fine tapering point. When greatly attenuated, it broke into dissolving fragments. It was longer and thinner than any spout I ever saw in the tropics. The whole phenomenon may have lasted about a quarter of an hour.

I hope a number of holiday seekers may have levelled their kodaks on it.

W. MacGREGOR.

Waverley Hotel, Edinburgh, August 25th, 1904.

[We are greatly indebted to His Excellency Sir William MacGregor, the new Governor of Newfoundland, for the graphic description given above, and we hope that if a photograph of the phenomenon was secured by any fortunate observer we may be favoured with a copy of it.—Ed. *S.M.M.*]

HEAVY RAIN ON AUGUST 22nd.

The rainfall of Monday, August 22nd, amounted to exactly 2 inches. A thunderstorm came up from the south, rain beginning at 2 p.m., by 4.30 rain had ceased, 1·33 in. having fallen. Rain fell at intervals through the evening, and another short thunderstorm occurred from 8 to 8.30 p.m. The afternoon storm was quite local, and no rain fell at Witham till 4 p.m., while the rain here was heaviest about 3 p.m., accompanied by two short falls of hail.

H. C. BOUTFLOWER.

Terling Vicarage, Witham, August 29th, 1904.

METEOROLOGICAL NEWS AND NOTES.

The Austrian Meteorological Society has received from the Emperor of Austria the right to use the letters "K.K.," equivalent to Royal Imperial, before its name, so that its official designation now becomes the "k.k. Oesterreichische Gesellschaft für Meteorologie." This Society and the German Meteorological Society are jointly responsible for the *Meteorologische Zeitschrift* so ably edited by Drs. Hann and Hellmann.

THE EIGHT MONTHS' RAINFALL OF 1904.

Aggregate Rainfall for January—August, 1904.

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	14·44	103	Arncliffe	40·02	107	Braemar	18·31	88
Tenterden	16·36	101	Hull	16·11	105	Aberdeen	18·56	96
Hartley Wintney	17·11	112	Newcastle	16·36	102	Cawdor	15·69	83
Hitchin	15·92	112	Seathwaite	85·76	109	Glencarron	54·71	98
Winslow	16·61	115	Cardiff	29·67	127	Dunrobin	18·69	101
Westley	15·08	97	Haverfordwest	26·96	109	Killarney	35·50	107
Brundall	13·97	91	Gogerddan	29·69	116	Waterford	29·07	120
Alderbury	19·95	123	Llandudno	18·69	108	Broadford	26·75	128
Ashburton	37·30	131	Dumfries	27·28	103	Carlow	23·43	111
Polapit Tamar	30·24	142	Lilliesleaf	21·79	117	Dublin	16·82	98
Stroud	20·27	121	Colmonell	27·12	104	Mullingar	24·20	104
Woolstaston	20·11	113	Glasgow	24·25	110	Ballinasloe	27·21	119
Boston	13·76	110	Inveraray	45·37	107	Clifden	56·52	116
Hesley Hall	15·90	122	Islay	32·05	122	Crossmolina	42·56	137
Derby	15·05	105	Mull	39·11	117	Seaforde	24·59	110
Bolton	23·10	91	Loch Leven	24·72	112	Londonderry	28·47	112
Wetherby	20·26	137	Dundee	19·25	114	Omagh	30·12	124

The fairly normal character of the rainfall during August, especially over England and Wales, leaves the general distribution of the areas of excess and deficiency very similar to that shown in the aggregate table ending July. The excess of rainfall accumulated in the early months of the year was to some extent neutralized by the dryness of June, and in a lesser degree July, but the percentages generally speaking are in the present table again showing a slight increase. Certain individual stations have been more disturbed, notably in the case of Dundee, which from a deficit of 3 per cent. at the end of July had advanced to an excess of 14 per cent. by the end of August. The south-west of England remains relatively the wettest part of the United Kingdom, but with slightly reduced values. The north-east of Scotland also maintains its position as the driest portion of our islands, though the area is probably somewhat reduced. The only other parts of the British Isles reporting a deficiency are the east of England and isolated patches in the neighbourhood of Bolton and Dublin, the deficit in the last-named instance being so small as to be almost negligible. Compared with the corresponding period of 1903 only three stations in the present table give values exceeding that year, one being in the south-west of England and two in the west of Ireland, and taking the country as a whole the value is found to be 111 per cent. of the average as against 139 per cent. in 1903, the average used being that for the decade 1890-99, which, it should be borne in mind, is considerably lower than the mean for a longer period.

RAINFALL AND TEMPERATURE, AUGUST, 1904.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in *British Rainfall* to which each station belongs.]	RAINFALL. Total Fall.	Diff. from average, 1890-9.	Greatest in 24 hours. Depth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of Nights below 32°. Shade	Grass
		inches	inches.	in.								
I.	London (Camden Square)	1·59	— ·51	·75	31	10	91·0	4	44·3	21	0	0
II.	Tenterden	1·18	— 1·26	·54	31	11	87·0	4	43·5	21	0	0
,,	Hartley Wintney	2·04	— ·31	·72	31	8	85·0	3, 4	39·0	26	0	0
III.	Hitchin	2·51	+ ·38	1·08	31	12	85·0	4	42·0	20	0	...
,,	Winslow (Addington)	2·68	+ ·55	1·00	31	11	87·0	4	37·0	25	0	0
IV.	Bury St. Edmunds (Westley)	2·67	+ ·27	1·54	31	10	87·0	4	40·0	25	0	...
,,	Brundall	2·17	— ·20	·59	21	13	87·6	4	42·0	21	0	0
V.	Alderbury	2·49	+ ·28	·53	22	13	79·0	3	39·0	24	0	...
,,	Winterborne Steepleton	3·82	...	·62	16	17	77·8	3	39·4	13	0	0
,,	Torquay (Cary Green)	2·87	...	·76	16	14	76·5	4	48·0	21, 24	0	0
,,	Polapit Tamar [Launceston]	2·32	— 1·02	·44	21	16	75·7	3	36·0	24	0	0
,,	Bath	2·82	...	·59	22	14	82·0	3	40·2	25	0	2
VI.	Stroud (Upfield)	2·80	+ ·26	·81	21	17	82·0	3	44·0	24	0	...
,,	Church Stretton (Woolstaston)	3·19	+ ·35	·70	3	16	78·0	3	42·0	23	0	...
,,	Bromsgrove (Stoke Reformatory)	1·62	+ ·33	·45	3	12	81·0	3	35·0	24	0	...
VII.	Boston	1·75	— ·20	·54	11	11	87·0	...	41·0	...	0	...
,,	Bawtry (Hesley Hall)	2·91	+ ·70	1·21	17	13	85·0	4, 5	51·0	23	0	...
,,	Derby (Midland Railway)	2·67	+ ·55	1·00	17	15	88·0	3	41·0	24	0	...
VIII.	Bolton (The Park)	4·64	+ ·16	·72	22	22	80·2	3	43·2	21	0	0
IX.	Wetherby (Ribston Hall)	3·75	+ 1·48	1·13	17	16	...	...	...	...	...	...
,,	Arncliffe Vicarage	5·76	+ ·27	·97	17	24	...	...	...	...	...	...
,,	Hull (Pearson Park)	3·28	+ ·66	1·24	17	19	84·0	3	38·0	21	0	0
X.	Newcastle (Town Moor)	2·59	— ·32	·90	22	19	...	...	...	...	...	...
,,	Borrowdale (Seathwaite)	11·09	— ·31	2·00	14	22	76·5	29	36·0	21	0	...
XI.	Cardiff (Ely)	3·47	— ·70	·63	22	21	...	...	...	...	...	...
,,	Haverfordwest (High St.)	2·93	— ·73	·90	12	10	83·6	10	40·2	8	0	0
,,	Aberystwith (Gogerddan)	6·86	+ 2·91	1·60	16	16	87·0	24	30·0	17	1	...
,,	Llandudno	3·26	+ ·46	·70	21	17	78·0	4	45·0	25	0	...
XII.	Cargen [Dumfries]	3·84	— ·30	·84	13	16	77·0	30	37·0	21	0	...
XIII.	Edinburgh (Royal Observy.)	4·30	...	1·15	17	18	75·1	4	42·5	21	0	0
XIV.	Colmonell	5·81	+ 1·82	1·65	10	19	75·0	30	38·0	23	0	...
XV.	Tighnabruaich	5·03	...	·67	10	21	66·0	30	40·0	22*b*	0	0
,,	Mull (Quinish)	5·84	+ ·72	·88	3	22	...	...	...	...	...	...
XVI.	Loch Leven Sluices	5·69	+ 2·03	·79	5	21	...	...	...	...	...	...
,,	Dundee (Eastern Necropolis)	5·55	+ 2·74	1·40	4	24	77·7	4	41·9	20	0	...
XVII.	Braemar	3·73	+ ·06	·72	4	21	72·0	4	34·0	25	0	6
,,	Aberdeen (Cranford)	2·31	— ·99	·31	6	22	77·0	29	36·0	24	0	...
,,	Cawdor (Budgate)	4·04	+ ·89	·79	4	24	...	...	...	...	...	...
XVIII.	Glencarron Lodge	9·27	+ ·73	1·36	6	28	77·6	30	36·5	25	0	...
,,	Bendamph	7·10	+ ·38	1·09	13	25	...	...	...	...	...	...
XIX.	Dunrobin Castle	3·03	+ ·48	·65	13	20	69·0	4	38·0	25	0	...
,,	Castletown	3·06	...	·59	13	28	76·0	3	36·0	25	0	0
XX.	Killarney	4·02	— 1·30	·82	14	19	76·0	30	41·5	24	0	...
,,	Waterford (Brook Lodge)	4·18	+ ·25	·74	30	17	69·5	4	40·0	16	0	...
,,	Broadford (Hurdlestown)	4·24	+ ·66	·64	3	23	68·0	29*a*	42·0	22, 23	0	...
XXI.	Carlow (Browne's Hill)	4·10	+ ·67	·86	21	18	...	...	...	...	...	...
,,	Dublin (FitzWilliam Square)	2·90	— ·06	·90	30	18	77·7	3	44·6	24	0	0
XXII.	Ballinasloe	4·82	+ ·89	1·34	1	25	74·0	30	39·0	16	0	...
,,	Clifden (Kylemore House)	6·63	— 1·27	1·25	5	22	...	...	...	...	...	...
XXIII.	Seaforde	4·73	+ 1·43	1·02	10	22	79·0	5	43·0	22	0	0
,,	Londonderry (Creggan Res.)	7·33	+ 2·91	1·05	30	25	...	...	...	...	...	...
,,	Omagh (Edenfel)	5·37	+ 1·13	·96	10	24	73·0	30	41·0	22	0	0

+ Shows that the fall was above the average; — that it was below it. *a* and 30 31. *b* and 23, 24.

SUPPLEMENTARY RAINFALL, AUGUST, 1904.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	2·09	XI.	New Radnor, Ednol	3·68
,,	Sheppey, Leysdown	2·18	,,	Rhayader, Nantgwillt	3·86
,,	Hailsham	2·00	,,	Lake Vyrnwy	5·61
,,	Crowborough	1·69	,,	Ruthin, Plâs Drâw	3·78
,,	Ryde, Beldornie Tower	2·38	,,	Criccieth, Talarvor	3·91
,,	Emsworth, Redlands	2·95	,,	Anglesey, Lligwy	2·74
,,	Alton, Ashdell	2·88	,,	Douglas, Woodville	4·21
,,	Newbury, Welford Park	3·10	XII.	Stoneykirk, Ardwell House	4·76
III.	Harrow Weald	2·17	,,	Dalry, Old Garroch	7·88
,,	Oxford, Magdalen College	1·48	,,	Langholm, Drove Road	5·63
,,	Banbury, Bloxham	1·77	,,	Moniaive, Maxwelton House	5·74
,,	Pitsford, Sedgebrook	3·18	,,	Lilliesleaf, Riddell	2·85
,,	Huntingdon, Brampton	1·31	XIII.	N. Esk Reservoir [Penicuick]	4·50
,,	Wisbech, Bank House	2·08	XIV.	Maybole, Knockdon Farm	4·90
IV.	Southend	1·80	,,	Glasgow, Queen's Park	3·45
,,	Colchester, Lexden	1·30	XV.	Inveraray, Newtown	7·41
,,	Saffron Waldon, Newport	2·46	,,	Ballachulish, Ardsheal	8·12
,,	Rendlesham Hall	·83	,,	Campbeltown, Redknowe	4·97
,,	Swaffham	3·38	,,	Islay, Eallabus	5·41
,,	Blakeney	1·63	XVI.	Dollar	5·61
V.	Bishop's Cannings	2·96	,,	Balquhidder, Stronvar	7·74
,,	Ashburton, Druid House	3·40	,,	Coupar Angus Station	4·34
,,	Okehampton, Oaklands	2·99	,,	Blair Atholl	4·13
,,	Hartland Abbey	3·06	,,	Montrose, Sunnyside	4·19
,,	Lynmouth, Rock House	2·99	XVII.	Alford, Lynturk Manse	3·04
,,	Probus, Lamellyn	2·40	,,	Keith, H.R.S.	5·14
,,	Wellington, The Avenue	2·76	XVIII.	Fearn, Lower Pitkerrie	3·36
,,	North Cadbury Rectory	3·27	,,	S. Uist, Askernish	...
VI.	Clifton, Pembroke Road	3·23	,,	Invergarry	4·53
,,	Moreton-in-Marsh, Longboro'	2·67	,,	Aviemore, Alvie Manse	3·67
,,	Ross, The Graig	1·77	,,	Loch Ness, Drumnadrochit	3·28
,,	Shifnal, Hatton Grange	2·75	XIX.	Invershin	3·68
,,	Wem Rectory	4·60	,,	Altnaharra	2·17
,,	Cheadle, The Heath House	4·86	,,	Bettyhill	4·98
,,	Coventry, Kingswood	1·69	,,	Watten, H.R.S.	2·87
VII.	Market Overton	2·08	XX.	Cork, Wellesley Terrace	2·97
,,	Market Rasen	5·62	,,	Darrynane Abbey	4·78
,,	Worksop, Hodsock Priory	3·45	,,	Glenam [Clonmel]	3·53
VIII.	Neston, Hinderton	4·18	,,	Ballingarry, Hazelfort	3·58
,,	Southport, Hesketh Park	3·10	,,	Miltown Malbay	6·01
,,	Chatburn, Middlewood	6·58	XXI.	Gorey, Courtown House	2·77
,,	Duddon Valley, Seathwaite Vic.	5·15	,,	Moynalty, Westland	3·67
IX.	Langsett Moor, Up. Midhope	...	,,	Athlone, Twyford	5·26
,,	Baldersby	3·04	,,	Mullingar, Belvedere	2·88
,,	Scalby, Silverdale	3·44	XXII.	Woodlawn	4·39
,,	Ingleby Greenhow	3·43	,,	Westport, Murrisk Abbey	5·47
,,	Middleton, Mickleton	2·80	,,	Crossmolina, Enniscoe	6·98
X.	Beltingham	...	,,	Collooney, Markree Obsy.	6·05
,,	Bamburgh	...	XXIII.	Enniskillen, Portora	4·35
,,	Keswick, The Bank	5·14	,,	Warrenpoint	5·74
,,	Melmerby Rectory	3·30	,,	Banbridge, Milltown	5·77
XI.	Llanfrechfa Grange	3·13	,,	Belfast, Springfield	4·90
,,	Treherbert, Tyn-y-waun	6·52	,,	Bushmills, Dundarave	5·52
,,	Llandovery, Tonn	3·42	,,	Stewartstown	5·22
,,	Castle Malgwyn	2·85	,,	Killybegs	4·81
,,	Llandefaelog-fach	3·13	,,	Horn Head	4·51

METEOROLOGICAL NOTES ON AUGUST, 1904.

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.—Changeable and never settled for more than a few days together. Hot weather during the first and last weeks. The R was of little consequence until the last day, and little T or L occurred. Duration of sunshine 199·6 hours,* and of R 31·5 hours, of which 15·5 hours occurred on 31st. Mean temp. 62°·6, or 0°·5 above the average.

ABINGER HALL.—Dry, with cold nights. R was much needed and grass lands very brown and dried up. The fall on the 31st was most welcome.

TENTERDEN.—Very dry till 31st. Several hot days in the first and last weeks. High wind on 14th and 15th, doing great damage to hops and fruit. Pastures much burnt up.

CROWBOROUGH.—The first four days were very warm, but the remainder cooler and very pleasant. R much below the average.

HARTLEY WINTNEY.—A perfect summer month, beautiful R alternating with lovely sunshine. Absence of T, and clear warm nights. Ozone on 15 days with a mean of 3·5.

PITSFORD.—A pleasant month, excellent for harvest operations. A considerable amount of wind. R 1·31 in. above the average. Mean temp. 59°·0.

COLCHESTER.—Dry, with much sunshine and several hot days. Cool from 11th to 25th.

BURY ST. EDMUNDS.—Very hot and dry till the last day, when 1·54 in. of R fell. Splendid for the harvest, which was completed in first-rate condition.

BRUNDALL.—Hot and dry at first, followed by a cool and unsettled period, with some sharp TSS. Splendid weather in the last week with increased heat, breaking into T and R again at the close. Mean temp. 0°·3 above the average.

TORQUAY.—R ·20 in. above the average. Duration of sunshine 233·2 hours* or 27·5 hours above the average. Mean temp. 60°·7 or 0°·9 below the average. Mean amount of ozone 4·5. Max. 7·0 on 18th, with W.N.W. wind; min. 2·0 on 5th, with S.W. wind.

POLAPIT TAMAR.—Generally very seasonable, though the night temp. was low.

NORTH CADBURY.—Good summer weather for the first ten days; after that cool, showery and autumnal, with never more than three fine days together and R well above the average.

ROSS.—Generally very fine but frequent slight showers. No heavy storms. R below the average, but temp. normal, being highest in the first and last weeks. Harvest, both hay and corn, was almost all secured in excellent condition.

WORKSOP.—Fine, except for heavy R between 17th and 23rd. Harvest was about finished by the end of the month.

BOLTON.—On the whole favourable for agriculture. The mean temp., 56°·2, was 0°·4 below the average, and the R just about normal. Duration of sunshine 150·8 hours* or 25·9 hours above the average. From 1st to 5th, and again from 28th to 30th, the mean temp. exceeded 60° for the first time in August since 1899. Nearly all the harvest was gathered in excellent condition.

SOUTHPORT.—A fairly normal month, bar. pressure being, however, rather high. Mean temp. 0°·1 below, duration of sunshine 7 hours below, and R ·67 in. below, the average.

HULL.—After the passing of the heat wave some unsettled weather ensued, lasting till 25th, when it became hot again till the end. Duration of sunshine 161·3 hours. On 17th 1·24 in. of R fell in 14 hours.

LLANFRECHFA GRANGE.—Wheat ripened early and well, and most of the harvest was secured during the month.

LLANDOVERY.—Changeable temp. and weather. Only two days without sun, but 11 without R. R about the average.

HAVERFORDWEST.—Fine and warm during the first 8 days, then cooler till 22nd when the max. only reached 58°·6; warmer to the end. The temp. reached 70° on 8 days during the month.

DOUGLAS.—On the whole better than the normal. There were a few warm days, reaching 70°, early in the month and towards the close; otherwise generally cold. Severe gale on 6th, and strong winds on 8 days.

SCOTLAND.

LANGHOLM.—R ·23 in. above the average of 28 years.

MAXWELTON HOUSE.—Fine and warm. A heavy hay crop was well got in, and there was plenty of grass and aftermath.

LILLIESLEAF.—Cold and rainy up to the last three days. R ·06 in. above the average. Crops were looking well but backward, owing to the small amount of sunshine. Harvest not commenced.

COLMONELL.—Generally wet, with frequent strong winds. H, T and L on 22nd.

INVERARAY.—On the whole very pleasant weather, but not warm except on one or two days.

QUINISH.—Very warm and much finer than the total R indicates, as it fell heavily and was soon over.

COUPAR ANGUS.—The first and last weeks were warm and the middle cold. Mean temp. 55°·9, or equal to the average. R an inch above the average. Two TSS.

DRUMNADROCHIT.—R ·36 in., and rainy days 5, above the average of 18 years.

WATTEN.—Cloudy, mild and fine, with light R and no flooding. A month of fine growing weather.

CASTLETOWN.—Warm and damp throughout with occasional bursts of bright, warm sunshine and drying winds, giving an opportunity for securing hay crops. On the morning of the 30th ·16 in. of R fell in 15 minutes. There was a scarcity of water in village wells from August 12th to September 3rd.

IRELAND.

CORK.—R ·52 in. less than the average and mean temp. 3°·5 below the average.

DARRYNANE.—A tolerably good month with some fine hot days. R slightly above the average.

MILTOWN MALBAY.—The first half was warm, with much R; the second more sultry, with less R, but on the whole a rainy month.

DUBLIN.—Showery, but very favourable, with frequent high day temp., the max. rising to 70° or upwards on 9 days. Gales on four days; TS on 17th. Duration of sunshine 186·5 hours.

MARKREE OBSERVATORY.—Very bad weather throughout, even worse than in 1903. R fell on 25 days, at times very heavily, with strong winds.

OMAGH.—This year formed no exception to the typical wetness of the "Lammas" period, for from July 18th to August 18th R fell more or less heavily on every day but two, 7·47 in. in all; but probably the excess of wet was attended with less damage and discomfort than the abnormal drought prevalent at so many English and continental stations during the same period.

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* Campbell-Stokes.

Climatological Table for the British Empire, March, 1904.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	61·0	9	27·9	17	47·9	34·5	36·5	87	96·4	20·9	1·72	15	7·0
Malta	69·8	17	44·3	5	63·1	51·5	47·4	72	119·8	38·9	1·40	6	3·7
Lagos, W. Africa	92·0	10	71·5	28	88·0	74·6	74·3	71	148·0	68·5	7·04	9	5·3
Cape Town	96·6	20	42·5	31	76·4	58·2	55·4	68	...	...	·40	7	3·9
Durban, Natal	88·4	26	61·6	19	82·2	66·5	...	...	143·3	...	4·87	15	5·4
Mauritius	87·3	14	67·8	6	83·3	71·9	70·1	80	154·2	60·8	13·21	22	7·1
Calcutta	100·0	28	61·9	12	92·1	69·4	64·6	62	153·6	58·4	2·62	4	1·6
Bombay	94·7	30	69·4	11	86·7	73·5	69·1	71	141·2	60·1	·07	1	1·2
Madras	93·3	20	67·7	10	88·2	70·0	69·7	76	143·0	63·8	·00	0	1·2
Kodaikanal	72·1	20	47·2	1	69·6	50·4	38·0	45	139·6	34·5	·04	1	2·4
Colombo, Ceylon	91·0	5	71·6	11	88·3	74·2	71·8	77	153·2	68·2	6·34	5	3·2
Hongkong	78·6	27	52·2	19	67·0	60·3	59·7	87	122·9	...	3·76	15	9·7
Melbourne	79·2	31	41·7	24	68·3	52·7	52·3	78	141·9	33·4	·95	8	6·6
Adelaide	96·2	14	51·0	8	78·5	56·9	49·2	53	144·6	45·4	·40	4	4·3
Coolgardie	97·6	24	51·4	21*a*	81·2	57·4	49·0	48	164·0	47·2	·80	4	3·6
Sydney	78·4	16	57·8	28	72·8	61·6	58·8	78	121·9	49·1	5·02	23	5·8
Wellington	73·4	10	47·0	26*b*	66·3	54·6	41·2	50	132·0	42·5	9·94	17	7·2
Auckland	75·0	6	50·5	20	69·5	58·8	56·1	76	141·0	45·0	7·33	14	5·6
Jamaica, Negril Point	87·8	17	64·1	9	83·5	67·1	68·5	80	...	...	2·59	10	...
Trinidad	89·0	14	72·0	13	85·2	66·3	70·9	86	166·0	59·0	4·24	15	...
Grenada	84·6	11	69·4	22*c*	81·7	70·9	69·4	76	150·2	...	4·40	19	3·9
Toronto	50·7	25	4·2	4	35·4	22·0	24·7	80	101·7	—2·0	2·92	17	3·6
Fredericton	51·8	26	— 9·7	5	39·1	14·0	13·5	56	...	...	4·79	14	5·4
Winnipeg	42·5	30	— 23·5	26	23·3	2·2	...	...	...	...	3·00	12	5·5
Victoria, B.C.	52·0	31	27·8	1	45·2	36·8	...	...	...	...	3·62	20	8·0
Dawson	38·0	26	—38·8	4	10·0	—15·1	...	...	...	...	2·00	2	3·9

a and 22. *b* and 27 *c* and 24

MALTA.—Mean temp. of air 56°·7 or 0°·9 above, mean hourly velocity of wind 10·9 miles or 1·1 below, averages. Mean temp. of sea 61°·0. TSS on 3 days.

Mauritius.—Mean temp. of air 1°·4 below, dew point 0°·4 below, and R 4·84 in. above averages. Mean hourly velocity of wind 11·1 miles or 0·7 below average; extremes, 44·2 on 21st and 1·7 on 24th.

MADRAS.—Bright sunshine 271·2 hours, or 72·9 per cent. of possible.

KODAIKANAL.—Bright sunshine 264 hours.

COLOMBO.—Mean temp. 81°·7 or 0°·3 below, dew point 1°·1 below, and R 1·59 in. above, averages. Mean hourly velocity of wind 6 miles; prevailing direction S.W.

HONGKONG.—Mean temp. of air 63°·2. Bright sunshine 29·7 hours. Mean hourly velocity of wind 14·6 miles.

Adelaide.—Mean temp. of air 2°·7 below, R ·67 in. below, averages.

Sydney.—Mean temp. 2°·1 below, humidity 2·8 above, and R ·08 in. below, averages.

Wellington.—Mean temp. of air 1°·3 above, R 7·99 in. above, averages.

Auckland.—Mean temp. of air about the average, and R more than three times the average. Heavy gale on 19th.