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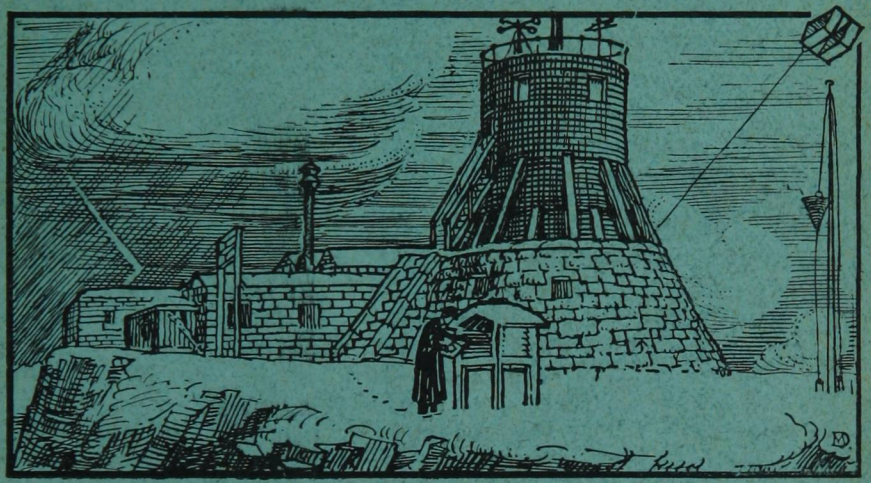
EDITED BY HUGH ROBERT MILL



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WEATHER IN THE SEVENTEENTH CENTURY.

By Walter Sedgwick, M.A.

Introduction.

It is often stated that the climate of England has undergone considerable changes in comparatively modern times, and that formerly Christmas time was more consistently cold and Midsummer more consistently warm, April more genial, and October less genial than at present. In fact, it appears to be generally believed that the coldest and warmest spells were more pronounced, and occurred somewhat earlier in the year, and that the annual variation of temperature was less broken by cold and warm spells out of their proper season. The date when the former climatic conditions is said to have existed is variously given; the "oldest inhabitant" affirms that there has been a great change since his boyhood, while others refer vaguely to the "old-fashioned" winters and summers, but so common is the belief that the climate of England has changed, that it is interesting to consider how far this belief is borne out by the observations handed down to us by those who lived in former days. An opportunity of comparing the weather of to-day with the weather of the Seventeenth Century is afforded by the diaries of John Evelyn and Samuel Pepys, and it is proposed in this and a few subsequent numbers to set out extracts from the diaries of those two writers which describe the weather of their time, and to consider whether those extracts show that any marked change in the climate of London has occurred since the Seventeenth Century.

It may be desirable to describe briefly who these writers were:—

John Evelyn, F.R.S., was born in 1620 and died in 1706; he thus lived from the reign of James I. to that of Queen Anne. He was a man of varied attainments and considerable distinction, and was on terms of great intimacy with many of the eminent men of his time. He took especial interest in questions of science, was one of the founders and also Secretary of the Royal Society, and on more than one occasion was asked to become the President, though this honour he declined. He was also interested in literature and art, and studied with attention questions of agriculture, gardening and kindred subjects. His diary is more of the character of Memoirs written up

from notes, and is a valuable commentory on the social, political, and scientific events of his life. Between 1641 and 1652 he spent several years travelling abroad, and his diary contains few notes on the weather prior to 1652, but subsequently to that year his observations on the weather become more frequent, especially in the last 25 years of his life. He was in London during the exceptionally severe winters of 1683-4, when the historic "Frost Fair" was held on the Thames.

Samuel Pepys, F.R.S., was born in 1633 and died in 1703, but his diary only covered the years 1660 to 1669. During the greater part of this period he was Clerk of the Acts and, *ex officio*, a member of the Navy Board; he was also a Younger Brother of the Trinity House. He was President of the Royal Society from 1684 to 1686, and, like Evelyn, he knew many eminent men in all walks of life, but his diary is devoted more to the social life and gossip of the day than to questions of science, and his observations on weather are of less interest than those of Evelyn, nevertheless they usefully supplement some of the gaps in Evelyn's diary.

In making a comparison between the weather of the Seventeenth Century, as described in these diaries, and the weather of to-day, a few points should be borne in mind. One is that the rigorous exactness which is expected from men of science to-day was not expected over two centuries ago, and the instruments were not then in existence which make possible the great accuracy of present day observations. The existence of atmospheric pressure was first demonstrated by Torricelli in 1643, and the actual proof of the principle of the barometer was given by Pascal about 1648, when Evelyn was 28. The relation of atmospheric pressure to weather is mentioned by Robert Boyle (1626-1691), but he expressed the opinion that it is exceedingly difficult to draw any correct conclusions. The hermetically-sealed thermometer had been invented in 1612 by Galileo, or possibly before his time, but this instrument was first made in England by Robert Boyle, and the substitution of mercury for spirit as the thermometric liquid was not suggested until 1693, when Evelyn was 73; this suggestion coming from Halley. The first rain gauge of which there is definite information was one shown by Sir C. Wren at a meeting of the Royal Society in 1662, and it is probable that he recorded rainfall regularly after that date; but the earliest records of rainfall which are in existence were commenced by Mr. Townley at Townley, in Lancashire, on 1st January, 1677, and the next earliest in England were started by Hooke at Gresham College, then the home of the Royal Society, in 1695, only 11 years before Evelyn's death.

Accordingly, although the barometer, thermometer, and rain gauge were known instruments before the close of the Seventeenth Century, yet there were but few in existence, and they cannot have been used regularly, if at all, by Evelyn or Pepys. Hence it would not have been possible for them to make accurate comparisons between the

weather of different years and the frequent use of the superlative in the descriptions of the weather in their diaries must be accepted with reserve. It must also be remembered that all non-instrumental observations on weather are largely affected by the personal element, and the diarist's impressions of cold and warmth, rain and drought, bad weather and good weather must necessarily have been influenced by his health and strength and by his occupation and pursuits at the time. Again, his tendency would be to record the abnormal rather than the normal conditions of weather.

Another important consideration is the change from the Julian to the Gregorian Calendar which was made in England in 1752. The Julian Calendar (named after Julius Cæsar), or Old Style, was adopted in its final form in the reign of the Emperor Augustus, and was used throughout civilised Europe till the Sixteenth Century. That Calendar assumed that the year was exactly $365\frac{1}{4}$ days in length, and it ordained a leap year every fourth year without any exceptions. The true year, however, is about 11 minutes 12 seconds less than $365\frac{1}{4}$ days, and this small difference amounts to three days in the course of every 400 years. In 1582 it was found that the vernal equinox occurred 10 days earlier than it did at the time of the Council of Nice in 325, and accordingly Pope Gregory XIII. published a Bull annulling 10 days by reckoning the 5th October, 1582, as the 15th October. He also ordained that years which were a multiple of 100 but not of 400 (*e.g.*, 1700) should not be leap years. The Gregorian Calendar, or New Style, was adopted by most continental Roman Catholic countries in the Sixteenth Century, and by Scotland in 1600, but it was not adopted in England until 1752. The difference between the two styles then amounted to 11 days (1700 having been reckoned a leap year under the Old Style but not under the New Style), and Parliament enacted that the 11 days after September 2nd should be omitted and the day following September 2nd should be September 14th. In Russia and other countries under the Greek Church the Old Style is still used, and the error is now 13 days. The result of the change of style is that any particular day of the year at the present time really corresponds (when considered in relation to the position of the sun in the Ecliptic) to a day dated in England 10 days earlier in the Seventeenth Century and 11 days earlier in the first half of the Eighteenth Century, *e.g.*, May 15th, 1911, corresponds with May 5th, 1611, and May 4th, 1711. It is possible that this change has some connection with the popular belief about the old-fashioned Christmas, since Christmas Day in the time of Evelyn really corresponds with January 4th or 5th of the present time, and in several years in the past decade there have been considerable falls of snow after Christmas which would have occurred before Christmas if the Julian Calendar had been still in force. Similarly, May Day used to occur 10 or 11 days later in the astronomical year than it does now, and there was consequently a better prospect of its being warm and genial.

It is also necessary to remember that under the Julian Calendar the year commences with the Feast of the Nativity (March 25th), and when days between January 1st and March 25th are mentioned there is sometimes a little confusion as to the actual year referred to.

Part I.—Spring.

In this part are given extracts from the diaries which relate to the weather of March, April, and May. As regards the weather of these months the only information given by Evelyn prior to 1681 is with reference to the severe cold in March, 1658, and the cold spring of 1667, but in 1689 he makes a general statement about the springs since 1660, and his diary contains many remarks about the spring weather from 1681 to 1705. Pepys also refers to the cold spring of 1667, and makes several comments on the weather in May from 1660 to 1669.

So far as these extracts enable an opinion to be formed, they appear to show a close similarity between the spring weather in the second half of the Seventeenth Century and the spring weather of the present time. In March there is reference to great cold in 1658, 1667, and 1696, and unusual warmth in 1700. In April there were frequently then, as there are now, spells of a dry, easterly type, and while many springs are described as cold and backward, few are described as warm and pleasant. Occasionally the cold spells were prolonged well into May, as in 1688, 1692, and 1698.* Attention is especially called to the observation dated 9th May, 1688, referring to a cold, late spring after a mild winter.

The springs from 1681 to 1705 of which information is given may be shortly described as below, and there is a noticeable correspondence between the weather of one year and that of the eleventh year after.

1681—Cold and dry.	1694—Dry.
1682—Wet.	1695—Cold.
1683—March hot and dry; April wet.	1696—March cold; April genial.
1684—Cold and dry.	1698—Cold.
1688—Cold.	1699—Stormy.
1689—Genial.	1700—Genial.
1692—Cold.	1701—Dry.
1693—Wet.	1705—Fine and dry.

Note.—In the following extracts the dates *have been corrected* to New Style, except where (O.S.) occurs.

Extracts from Pepy's diary are distinguished thus—(P.); all other extracts are from Evelyn's diary.

1658 17 March.—This had been the severest winter that any man alive had known in England. The crow's feet were frozen to their prey. Islands of ice inclosed both fish and fowl frozen, and some persons in their boats.

1660 30 May.—At sea off the Hague. This hath not been known four days together such weather this time of the year a great while. (P.)

1660 31 May.—At sea off the Hague. The weather foul all this day also. (P.)

1661 (*a*)3 May.—Fair during day, late afternoon or evening "it fell a raining and thundering and lightning as I have not seen it do for some years." (P.)

31 ,, One of the greatest showers of rain that ever I saw. (P.)

1663 25 May.—Strange were the effects of the late thunder and lightning about a week hence at Northampton, coming with great rain which caused extraordinary floods in a few hours bearing away bridges, drowning horses, men, and cattle. (P.)

1666 1 May.—A mighty hot and pleasant day. (P.)

1667 16 March.—Great frosts, snow and winds prodigious at the vernal equinox; indeed it had been a year of prodigies in this nation, plague, war, fire, rain, tempest and comet.

16 ,, The weather being become most bitter cold, the king saying to-day that it was the coldest day he ever knew in England. (P.)

17 ,, This day was reckoned by all people the coldest day that ever was remembered in England. (P.)

26 ,, The weather is now grown warm again after much cold. (P.)

14 April.—The cold so intense that there was hardly a leaf on a tree.

1668 14 April.—The Duke of York did tell us what rules he had of knowing the weather, and did now tell us we should have rain before to-morrow (it having been a dry season for some time), and so it did rain, all night almost; and pretty rules he hath, and told Brouncker and me some of them, which were such as no reason can readily be given for them. (P.)

1669 11 May.—The day being unpleasing. . . . .dusty, windy and cold, and now and then a little dribbling of rain. (P.) May Day, O.S.

1681 6 April.—An extraordinary sharp cold spring, not yet a leaf on the trees, frost and snow lying.

9 May.—But one shower of rain all this month (April, O.S.).

1682 22 April.—This season was unusually wet, with rain and thunder.

1683 11 May.—March (O.S.) was unusually hot and dry, and all April (O.S.) excessively wet.

1684(*b*) 7 April.—The weather began to be more mild and tolerable, but there was not the least appearance of any spring.

14 ,, Hardly the least appearance of any spring.

1687 22 May.—Such a storm of wind as had seldom happened, being a sort of hurricane. It kept the flood out of the Thames so that people went on foot over several places above bridge. Also an earthquake in several places in England about the time of the storm.

1688 25 April.—A dry, cold, backward spring; easterly winds.

9 May.—The weather was till now so cold and sharp, by an almost perpetual east wind, which had continued many months, that there was little appearance of any spring, and yet the winter was very favourable as to frost and snow.

1689 1 May.—This was one of the most seasonable springs, free from the usual sharp east winds that I have observed since 1660, which was much such an one.

1692 April.—No spring yet appearing.

4 May.—Very cold and unseasonable weather, scarce a leaf on the trees.

15 ,, The eastern wind constantly blowing.

1693 1 March.—Hitherto an exceeding warm winter such as has seldom been known.

8 ,, An extraordinary deep snow after almost no winter, and a sudden, gentle thaw.

3 May.—An extraordinary wet spring.

1694 The whole month of April (O.S.) without rain.

2 May.—A fiery exhalation rising out of the sea spread itself in Montgomeryshire a furlong broad and many miles in length, burning all straw, hay, thatch and grass, but doing no harm to trees, timber, or any solid things, only firing barns or thatched houses. It left such a taint on the grass as to kill all the cattle that eat of it. It [? the taint] lasted many months.

16 ,, Scarcely one shower had fallen since the beginning of April.

1695 April.—The latter end of March (O.S.) sharp and severe cold, with much snow and hard frost; no appearance of spring.

24 ,, After a most severe, cold and snowy winter, without almost any shower for many months, the wind continuing N. and E., and not a leaf appearing, the weather and wind now changed, some showers fell, and there was a remission of cold.

1 May.—The spring begins to appear, yet the trees hardly leafed.

1696 11 March.—The wind continuing N. and E. all this week.

18 ,, Great frost and cold.

22 April.—A very fine spring season.

1698 1 May.—An exceeding sharp and cold season.

18 ,, An extraordinary great snow and frost.

1699 1 March.—A most furious wind, such as has not happened for many years.

5 April.—After an extraordinary storm there came up the Thames a whale which was 56 feet long.

1700 19 March.—The season was like April for warmth and mildness.

4 April.—The season warm, gentle, and exceeding pleasant.

5 May.—A most glorious spring, with hope of abundance of fruit of all kinds and a propitious year.

1701 May.—A great dearth, no considerable rain having fallen for some months.

28 ,, Very plentiful showers, the wind coming west and south.

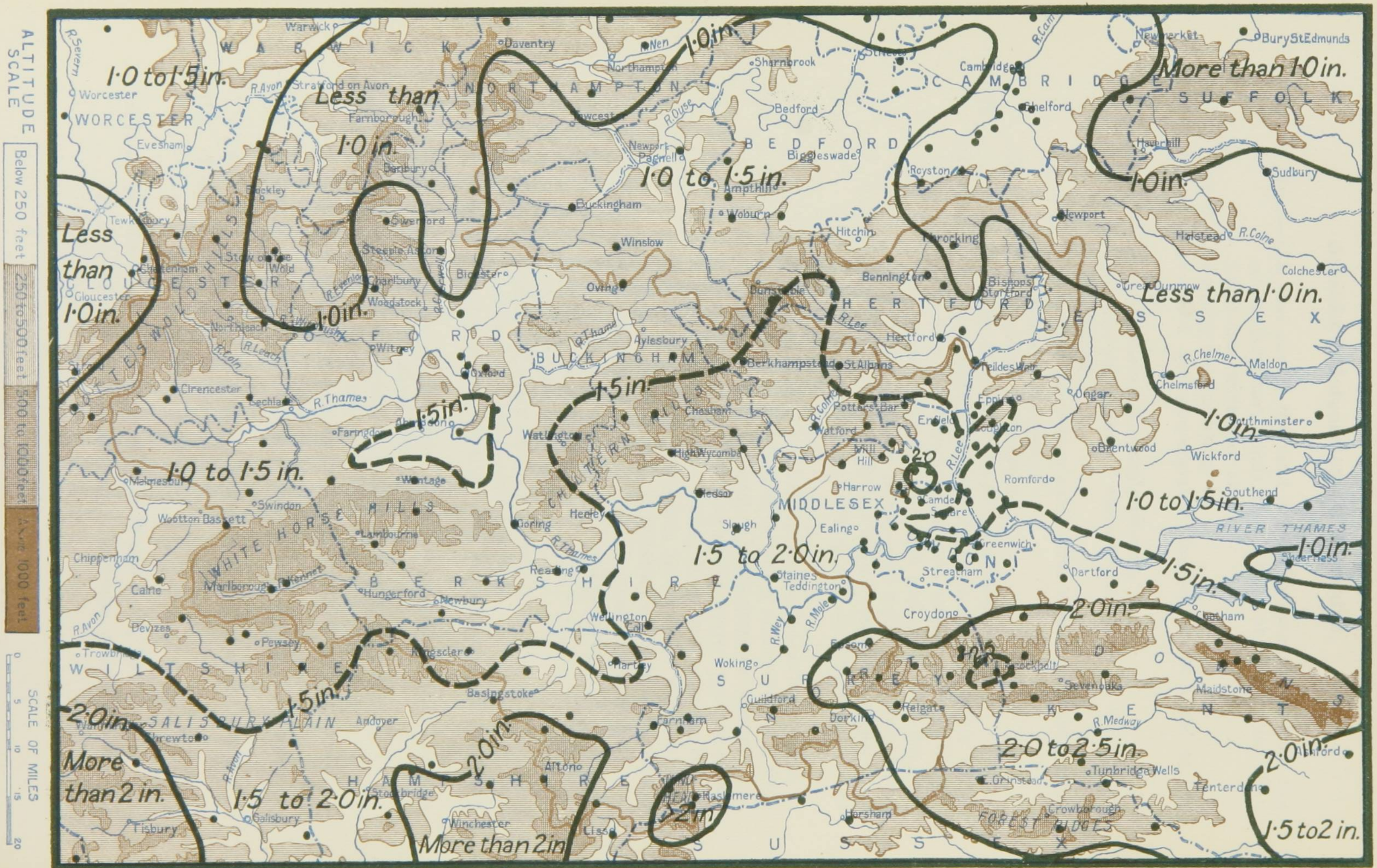
1705 4 March.—Remarkable fine weather.

22 ,, An exceeding dry season.

Notes.—(*a*) The Coronation Day of Charles II., 23 April, 1661 (O.S.).

(*b*) This followed the exceptionally cold winter of 1683-4, when the Frost Fair was held.

THAMES VALLEY RAINFALL APRIL, 1911.



Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir.

Rainfall Stations reporting ●

Isohyetals.

THE WEATHER OF APRIL.

By FRED. J. BRODIE.

OVER the southern half of England the weather of April, which was at no time very warm, was distinguished at the outset by one of the sharpest touches of cold ever experienced in mid-spring. A brisk wind from the north-eastward prevailed at the time over all but the extreme northern parts of the United Kingdom, and temperature fell steadily, a keen frost occurring on the nights of the 4th and 5th in nearly all districts. At a large number of stations scattered over various parts of the country the sheltered thermometer fell at least 10° below the freezing point, a reading as low as 17° being recorded at West Linton, and a reading of 20° in Ayrshire, at Kilmarnock and Colmonell. On the surface of the grass frost occurred as far south as the Channel Islands (where considerable damage was done to the young potato crop) and in many of our northern and central districts it was severe, the exposed thermometer sinking below 20° in many places, and touching 15° at Dumfries and Llangammarch Wells, and 14° at Armagh and Markree Castle. Over eastern, central and southern England the day temperatures registered at this time were more remarkable even than the night frosts. On the 5th the thermometer in many places failed to rise more than a degree or two above the freezing point; at Hampstead and Worthing it did not exceed that level, and at Tunbridge Wells it did not pass beyond 31°. Heavy showers of snow occurred in many districts during the opening week, and at Guernsey the total fall, when melted, yielded ·80 in. to ·90 in. of water in the gauge. At the close of the first week the weather improved somewhat, but on the nights of the 10th and 11th further sharp frosts were experienced, the thermometer in the screen falling slightly below 25° in many districts, while the exposed instrument sank to 15° at Llangammarch Wells and to 20° at Cambridge, Birmingham, Kew and Wisley.

After the 11th a large anticyclone whose central area had been situated for some time off our north and north-west coasts, extended southwards over the whole kingdom, and the cold north-easterly wind gradually died away. For the remainder of the month the type of weather was almost continuously westerly or south-westerly, and temperature was above the average, the excess being greatest in the eastern parts of Great Britain. The warmest weather occurred respectively on the 14th and 15th or between the 22nd and 24th. On the earlier occasion the thermometer rose to 65° or a trifle above it in many parts of England and the south of Ireland, a reading of 67° being recorded at Camden Square, Greenwich and Westminster, and a reading of 68° (on the 13th) at Killarney. Between the 22nd and 24th the thermometer again exceeded 65° in several parts of eastern, central and southern England, and touched 69° (on the 22nd) at Raunds and Cambridge, and 68° at Camden Square. During the latter half of the month the nights were, as a rule, fairly mild, but

early on the 17th a rather sharp ground frost occurred in many districts, while on the nights of the 26th and 28th a similar visitation was reported over the northern half of the kingdom.

In the more southern districts the effect of the cold weather which prevailed early in the month was not entirely compensated for by the subsequent mildness, and the mean temperature of the month was therefore below the average. Further to the northward, where the early period of cold has been marked, the mean values were slightly above the normal. Most places in the South of England enjoyed more than the average amount of bright sunshine, but over the country, as a whole, the total duration wes somewhat small. At Stornoway the total of 111 hours was little more than two-thirds of the average.

BALLOON ASCENTS, SEPTEMBER 3rd, 1908.

By W. H. DINES, F.R.S.

Starting Point.	Country	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Hamburg.....	Germany	6·5	—55	7·3	—42	38	S.E.
Lindenberg....	,, ...	5·3	—56	11·3	?	71	E.
Paris	France.....	8·4	—80	9·0	—69	128	S.E. by E.
Strassburg	Germany....	7·1	—65	7·3	—63	91	S.E. by E.
Munich.....	,, ...	6·1	—53	7·3	—51	105	S.E. by E.
Vienna.....	Austria	8·6	—47	12·0	—	119	E. by S.
Kuchino	Russia	7·3	—80	7·9	—71	60	N.N.E.

A=Height in miles of commencement of isothermal column.
B=Temperature, F°., at bottom of column.
C=Greatest height of reliable record in miles.
D=Temperature, F°., at greatest height.
E=Distance in miles of point where balloon fell.
F=Bearing of falling point from starting point.

Owing to the date being that of the Meeting of the British Association at Dublin few balloons were sent up in England, and of these few unfortunately none were found.

The figures were of a very unusual character, especially those for Vienna, where a high temperature, —47, is combined with an unusual height of the isothermal. As a general rule, low temperatures and great heights go together.

The weather during the whole week was very rough, a succession of depressions passing from the Atlantic to the Continent.

ERRATA.—Not the least of the penalties of carrying on meteorological work under the pressure of coping with the monthly deluge of rainfall returns lies in the necessity of exorcising the spectres of typographical errors which for ever haunt the dealer in statistics. In the Magazine for January, 1911, page 223, line 18, *for* 23rd *read* 3rd, on which date the noteworthy shade minimum temperature referred to tock place ; and in the April number, on p. 42, 23 lines from bottom, *for* two *read* three, and on same pages, 22 lines from bottom, *for* £2 *read* £3.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE SUPPOSED COLD OF ANTICYCLONES.

I AM glad that my letter should have drawn a reply from so high an authority as Dr. Hann, and must state at once that I have the greatest respect for his book, and do not class it among ordinary text books.

The first part of Dr. Hann's letter asserts the proposition that I have been trying to combat for many years, but it seems to me that the second part concedes everything for which I contend. St. Petersburg and Vienna are continental stations in the meteorological sense, and I express no opinion about them, but my position is that in the North-West of Europe the winter temperature is quite independent of whether the conditions be cyclonic or anticyclonic, and depends on the general trend of the prevailing air current.

The figures for Greenwich show that severe cold in the south-east of England is most likely to occur with the barometer below its average value, and that on days when the barometer is very high the temperature is close to its mean value. This is a very awkward fact for those who hold that an anticyclone is a "focus of cold," and hence we are asked to believe that the 1,300 odd days at Greenwich on which the barometer was above 30·20 in. were not, as a rule, anticyclonic, and that the severe frosts that occurred with the barometer below its mean value really occurred in anticyclonic weather. I leave it to every independent meteorologist to judge whether this is likely.

Doubtless a few exceptional cases can be found in which cyclonic conditions are shown on a chart with a high barometer, and conversely, but so fully is it recognised that a high barometer means an anticyclone, and a low barometer a cyclone, that many authors use the words indiscriminately. Thus the Americans use the word "high" for an anticyclone, and "low" for a cyclone, and in Dr. Hann's own book I find the following on page 402 (1906 edition), "*Witterung in den verschiedenen Sektoren einer Area hohen Luftdruckes. Bebber (1),*" with the footnote, "*(1) W. van Bebber, 'Das Wetter in den barometrischen Maxima.'*"

These same figures of W. van Bebber given on page 403 of Dr. Hann's very valuable book suffice to prove my point, and from them I extract the following. They are stated to relate to 8 a.m. The departures from the mean for an anticyclone in winter are given as —4°·3 C. in the S.E. sector, —1°·4 at the centre, and + 3°·0 in the N. sector. If the centre of an anticyclone is a "focus of cold," why does not the lowest temperature occur at the centre, and why, since the North side has a temperature of +3°·0 C., may I not, with equal truth, call an anticyclone a focus of warmth?

It is true that the centre has a temperature at 8 a.m of —1°·4, but 8 a.m. does not represent the daily mean. In the calm weather of an anticyclone the daily range is large, and 8 a.m. is close to the time of the minimum. Thus the comparison is between two minima, one when the range is large and one when it is normal, and of course the time when the range is large appears to be the colder, but is not so necessarily. The figures themselves show this, for the temperature at the centre in summer is given as —0°·2 C., though on page 397 Dr. Hann states that the centre in summer is characterised by "great warmth." Doubtless it is so, but —0°·2 does not indicate great warmth.

The time to which the figures given by Dr. Hann refer is not stated: presumably it is 8 a.m., and if so they do not fairly represent the mean temperature.

The plain fact is that it is the direction of the wind that matters. See Hann, p. 399. In Europe in winter the isotherms run North and South rather than East and West, and thus an east wind brings cold and a west wind warmth; hence the north side of an anticyclone and the south of a cyclone are warm, and the south side of an anticyclone and the north side of a cyclone are cold.

The second part of Dr. Hann's letter is practically equivalent to what I said in the *Quarterly Journal* of the R.Met.Soc. (Jan., 1899, Vol. **25**, No. 109, p. 32). He finds that "extreme winter months in Central Europe show no constant relation to the variations of pressure in Central Europe itself," but that in extreme months the pressure is abnormally high to the North and North-East. This is very similar to my statement that no connection between the height of the barometer and the winter temperature at the same place could be found, but that an unusually high barometer at Berlin was accompanied by unusual cold at Geneva.

With regard to the Asiatic anticyclone, I believe that in so far as it is genuine, and not due to the method of reduction to sea level, it is caused by the cold and is not the cause of the cold. Every place that is cut off from the source of heat supplied by a large mass of open water becomes cold in winter—the coast of Labrador, for example. The prevailing winds prevent it from receiving heat from the Atlantic as Europe does; it lies within the region of the N. Atlantic depression, and yet its January mean is below 0° F.

All my opponents who have discussed this question have quoted the winter of 1879-80, an undoubted case of the occurrence of severe cold with a high barometer. I have never asserted that such cases do not occur, but the continual quoting of a special instance suggests to me the remark about an exception proving a rule. The emphasis laid on this particular winter shows that examples are scarce, and proves my statement that the winter temperature is independent of the height of the barometer.

W. H. DINES.

I AM glad to see in your March issue Mr. Dines giving chapter and verse showing the fallacy of the so-called rule that cold weather accompanies winter anticyclones, as I have long doubted the truth of the rule. The particular example in England that I can especially remember is February, 1891, which to my mind goes a long way to disprove the rule.

Mr. Dines asks about the truth of the rule in North America. As far as my experience goes from a residence of eighteen years here (about 300 miles north of Toronto), the reverse of the rule is more often true. The weather of the last week in March and the first two days of April this year has been a very good example of a steady, low temperature, considerably below the average for the time of year, accompanied by an abnormally low barometer, and no "let up" to the cold till the pressure had reached a more normal height.

At the same time there are frequent occasions when the rule is justified by the facts. This can be explained by the spreading out, or branching out, of the permanent continental anticyclone that is centred in the winter months over the province of Alberta, giving rise to the popular description of Medicine Hat as "the place where the cold waves come from." In Dr. Willis L. Moore's "Descriptive Meteorology," pp. 223-227, is an account of the formation and progress of a typical cold wave over the United States. But the primary cause of the development of the cold wave from the Alberta anticyclone seems to me to be the passage of a depression across the Southern States and along the Atlantic Coast to the Gulf of St. Lawrence.

The temperature of a district is so largely the result of the winds prevailing for the time being that the gradients have far more to do with the production of cold weather than the existence of high or low pressure over the country. Of course an anticyclone is often, but not always, accompanied by clear weather, which increases radiation, giving cold nights but warmer days. In the still clear weather of anticyclonic conditions we notice here a considerable warming-up effect in the middle of the day throughout February and March.

Possibly the rule could be more correctly stated by saying that an anticyclone which follows close on the heels of a depression in winter brings cold weather, but that if the anti-cyclone is persistent the cold decreases.

A distinction, too, should be drawn between cold waves and the type of weather that gives a continued low temperature; a cold wave implies a sudden drop either to the freezing point or of 20 to 40 degrees from the temperature of the previous day. A *cold spell*, if I may invent a new term, begins gradually and continues for a week or even longer, with an average temperature far below the normal and a gradual rise to average conditions. I imagine that in Asia the conditions are not quite the same as in America; there is a larger land area, and the main mountain ranges do not run north and south. I should expect to find cold waves in the Argentine, as I

think the Andes will have the same general effect as the Rockies. Dr. Moore (Loc. cit., p. 226) states that cold waves cannot accompany an anticyclone that advances over this continent from the Pacific.

PAUL A. COBBOLD, F.R.Met.Soc.

Haileybury, Ontario, Canada, 7th April, 1911.

THE JOHANNESBURG OBSERVATORY.

MR. INNES is sanguine in thinking that by printing the out-station barometric results in inches, and the observatory hourly results in millimetres, he is attending to the interests of future investigators. How would it be if he were to "go one better" by either—

(1.) Printing the out-station results in mm.; or

(2.) Printing his hourly results in inches; or

(3.) Printing the hourly means for each month in both mm. and inches?

I am afraid that an astronomical observatory will always find it troublesome to do everything for meteorology that meteorologists would like to see done. Particularly is it practically impossible for the astronomical observatory to develop meteorology on the side of experimental science. That is a good reason why meteorologists—although they are willing to recognise the fine routine work done at such places as Greenwich—would prefer, on the whole, to see a permanent divorce between astronomy and meteorology, for meteorology will either have to run alone or take a back seat.

I was surprised at your remark as to the lack of suitability of the Transvaal Observatory for astronomical purposes. According to the speeches at the opening ceremony of this observatory—which was specially selected by astronomers—it only wanted good instruments to be a perfect astronomical observatory. It is one of the proofs that the best interests of astronomy and meteorology always clash, that if a meteorological observatory had been in contemplation a fine site was available on the French Rand. At least, so a Rand magnate told me.

CONTRIBUTOR.

[We have certainly been under the impression that the observatory at Johannesburg was primarily meteorological, and that any astronomical work done there was of a subordinate character. We agree with "Contributor" that purely meteorological observatories are best in the interest of meteorology; but on the other hand, we fear that if meteorologists clamour too insistently for a divorce, astronomers will in some instances joyfully abandon meteorological work altogether, and many fine and ancient records would be hopelessly broken. Perhaps Mr. Innes will put us right as to whether the Johannesburg Observatory is meteorological or astronomical.—Ed. *S.M.M.*].

WATERSHEDS.

In the article in the Magazine for November, 1910, it is stated that "it sometimes happens, though rarely, that a stream flows along a watershed and bifurcates, part flowing down one slope, part down another."

I should much like to enquire if any such case is authentically known, and if so to learn particulars about it. Could any of your readers supply such?

It sounds highly paradoxical to speak of a stream flowing along a watershed, which is a height of land, and it seems almost impossible to picture such a phenomenon.

The case of a stream splitting (outside a delta area) and dividing itself between two distinct river systems seems rare in the extremest degree. There is the case of the Orinoco, and there is, I believe, a case in Lapland, northward of the head of the Gulf of Bothnia; but anomalous cases like these surely need closer investigation than they have hitherto had, as in cases of lakes with two outfalls, and the paradox probably disappears when all the facts are accurately known.

INQUIRER.

[Apart from the classic example of the Casiquiare which unites the Orinoco and the Amazon system, there are several instances of rivers flowing across a watershed or, if the rather loose phrase be permitted, along one. The height of land which forms a watershed is sometimes rather shield-shaped than roof-shaped, and while, as in North America, the main drainage of the continent is shed to north and south like the Mackenzie and Mississippi, a line of drainage at right angles may traverse the main height of land, as in the case of the St. Lawrence. The Petterill, near Penrith, runs at one point so nearly along a watershed that water is drawn off through an opening in the bank, and eventually finds its way into a different valley. It must be acknowledged, however, that in strictness a watershed is a line, while a river-bed is an area which, though long in relation to its breadth, is not without that dimension. But while geometry admits no transitional forms between lines and surfaces, nature is full of compromises distressing to the systematic geographer.—Ed. *S.M.M.*]

EFFECTS OF A FLASH OF LIGHTNING.

On the evening of March 22nd, during a thunderstorm, a tall elm, 600 yards north-north-west of my home, was struck by lightning and a deep score made all down the stem. The road and opposite field were strewn with stringy fragments of wood and bark. My own servants, in a house not 200 yards from the tree, agree that the noise was such as they never heard. A woman living 400 yards from the tree, who was standing in her porch when the flash came, with a kettle in her hand, said she felt both her hands burnt. Our school-

master, who was about 100 yards away, stated that the flash had the appearance of a *large globe* about 15 or 18 ins. in diameter. His eyes were badly affected, and he had difficulty in performing his duties on the following day. H. A. BOYS.

North Cadbury Rectory, Somerset, March 24th, 1911.

"SHEET" OR "SUMMER LIGHTNING"? OR NEITHER?

THIS evening, at 7 p.m., there were three flashes at intervals of two or three minutes, in what were probably alto-stratus clouds, barely dense enough to obscure the stars. The clouds at the time were generally outspread, but appeared to be evaporating, and at 8 it was very clear. The flashes were localized between 15° and 20° above the horizon, centred from E.S.E. to N.E., successively, each, perhaps, extending horizontally over 30°. The reddish light was faint and diffuse, like exceedingly distant sheet lightning. Yet it could hardly have been that, for such would have affected the sky much nearer the horizon. On the other hand the diffuse glow contrasted with the usual "forked" character of "summer" lightning. The appearance suggested rather a single vacuum tube discharge. Cyclonic clouds were noted at 11 a.m., but the barometer continued rising until 2 a.m., 21st, slowly after 10 p.m. Is there anything exceptional in the phenomenon and what is its probable explanation.

J. EDMUND CLARK.

Purley, Surrey, 20th February, 1911.

BLACK HAZE AND LANCASHIRE SMOKE.

IN the article on "The Brocken Spectre on Snowdon," p. 227 of the January number, I read:—"easterly winds prevailed, and on several days there was much "black haze," so much that the scenery was obscured, and no sun or sky was to be seen."

I do not know whether all your readers would see the connection between the "easterly winds" and the "black haze" in the neighbourhood of Snowdon, or realise that the black haze comes from Lancashire chimneys In dry weather it not only obscures North Wales, but is noticeable even in Ireland. On July 12th, 1910, after a few days of dry weather with east wind, I saw on the coast of Donegal, 200 miles from Lancashire, the sun set into a bank of black (i.e., smoky) haze much as I have seen it at New Brighton under similar conditions. Naturally in Donegal it was less dense, the sun becoming invisible about 10 minutes before setting, whereas at New Brighton I have seen it vanish into the haze an hour before setting. Of course, I am referring to *cloudless* weather in both cases.

G. DAWSON LEWIS.

29, Devonshire Road, West Kirby, Birkenhead, 7th February, 1911.

OUR ARCTIC SPRING.

It would be correct, perhaps, to say that in the British Islands we normally get a damp Atlantic winter (November to January), followed by an Arctic spring (February to April), and the kind of weather we are now enduring, and which has gradually intensified since the beginning of March, is, after all, perfectly normal and typical of the season.

Why it is that in the southern counties of England the snowflakes will so often come down in April rather than in January, with a deliberateness that cannot be entirely explained by pressure distribution and wind direction, is very puzzling.

The conventional meaning of the word "spring-like," which is so different to the true meaning we have, of course, borrowed from the south, chiefly, perhaps, through the influence of one or two notably unpatriotic English poets who seemed in their day to find the genial atmosphere of a Grecian or Italian spring more stimulating to their imagination than the sight of tender foliage and scented herbs bravely endeavouring to open amid the howling wind, frowning sky, and belching snow-squalls of their northern home.

This evening (April 7th) at sunset the easterly wind in London was driving a very wild pattern of cirrus-sky—horses' tails, fish-bones, ferns, chess-boards, billiard-cues, and what not—which looked particularly ominous; for according to the happy anticipations of a versifier in an evening paper we shall be snowballing one another at Hyde Park Corner in May (he even speaks of the sound of "steel" on the Serpentine during the long days of the merry month), seemingly because Greenland's mountains will then be ready to send us down a series of north-westerly puffs more icy than usual, causing our fires to blaze at a time when our gardens will be trying to become paradises of lilac and hawthorn flower.

L. C. W. BONACINA.

April 7th, 1911.

The following temperatures here for this week may interest you. The max. are entered to preceding day.

		Max.	Min.	Grass.	Rainfall. All of snow on 4th & 5th.
		°	°	°	In.
April	1 ...	50·4	38·9	33.7	·06
,,	2 ...	47·1	41·8	38·7	·04
,,	3 ...	44·1	40·9	39·6	—
,,	4 ...	44·1	32·0	28·4	·04
,,	5 ...	34·6	30·3	30·0	·03
,,	6 ...	38·1	27·3	24·1	—
,,	7 ...	42·2	31·2	27·9	—
,,	8 ...	—	29·0	19·7	—

I have taken observations here for 26 years. This is the first April I have found any temperature in the screen fail to reach 43°·0 F.

I have not recorded any minimum temperature below 28°·0 F. in screen in any previous April. The sky was clear in the early morning of the 8th, with very cold, still air, and the grass thermometer fell to the unusual point 19°·7 F. The wind here during the week has been strong, but not up to gale force, as in many places, snow has fallen on five days, but only two days enough to measure.

JOHN DOVER.

Totland Bay, Isle of Wight, 8th April, 1911.

THE maximum temperature to-day (April 5th) in the screen (Kew certified thermometer) was 34°·3. This will probably prove to be the lowest maximum ever recorded in the south of England for this day. The Greenwich tables from 1841 show that 41°·4 in 1864 has hitherto been the lowest maximum for April 5th. In fact, there is only one record of an April maximum below 40°, viz., 36°·3 on April 19th, 1849, on which day a very heavy fall of snow took place in Kent and adjoining counties. The maximum yesterday (April 6th) was only 36°·7.

H. K. G. ROGERS.

"Glenart," Weybridge, 7th April, 1911.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April 19th, at the Institution of Civil Engineers, Great George Street, Westminster, Dr. H. N. Dickson, President, in the chair.

Mr. W. Marriott read a paper on "Variations in the English Climate during the Thirty Years, 1881-1910." He stated that the Royal Meteorological Society in 1874 commenced the organisation of a series of "Second Order Stations," at which observations of pressure, temperature, humidity, rainfall and wind are made twice a day, viz., at 9 a.m. and 9 p.m. In addition to these, another class of stations, termed "Climatological," at which observations are made once a day, at 9 a.m., was organised in 1880. The monthly results from all these stations have been regularly published in the "Meteorological Record." The author has taken the general monthly means of all these results as representing the means for England and Wales, and these general means were depicted in the form of a series of diagrams, in which the variations of the various elements for each month were shown in red when above the average, and in blue when below the average for the 30 years, 1881-1910. The results were also exhibited to the meeting by means of lantern slides, The warmest months were August 1899, July 1900, and July 1901; while the coldest months were February 1895, January 1881, and December 1890. During the last 14 years the temperature in October was above the average with only one exception, viz., 1905. The years with the

highest mean temperature were 1898, 1893, and 1899, and the years with the lowest mean temperature were 1892, 1888, and 1887. The month with the highest mean pressure was February, 1891, and that with the lowest pressure was March, 1909. On the average April is the month with the least rainfall, and October the month with the heaviest rainfall; while June has the least number of days of rain. The wettest months during the 30 years were October, 1903, and October, 1891, and the driest months were February, 1891, and April, 1893. The years with the heaviest rainfall were 1903 and 1891, and the years with the least rainfall were 1887 and 1893. The wind diagrams showed that the prevailing winds were from the South-west and West, but that in April, May, and June, North-easterly winds were more pronounced than in the other months of the year.

Mr. W. W. Bryant said that it occurred to him to take a longer period, the 70 years of Greenwich observations, and investigate whether it would be possible to trace any secular change during it. He had come to the conclusion that it would be unjustifiable to draw any such deduction from the results.

Mr. W. H. Dines was surprised to see from the diagrams that recent years had been, on the whole, warm. The striking absence of any severe cold since February, 1895, was well known, and it seemed likely that there must soon be a return to average conditions in the winter, but he thought that there was ample evidence to show that the winter climate of Europe was slowly but surely becoming milder.

Colonel H. E. Rawson said that he was specially interested in the diagram giving the excess of S.W. winds over N.E., showing the correlation with the excessive rainfall in August. August was, as a rule, a wet month, and April dry, and when both were wet they generally determined the character of the rainfall for the year.

Mr. E. Gold said that September was a peculiar month, not only on the surface but also in the upper air, and no doubt the different effects were closely related to each other.

Captain W. F. Caborne, Mr. C. Harding, Mr. J. E. Clark, and the President also took part in the discussion, and Mr. Marriott replied.

Two papers by Captain C. H. Ley were, in his absence, read by the Secretary, viz., (1) "The Value of the Two-Theodolite Method for determining Vertical Air-Motion," and (2) "An Automatic Valve for Pilot Balloons."

The following gentlemen were elected Fellows of the Society:—Mr. G. R. Crompton, Mr. J. D. Fettes, Assoc.M.Inst.C.E., Mr. F. P. Khan, M.A., Assoc.M.Inst.C.E., Mr. P. S. Leggatt, and Mr. G. G. V. Millard.

REVIEWS.

What Will the Weather be? The Amateur Forecaster's Vade Mecum. H. G. Busk, F.R.Met.Soc. Cambridge: W. Heffer & Sons, Ltd. 1911. Size 7½ × 6. Pp. 28. Plates. Price 6d. net.

An introduction by Mr. H. B. Stone explains Mr. Busk's purpose and methods. The purpose is stated thus:—

"The reader is supposed to be of average observation and should possess a reliable barometer (a self-recording instrument is recommended). If he observes whether this is rising or falling and knows the direction of the wind, by consulting the tables at the end of this volume he can foretell with reasonable accuracy the weather conditions for the ensuing twenty-four hours."

The weather is viewed as being either cyclonic or anti-cyclonic, and the conditions for a number of combinations of rising and falling barometer with wind from given directions is given in the Table, which forms the bulk of the pamphlet, with the associated weather conditions in winter and summer respectively. Other configurations of the isobars are not considered, nor is the case of a cyclone moving in any other than a generally easterly direction. No doubt the rules given will very often prove satisfactory, but the study of the daily weather maps should be recommened as a corrective.

On the Bai-u, or Rainy Season in Japan, by T. Okada. Bulletin of the Central Meteorological Observatory of Japan. No. 5. Tokio, 1910. Size 12 × 9. Pp. 82. 9 Plates.

This memoir contains the results of the most recent research into the causes underlying the phenomena of the "Bai-u," or early summer rains of the Japanese archipelago and the adjacent mainland. The extension of the Imperial Japanese meteorological service to Korea and Eastern China provides essential information which has been until the last few years entirely wanting, and a methodical reduction of the whole of the available observations throws much light on a problem which has hitherto been but imperfectly explained. The features of the Bai-u season, which extends from mid-June to mid-July, are heavy rainfall, excessive cloudiness and humidity, and a very slight wind movement, the whole resulting in an extremely oppressive and unpleasant type of weather, but one nevertheless most beneficial from an agricultural point of view. The rainfall is heaviest in the southern islands, especially in Formosa, and falls off rapidly to the north, the distribution showing no apparent relation to the contour of the land or to the prevailing wind. The relative humidity and amount of cloud on the other hand are clearly dependent on the monsoon wind. The hypothesis put forward is that the rainfall at this season is the result of cyclonic disturbances of convectional origin due to the pronouncedly irregular heating of the moisture laden air. It is shown that the depressions develop most freely when

the barometric gradient is slight and the monsoon consequently fitful and wanting in strength. These conditions are coincident with the season at which the sun is vertical over the Valley of the Yangtse and Formosa, and in a less pronounced degree over Japan proper. The tabulated statistics of depressions give evidence of a strong tendency for cyclones to form in these neighbourhoods and to travel slowly over the archipelago. With the return of the Pacific anticyclonic centre from higher to lower latitudes, which occurs in the middle of July, the gradients become steeper, and the possibilities for irregular heating being diminished, the rains cease abruptly until, after a dry and hot interval, the season merges into the true monsoon maximum in the early autumn.

One of the most interesting chapters of the bulletin deals with the "Karatsuyu," or failure of the rains. The two most prominent failures of recent years were those of 1883 and 1893, years famous for memorable spring droughts in Europe. The incidence of the Karatsuyu shows a certain degree of correspondence with Wolfe's sun-spot periods, and this and other considerations lead the author to the reasonable conclusion that the dominating factors are certainly not of a local nature. This branch of the subject is, however, one which demands more exhaustive study, and we shall look forward with more than ordinary interest to any future developments of the enquiry in this direction. C. S.

METEOROLOGICAL NEWS AND NOTES.

THE TERM "ANTICYCLONE" has been the subject of an interesting correspondence in *The Times*. The name was said to be ugly and in many ways inappropriate, and Mr. Pearsall Smith suggested that an anticyclone should be called a *Halcyon* with reference to the fabled condition of weather at Christmas-tide, when the kingfisher or halcyon hatched out its brood floating on the sea. Other writers, some of them with a somewhat vague knowledge of the conditions to which the word "anticyclonic" is applied, suggested as alternatives (they certainly could not be called definitions) *calm*, *air-calm*, *wind-wyr*, *plenum*, and it was pointed out that on meteorological maps in this country and in descriptive writing in America the word *high* was already in familiar use. The result of the correspondence leaves us thankful that Sir Francis Galton hit on such a good word as *anticyclone*, which indeed would not have come into general use and survived for nearly half a century, had it not possessed merits counterbalancing its uncouthness, which is conspicuous only to those unfamiliar with the literature of meteorology.

ALL WIRELESS WEATHER TELEGRAMS from Atlantic steamers will, it is announced in the German papers, be transmitted henceforth, by agreement of the British and German governments, to the Meteorological Office, the *Deutsche Seewarte* at Hamburg, and the Central Meteorological Station at Aachen, for use in weather forecasts.

RAINFALL TABLE FOR APRIL, 1911.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875—1909. in.	1911 in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·74	1·80
Tenterden	*Kent*	51 4	*0 41	190	1·77	1·89
Arundel (Patching)	*Sussex*	50 51	0 27	130	1·82	1·84
Southampton (Cadland)	*Hampshire*	50 50	1 22	52	1·98	1·48
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·67	1·10
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	1·78	·70
Shoeburyness	*Essex*	51 31	*0 48	13	1·25	1·25
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·62	1·25
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·55	·81
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·34	3·06
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·39	2·04
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·09	·94
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·20	1·78
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	1·96	·83
Boston	*Lincolnshire*	52 58	0 1	25	1·57	·68
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·62	·63
Macclesfield	*Cheshire*	53 15	2 7	501	2·02	2·81
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	1·84	2·54
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	1·85	1·19
Arncliffe Vicarage	,, ,,	54 8	2 6	732	3·73	4·63
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·69	1·40
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·84	1·59
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	6·91	12·65
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·50	3·05
Haverfordwest	*Pembroke*	51 48	4 58	95	2·82	2·76
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·48	2·30
Llandudno	*Carnarvon*	53 20	3 50	72	1·79	1·47
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·50	4·61
Marchmont House	*Berwick*	55 44	2 24	498	2·28	1·74
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	2·81	4·65
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	1·86	2·82
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	3·69	7·28
Mull (Quinish)	,,	56 34	6 13	35	2·98	4·56
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	1·93	·78
Braemar	*Aberdeen*	57 0	3 24	1114	2·30	2·40
Aberdeen (Cranford)	,,	57 8	2 7	120	2·23	1·25
Cawdor	*Nairn*	57 31	3 57	250	1·62	1·69
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·22	3·01
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	4·70	8·14
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·02	2·50
Wick	*Caithness*	58 26	3 6	77	1·89	1·76
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·46	3·57
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·68	2·56
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·54	2·38
Miltown Malbay	*Clare*	52 52	9 26	400	2·69	2·52
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·37	2·23
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·54	3·14
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·03	1·41
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·37	2·29
Ballinasloe	*Galway*	53 20	8 15	160	2·37	2·19
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	3·13	3·71
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	2·52	2·80
Seaforde	*Down*	54 19	5 50	180	2·76	2·44
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·08	1·69
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·50	2·66

RAINFALL TABLE FOR APRIL, 1911—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1911. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
+ ·06	103	·57	1	11	6·93	6·39	— ·54	92	25·11	Camden Square
+ ·12	107	·71	1	13	7·76	7·03	— ·73	91	27·64	Tenterden
+ ·02	101	·56	1	12	8·53	7·03	—1·50	82	30·48	Patching
— ·50	75	·35	26	11	9·18	6·63	—2·55	72	31·87	Cadland
— ·57	66	·32	28	12	6·52	4·58	—1·94	70	24·58	Oxford
—1·08	39	·32	26	12	7·05	4·47	—2·58	63	25·17	Croyland Abbey
·00	100	·39	1	13	4·96	4·38	— ·58	88	19·28	Shoeburyness
— ·37	77	·28	28	10	6·62	6·37	— ·25	96	25·40	Westley
— ·74	52	·23	28	11	6·06	6·08	+ ·02	100	23·73	Geldeston
+ ·72	131	·66	1	13	11·62	8·59	—3·03	74	38·27	Polapit Tamar
— ·35	85	·51	29	12	10·13	7·64	—2·49	75	33·54	Rousdon
—1·15	45	·21	28	14	8·55	5·95	—2·60	70	29·81	Stroud
— ·42	81	·34	26	13	9·07	6·65	—2·42	73	32·41	Wolstaston
—1·13	42	·25	26	11	8·08	4·99	—3·09	62	28·98	Coventry
— ·89	43	·22	28	10	6·11	5·16	— ·95	84	23·35	Boston
— ·99	39	·16	28	13	6·66	3·43	—3·23	52	24·46	Hodsock Priory
+ ·79	139	·70	27	14	9·48	8·84	— ·64	93	34·73	Macclesfield
+ ·70	138	·62	29	11	8·57	7·35	—1·22	86	32·70	Southport
— ·66	64	·25	20	13	7·37	5·73	—1·64	78	26·87	Ribston Hall
+ ·90	124	·64	24	18	20·04	25·76	+5·72	128	61·49	Arncliffe
— ·29	83	·27	28	16	7·01	6·26	— ·75	89	26·42	Hull
— ·25	86	·44	28	19	7·47	6·24	—1·23	84	27·94	Newcastle
+5·74	182	2·16	25	17	41·94	50·54	+8·60	121	129·48	Seathwaite
+ ·55	122	·83	20	12	12·11	11·91	— ·20	98	42·28	Cardiff
— ·06	98	·53	26	12	14·09	12·68	—1·41	90	46·81	Haverfordwest
— ·18	93	·50	25	14	12·52	10·93	—1·59	87	45·46	Gogerddan
— ·32	82	·39	19	12	8·54	5·85	—2·69	68	30·36	Llandudno
+2·11	184	·71	25	16	13·35	13·42	+ ·07	101	43·47	Cargen
— ·54	76	·48	25	17	9·47	7·57	—1·90	80	33·76	Marchmont
+1·84	165	·70	19	16	15·08	15·69	+ ·61	104	49·77	Girvan
+ ·96	152	·35	27	15	10·70	12·79	+2·09	120	35·97	Glasgow
+3·59	197	1·26	17	17	22·15	30·04	+7·89	136	68·67	Inveraray
+1·58	153	1·02	17	16	17·26	18·55	+1·29	107	56·57	Quinish
—1·15	40	·20	24	13	7·91	3·64	—4·27	46	28·64	Dundee
+ ·10	104	...	...	...	10·64	9·64	—1·00	91	34·93	Braemar
— ·98	56	·24	25	16	9·60	6·03	—3·57	63	32·73	Aberdeen
+ ·07	104	·30	17	11	8·31	7·27	—1·04	88	29·33	Cawdor
+ ·79	136	·43	21	20	15·79	15·97	+ ·18	101	44·53	Fort Augustus
+3·44	173	1·76	21	18	28·78	34·31	+5·53	119	83·61	Bendamph
+ ·48	124	·39	16	15	9·99	9·52	— ·47	95	31·90	Dunrobin Castle
— ·13	93	·35	17	24	8·84	8·17	— ·67	92	29·88	Wick
+ ·11	103	·67	17	15	18·90	12·08	—6·82	64	54·81	Killarney
— ·12	96	·52	26	16	12·28	9·17	—3·11	75	39·57	Waterford
— ·16	94	·38	26	15	12·30	9·22	—3·08	75	39·43	Castle Lough
— ·17	94	·60	26	17	13·02	10·14	—2·88	78	45·11	Miltown Malbay
— ·14	94	·64	18	11	10·59	6·87	—3·72	65	34·99	Courtown Ho.
+ ·60	124	·55	18	17	10·83	9·52	—1·31	88	35·92	Abbey Leix
— ·62	69	·80	18	15	8·08	4·70	—3·38	58	27·68	Dublin
— ·08	97	·38	20	16	10·78	10·02	— ·76	93	36·15	Mullingar
— ·18	92	·50	20	15	10·88	10·10	— ·78	93	36·64	Ballinasloe
+ ·58	119	·55	21	17	17·04	13·63	—3·41	80	52·87	Enniscoe
+ ·28	111	·42	27	14	12·92	11·41	—1·51	88	42·71	Markree
— ·32	88	·37	18	16	11·82	8·96	—2·86	76	38·91	Seaforde
— ·39	81	·37	27	15	10·56	8·53	—2·03	81	37·56	Dundarave
+ ·16	106	·40	19	14	11·62	11·16	— ·46	96	39·38	Omagh

SUPPLEMENTARY RAINFALL, APRIL, 1911.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	2·37	XI.	Lligwy	2·94
,,	Ramsgate	·97	,,	Douglas	2·97
,,	Hailsham	1·89	XII.	Stoneykirk, Ardwell House	2·87
,,	Totland Bay, Aston House.	1·45	,,	Dalry, The Old Garroch	6·11
,,	Stockbridge, Ashley	1·82	,,	Langholm, Drove Road	5·17
,,	Grayshott	2·04	,,	Beattock, Kinnelhead	6·70
,,	Reading, Calcot Place	1·34	XIII.	St Mary's Loch, Cramilt Ldge	4·86
III.	Harrow Weald, Hill House.	1·70	,,	North Berwick Reservoir	1·33
,,	Pitsford, Sedgebrook	·86	,,	Edinburgh, Royal Observty.	1·00
,,	Somersham Vicarage	·78	XIV.	Maybole, Knockdon Farm..	3·85
,,	Woburn, Milton Bryant	1·21	XV.	Campbeltown, Witchburn...	3·06
IV.	Colchester, Lexden	·85	,,	Glenreasdell Mains	3·90
,,	Newport	·95	,,	Holy Loch, Ardnadam	6·72
,,	Rendlesham	1·28	,,	Ballachulish House	8·79
,,	Swaffham	·93	,,	Islay, Eallabus	4·00
,,	Blakeney	·84	XVI.	Dollar Academy	2·24
V.	Bishops Cannings	1·18	,,	Balquhidder, Stronvar	6·19
,,	Winterbourne Steepleton	2·26	,,	Coupar Angus	·80
,,	Ashburton, Druid House ..	2·20	,,	Glenlyon, Meggernie Castle.	5·69
,,	Okehampton, Oaklands	3·37	,,	Blair Atholl	2·42
,,	Cullompton	2·41	,,	Montrose, Sunnyside Asylum	1·50
,,	Hartland Abbey	1·81	XVII.	Alford, Lynturk Manse	1·60
,,	Lynmouth, Rock House	2·52	,,	Fyvie Castle	1·34
,,	Probus, Lamellyn	1·48	,,	Keith Station	2·08
,,	North Cadbury Rectory ..	2·27	XVIII.	Glenquoich, Loan	17·50
VI.	Clifton, Pembroke Road	2·03	,,	Skye, Dunvegan	6·91
,,	Ross, The Graig	·84	,,	N. Uist, Lochmaddy	2·19
,,	Shifnal, Hatton Grange	·75	,,	Alvey Manse	1·91
,,	Blockley, Upton Wold	·92	,,	Loch Ness, Drumnadrochit.	2·15
,,	Droitwich	·88	,,	Glencarron Lodge	7·04
VII.	Market Overton	·94	XIX.	Invershin	2·53
,,	Market Rasen	1·34	,,	Loch Stack, Ardchullin	5·41
,,	Bawtry, Hesley Hall	·61	,,	Melvich	2·66
,,	Derby, Midland Railway	1·38	XX.	Skibbereen Rectory	3·58
,,	Buxton	3·51	,,	Dunmanway, The Rectory..	5·03
VIII.	Nantwich, Dorfold Hall	·88	,,	Cork	2·13
,,	Chatburn, Middlewood	2·71	,,	Mitchelstown Castle	3·10
,,	Cartmel, Flookburgh	3·35	,,	Darrynane Abbey	3·61
IX.	Langsett Moor, Up. Midhope	2·44	,,	Glenam [Clonmel]	3·59
,,	Scarborough, Scalby	·96	,,	Newmarket-on-Fergus, Fenloe	2·17
,,	Ingleby Greenhow	1·18	XXI.	Laragh, Glendalough	5·28
,,	Mickleton	1·66	,,	Balbriggan, Ardgillan	1·53
X.	Bardon Mill, Beltingham	...	,,	Moynalty, Westland	2·94
,,	Ilderton, Lilburn Cottage...	1·38	XXII.	Cong, The Glebe	2·65
,,	Keswick, The Bank	4·46	,,	Westport, St. Helens	2·99
XI.	Llanfrechfa Grange	3·73	,,	Achill Island, Dugort	4·91
,,	Treherbert, Tyn-y-waun	6·06	,,	Mohill	2·30
,,	Carmarthen, The Friary	3·07	XXIII.	Enniskillen, Portora	2·63
,,	Castle Malgwyn [Llechryd].	2·97	,,	Dartrey [Cootehill]	3·45
,,	Plynlimon	7·00	,,	Warrenpoint, Manor House	2·50
,,	New Radnor, Ednol	2·24	,,	Banbridge, Milltown	1·75
,,	Rhayader, Tyrmynydd	2·94	,,	Belfast, Cane Hill Road	3·20
,,	Lake Vyrnwy	3·25	,,	Glenarm Castle	2·91
,,	Llangyhanfal, Plâs Draw....	·58	,,	Londonderry, Creggan. Res.	2·24
,,	Dolgelly, Bryntirion	3·67	,,	Killybegs	3·86
,,	Bettws-y-Coed, Tyn-y-bryn	2·96	,,	Horn Head	2·17

METEOROLOGICAL NOTES ON APRIL, 1911.

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; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Unusual cold prevailed throughout the first ten days with frequent slight S falls. Beautiful dry, sunny weather followed, with an increase in temp., and there were 15 days' absolute drought from 10th to 24th. The duration of sunshine amounted to 164·0* hours, with only two sunless days. Duration of R 35·1 hours. Evaporation 1·77 in. Shade max. 67°·5 on 22nd; min. 25°·5 on 6th, with two exceptions the lowest temp. recorded in April in 54 years. The shade max. on 5th was 38°·1, or 2°·9 below the previous lowest recorded in April, and that on 6th was 41°·0. F 5, f 10.

TENTERDEN.—Very cold at first but a fine Easter. The last six days were showery after a dry fortnight. Duration of sunshine 187·5† hours. Shade max. 63°·5 on 24th; min. 26°·0 on 6th. F 7, f 12.

TOTLAND BAY.—Duration of sunshine 176·8* hours. Shade max. 56·8 on 26th; min. 27°·3 on 6th, the lowest on any April day in 26 years. F 5, f 10.

PITSFORD.—Mean temp. 46°·3. Shade max. 67°·6 on 22nd; min. 25°·4 on 12th. F 6.

NORTH CADBURY.—Temp. much below average, and wind and cloud well above normal. The chief feature of the month was the abnormal cold from 3rd to 7th. A freezing N.E. wind, almost a gale for 3 days, with driving S showers made this period quite the worst of the winter. Shade max. 65°·0 on 14th and 17th; min. 24°·5 on 8th. F 5, f 14.

ROSS.—Shade max. 60°·8 on 30th; min. 27°·0 on 12th.

HODSOCK PRIORY.—Shade max. 63°·8 on 15th; min. 27°·7 on 6th. F 6, f 14.

SOUTHPORT.—Duration of sunshine 147·9* hours, and of R 45·8 hours. Mean temp. 45°·8. Shade max. 59°·6 on 21st; min. 28°·3 on 6th. F 4, f 13.

HULL.—Winterly with S at the beginning. Some fine periods after, but cold with high and squally winds at times; then dull and mild to the end. Shade max. 69°·0 on 21st; min. 29°·0 on 7th. F 5, f 10.

HAVERFORDWEST.—Dry, stormy and cold. Vegetation very backward. Duration of sunshine 168·5* hours. Shade max. 61°·7 on 22nd.

LLANDUDNO.—Shade max. 59°·0 on 22nd; min. 33°·2 on 5th. F 0.

CARGEN.—The chief characteristics were the absence of sun and the continuance of strong winds. Sunshine nearly 100 hours below the average. Much damage done to expanding foliage, buds and fruit blossom. Shade max. 61°·3 on 13th; min. 26°·3 on 6th. F 3.

EDINBURGH.—Shade max. 60°·9 on 13th; min. 30°·6 on 3rd. F 4, f 8.

COUPAR ANGUS.—The fourth successive month with deficient R, and also the fourth in succession with high temp. There was an absence of severe frost and also of sunshine. Shade max. 65°·0 on 13th; min. 25°·0 on 8th.

FORT AUGUSTUS.—Shade max. 59°·5 on 11th; min. 24°·1 on 6th. F 3.

SKIBBEREEN.—Cold, dry and harsh, with E. winds in the first fortnight. Wet, with S.E. winds in the third week. Shade max. 57°·0 on 11th, 12th and 25th; min. 27°·0 on 10th. F 7.

DUBLIN.—The first twelve days were cold with steady N.E. winds and showers of S and H on 4th and 5th. Fresh to strong W. and S.W. winds prevailed from 17th. R fell heavily on 18th and in frequent showers subsequently to 28th. Mean temp. 48°·0. Shade max. 63°·5 on 22nd; min. 31°·8 on 4th. F 1, f 3.

MARKREE—Dry with cold E. winds and severe night frosts from 2nd to 14th. The remainder was showery and mild and with but little sunshine. Shade max. 59°·2 on 22nd; min. 21°·5 on 6th. F 8, f 10.

WARRENPOINT.—Shade max. 61°0 on 22nd and 23rd; min. 33°·0 on 4th. F 0, f 3.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, November, 1910.

STATIONS (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	53·3	1	24·0	17	45·4	32·3	36·4	90	85·5	19·7	3·19	16	7·4
Malta	80·2	6	50·0	20	72·1	58·3	53·9	69	142·2	...	1·79	13	6·1
Lagos	90·0	18	71·0	5	87·3	74·4	74·3	73	155·0	72·2	1·86	3	...
Cape Town	91·8	14	47·1	7	71·9	54·5	52·6	68	...	...	1·47	8	4·4
Durban, Natal ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Johannesburg	79·0	16	41·4	5	71·1	50·7	48·1	68	151·1	41·1	·97	9	4·3
Mauritius	84·7	30	61·5	14	81·7	68·0	63·0	69	159·4	55·2	1·73	11	5·9
Calcutta...	86·0	14	52·1	30	82·3	63·0	62·5	71	...	46·6	·00	0	1·4
Bombay...	88·2	2	67·3	27	85·5	71·8	65·9	68	134·9	58·3	·14	2	1·8
Madras	89·7	13	62·5	27	83·1	71·3	69·3	81	143·4	59·6	15·78	11	4·8
Kodaikanal	70·3	29	44·6	19	61·1	49·9	49·2	83	137·5	33·1	11·41	22	6·4
Colombo, Ceylon ...	87·1	22	68·4	28	84·9	73·4	72·2	80	160·0	63·9	5·71	18	6·0
Hongkong	83·4	2	52·9	19	73·3	64·7	59·4	70	134·8	...	2·54	6	6·4
Melbourne	90·5	17	39·4	1	73·4	53·3	49·2	60	155·8	36·2	2·33	12	5·6
Adelaide	93·7	16	46·3	7	76·7	55·8	48·7	54	162·3	38·2	1·32	9	4·9
Coolgardie	101·2	14	45·0	5, 6	83·5	54·1	37·5	50	163·0	41·6	·58	3	2·6
Perth	96·6	25	45·0	6	74·4	55·1	42·3	64	160·9	35·5	·67	7	3·6
Sydney	86·4	24	49·9	3	73·4	58·1	50·2	54	150·0	39·0	·19	12	4·5
Wellington	76·0	22	42·2	17	64·8	53·0	51·3	76	125·0	34·0	3·91	9	5·1
Auckland	75·5	23	49·0	4, 17	67·7	55·9	55·7	81	147·0	45·0	3·71	14	6·9
Jamaica, Kingston ..	90·9	6	69·1	5	86·9	71·0	69·9	79	...	...	1·43	7	...
Grenada	86·0	5	71·0	30	83·8	74·6	72·1	79	141·0	...	9·44	26	4·5
Toronto	56·6	1	25·6	5	48·8	31·2	...	82	65·8	20·2	2·52	18	8·0
Fredericton	54·6	2	16·0	22	39·6	28·3	...	89	...	...	2·29	9	7·5
St. John, N.B. ...	51·5	2	25·5	21	42·0	33·2	...	...	...	...	2·04	9	7·2
Victoria, B.C.	54·8	1	33·3	26	48·2	39·8	...	89	...	...	7·71	20	8·0
Dawson	23·0	1	—25·0	29	7·3	—4·1	...	...	...	...	1·46	10	7·3

MALTA.—Mean temp. of air 63°·8. Average bright sunshine 5·4 hours per day.

Johannesburg.—Bright sunshine 256·2 hours.

Mauritius.—Mean temp. of air 1°·1, of dew point 1°·3, and R ·15 in., below averages. Mean hourly velocity of wind 12·4 miles, or 1·7 above average.

KODAIKANAL.—Bright sunshine 118 hours.

COLOMBO.—Mean temp. of air 76°·5, or 3°·2 below, of dew point 0°·1 below, and R 6·05 in. below, averages. Mean hourly velocity of wind 7·6 miles. TSS on 3 days.

HONGKONG.—Mean temp. of air 68°·7. Bright sunshine 156·4, or 33 hours below the average. Mean hourly velocity of wind 14·2 miles.

Melbourne.—Mean temp. of air 2°·1, and R ·12 in., above, averages.

Coolgardie.—Mean temp. of air 2°·0 below, and R ·01 in., above averages.

Perth.—Mean temp. of air 0°·6 below, and R ·04 in. above, averages.

Sydney.—Mean temp. of air 1°·1, and R 2·74 in., below averages.

Wellington.—Mean temp. of air 58°·9, or 2°·1 above the average Bright sunshine 263·8 hours.

Auckland.—An average month. Mean temp. and Rainfall very near the mean for the past 44 years.

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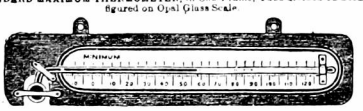

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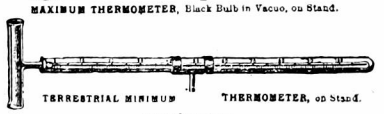

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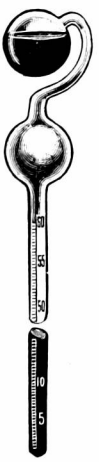

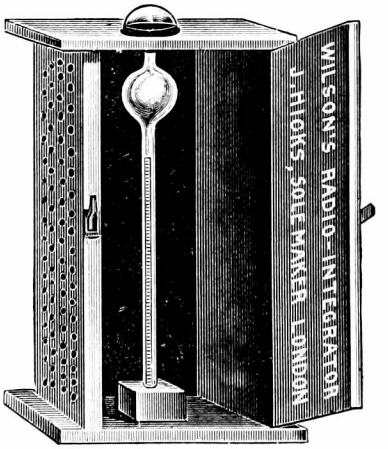

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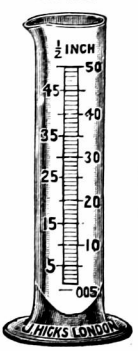

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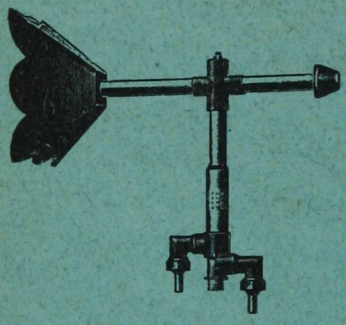

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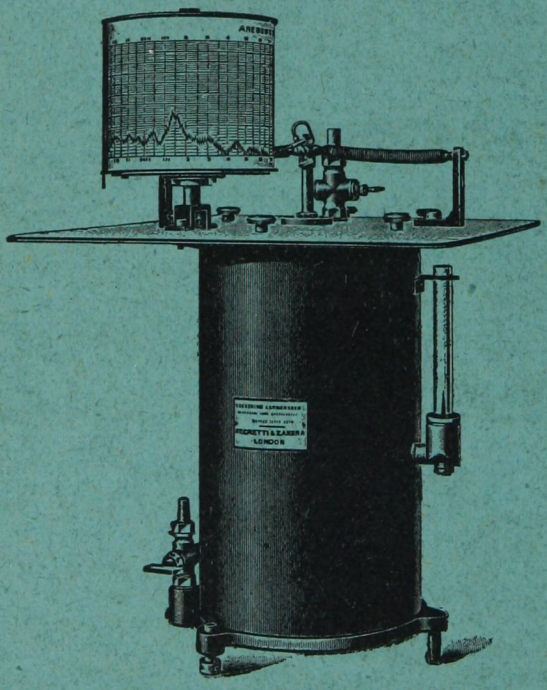

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