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THE MAY FROST OF 1894.

WE revert to this subject not only because of its importance, and because we wish to insert two paragraphs which were crowded out last month, but because Mr. Harold Smith quite rightly criticises our statement in Section (4), p. 72. We say "quite rightly," because he quotes facts in support of his views; and it is only by criticism that truth can be elicited. We may have been wrong in assuming that the cause was identical throughout the country, but we think that the data in our last prove that Mr. Harold Smith's explanation will not do generally. He speaks of a "very strong, cold, and very dry N.E. wind," but the Rev. H. A. Boys, who got up at 3.20 a.m. on purpose to see what was going on, says, on page 67, "the air was wonderfully bright, keen and still." We think that Mr. Smith will be interested in Mr. Slade's report from Beckford; and for the present leave the subject, with the suggestion that it is probably not too late even now to ascertain for the vicinity of Kenley the relative damage at various heights above sea level, and at places exposed to, and sheltered from, N.E. winds. If Mr. Smith, or the "Croydon Microscopical and Natural History Club," will undertake this, we shall be happy to place a page or two at their disposal to report the result.

To the Editor of the Meteorological Magazine.

SIR,—In your "Comment No. 4" you attribute the damage done by the May Frosts to the radiation of the heat into space, which was facilitated by a clear sky and is proved by the grass temperatures. Here the values were:—

	Minimum Stevenson stand.	Grass.
May 21st, 1894	30°	27°
„ 17th, 1891	30°	26°
„ 12th, 1888	31°	24°

In 1894, with a difference of 3° between the stand thermometer and grass, an unprecedented damage was done; in the two other years only slight damage. 1888 and 1891, had, however, both been preceded by cold Aprils, and the differences were 4° and 7°.

On May 1st, 1892, min. on stand 31°, on grass 24°
 „ „ 7th, „ „ „ „ 26°, „ „ 18°

April, 1892, was warm—the differences in May, 1892, 7° and 8°

and still no extraordinary damage—but the earliness of the dates may partly account for that.

I think that the damage at Kenley is proved by the above not to have been due to radiation alone; a difference of only 3° does not point to so clear a sky with us, and yet our hardy English trees (Yews, Ashes, Maples and even Oaks) have suffered in a manner I never saw before.

There was one feature in the 1894 frost you do not mention in your comments, which is the prevalence at the time, of a very strong, cold and very dry North-East wind. I am of opinion that that wind was the criminal who robbed us of our garden stuff and spoiled the beauty of our trees. On all the other occasions I have quoted above, the air was comparatively calm.

Probably, first, radiation causes on the foliage a deposit of hoar frost. Second, the sun rises early and melts the hoar frost. Third, the wind blows strongly into the damp foliage, and causes a very rapid evaporation and consequent lowering of temperature in the foliage and young shoots, and to this third cause in my opinion the damage is due.

As an instance of what a cold N.E. wind can do, I relate the following:—In our garden at Hull, we had a small fountain; one winter's morning looking out, I saw large icicles hanging from the upper basin. I, of course, thought there had been a sharp frost, but on consulting the thermometer there had been no frost either on the stand or on the grass. At the time this occurred a strong dry N.E. wind was blowing, and the only cause I could assign for the formation of the icicles was the rapid evaporation caused by the cold, dry wind and consequent abstraction of heat from the trickling water. If the wind could do that, I think it could also cause the damage to vegetation that occurred last month. Please also note air temperatures are mild comparatively to some recorded and yet the damage occurred.

Yours sincerely,

Ingleside, Kenley, Surrey, 19th May, 1894.

HAROLD SMITH.

To the Editor of the Meteorological Magazine.

SIR,—Your statements as to the relative severity of the May frosts of 1891 and of this year are borne out by the state of the foliage as seen in travelling between Northallerton and Newcastle. At most spots on that line there is a good deal of brown, yet at least some green tinge is on almost, if not quite every tree; whereas in 1891, many beeches were perfectly brown, the nipping being much more severe in that year. In Cleveland, too, the nipping is very slight; while in 1891 it was severe. Yet the damage to the fruit crop is much greater than in 1891.

In the Swindon district the foliage is almost as much nipped as on the North-Eastern Railway, but I was not in that part in 1891, so cannot compare the two years there.

T. W. BACKHOUSE.

Sunderland, July 7th, 1894.

BECKFORD, GLOUCESTER.—The frost has done immense damage; early potatoes and kidney beans are practically destroyed; plums, strawberries and early peas that were either in blossom or pod have suffered severely, and what on May 20th promised a very good crop, may now be expected to yield less than half an average. The spring-planted beans in the fields, which were half a yard high, bent their heads to nearly touch the ground, and some of the stalks were cracked. This cannot fail to have a bad influence on the crop at harvest. Cherries and apples are also damaged; in short, all kinds of fruit and vegetables have suffered more or less from the severe frosts of May 20th—22nd.

The frost was confined entirely to the valleys and low-lying districts near the rivulets and watercourses. Beckford is 120 ft. above the level of the sea. At Grafton, which is 200 ft. above sea level, scarcely any damage was done; in one or two patches of potatoes only just the tops of the haulm was nipped, and at 30 ft. higher, at the upper end of the village, there was no trace of a frost having occurred. At Cobbler's Quarry, an elevation of 520 ft., the potato haulm and kidney beans exposed to the full blast of the cold north-easterly winds were not even touched by frost. At the Overbury allotments, 330 ft. above sea level, no damage was done; but at the lower end of the village, which is the same elevation as Grafton, just the tops of a few patches of potatoes were scorched.

A line drawn at 230 ft. above sea level—or, what is more to the purpose, 100 ft. above the level of the brook in the valley—would represent the limit of the frost. Above that line no damage was sustained; below that line everything in the shape of fruit and vegetables is more or less affected, the destruction increasing in intensity the nearer the watercourses, where it is indeed lamentable.—*Report for week ending May 24th, by Mr. F. Slade.*

EFFECTS OF THE FROST.—Reports from many counties in England and Scotland testify to serious damage having been done to tender crops by the frosts which occurred at the beginning of last week. The tops of potatoes were blackened in fields and gardens, and in many cases were killed quite down to the ground. French beans were destroyed, and early peas nearly or quite fit for picking were badly injured, while other crops in market gardens were more or less damaged. Early swedes and other turnips, just up, are reported by the *North British Agriculturist* to have been destroyed in Scotland. Some kinds of fruit, too, suffered a good deal in exposed situations from frost, while hailstorms were still more destructive in some parts of the country, cutting the fruit off the trees, and almost stripping them in the worst cases. Where strawberries were forward in the berry stage, as in Kent and other parts of the South, they were spoilt, and hop vines in exposed plantations were injured. Even such forage crops as clover, sainfoin, and vetches were affected in many places. Some of the injured crops will recover, while others, such as French beans and turnips, have been quite destroyed. Potatoes will grow fresh tops, but will be put back a good deal by the necessity of making a fresh start, and will yield badly in the end, or, at any rate, much less than they would have produced if no damage had been done to them. The misfortune is exceptionally partial in its coincidence. The frost was mainly a wind frost, and, therefore, it was most felt in exposed situations; but it was a white frost in some parts of the country, and there its results are as serious in low-lying damp places as where the wind swept over the land without check. On the other hand, many a sheltered garden escaped injury entirely, and a smaller propor-

tion of fields and fruit and hop plantations. Apart from the frosts, the weather during the month now nearly ended has been cold and altogether unpropitious to vegetation, so that the farm outlook has deteriorated in a marked degree. Most of the white-straw crops have now assumed a sickly colour, and peas and beans have suffered quite as much as a rule. Even the hay crop, of which high hopes were raised a month ago, will be much smaller, as well as less satisfactory in quality, than it was expected to prove. Only the hardy varieties of herbage have been able to make much headway during this very unseasonable month of May. Warm weather immediately would do a great deal to restore the hopeful prospects of the early period of spring, but even another week of such low temperature as has been lately experienced would go far towards destroying the hope of a good harvest.—*Standard* (reprinted in *Hereford Times* of June 2nd).

STRAWBERRIES IN 1894.—The season of 1894 has in this locality but one word to describe it—disaster. The greater number of varieties were in full bloom when we experienced a frost, which not only registered 10° at 3 feet from the grass, but which lasted for at least six hours. The consequence was that not only the expanded blooms, but also the majority of the unopened buds, were destroyed, and the few blooms which survived this ordeal have been prevented bringing their fruit to perfection by the extraordinary hot weather and parching winds which have prevailed during the past three weeks.—A. H. PEARSON, Chilwell, Notts, in *Journal of Horticulture*.

ROYAL METEOROLOGICAL SOCIETY.

The closing meeting for the session of this society was held on Wednesday, June the 20th, at the Institution of Civil Engineers, Great George-street, Westminster, Mr. R. Inwards, F.R.A.S., President, in the chair.

Mr. R. H. Scott, F.R.S., read a paper on "Fogs reported with Strong Winds during the 15 years 1876-90 in the British Isles."

In a paper read before the society in June, 1893, the author drew attention to the instances of fog occurring with forces of wind of 6 and upwards on Beaufort's scale, and the present paper gives the results of an investigation of the conditions under which these fogs occurred.

Firstly, the distributions of pressure under which these fogs were reported were examined, in order to learn whether they were cyclonic or anticyclonic.

Secondly, the actual weather reported on each occasion was noted, whether simply "f," or qualified by any other letter, such as "o" "u" "d" "f"—overcast, ugly, drizzle, and fog.

Thirdly, the temperatures were extracted not only for the hour at which the fog was reported to have been present, but also the maximum temperature for the 24 hours to which the observation belonged.

Fourthly, the rain was extracted for the preceding and the succeeding days, except in the case of the 6 p.m. fogs, where only the rain reported at 8 a.m. next morning was tabulated.

It should be remarked that these fogs do not occur with typical anticyclonic conditions inasmuch as a wind force of 6 (Beaufort scale) implies steep gradients, and these are incompatible with an anticyclone. The fogs can occur only on the outskirts of the anticyclone, and as usually cyclones press rather closely upon anticyclones, it was often difficult to decide to which system the reported fog properly belonged. An attempt was, however, made to form a judgment on each case, and the accompanying table shows the number of the fogs attributed to each category and referred to winds from different quadrants.

The total number of strong wind fogs dealt with was 135 :—

Winds from	Cyclonic.	Anticyclonic or doubtful.	Total.
N. to E.N.E.	7	0	7
E. to S.S.E.	13	5	18
S. to W.S.W.	81	14	95
W. to N.N.W.	7	8	15
	Total 108	27	135

It need scarcely be said that in general no precipitation occurs with ordinary fogs. In the case of the strong wind fogs, this is far from being a correct statement, although it is the predominant condition of those classed under anticyclones. Of the 27 cases of the latter class of fog, 21 were dry, or at least unaccompanied by as much as 0.1 in. of rain. Of the 108 cases classed as cyclonic fogs, only 30 were dry to the same extent, and 78 were either accompanied with, or followed immediately by, rain (sometimes heavy) and in 18 cases exceeding half-an-inch. It is therefore evident that the majority of these fogs are essentially wet fogs.

All the cases were picked out in which the temperature at the time the fog was reported, either agreed with the maximum for the day or fell only 1° below it.

Of the 27 anticyclonic fogs, 11 fulfilled this condition, and of the 108 cyclonic fogs 61 fulfilled it. Accordingly, out of 135 fogs, 72 or 54 per cent., occurred with temperatures either agreeing with, or very close to, the maximum for the day.

It appeared interesting to examine into the relation of these strong wind fogs to storms. They sometimes occur with actual gales and there were 11 such instances among the fogs classified as cyclonic. No fewer than 25 cases are put down as "preceding severe gales." That fogs sometimes occur just before gales is well known, they are frequently only the last dregs of a regular anticyclone fog to be dispersed by the incursion of the gale.

The overwhelming majority of these cyclonic fogs with South-westerly winds—81 out of 108—and their much greater prevalence on the south-west coast (Scilly, Pembroke, Prawle Point) than elsewhere, points distinctly to their marine origin. They come in to us from the Atlantic Ocean.

They are apparently very thick mist, or very dense rain, and in the author's opinion, should not receive the name of "fog," but that of "mist."

Captain Wilson Barker said that there is a well marked area between cyclones and anticyclones where fog may be expected and is, with a falling barometer, a good prognostic of wind.

Captain Tissard would have liked some observations at sea to be included in the paper, and thought that more precise definition of fog was wanted; many instances in the paper of fog and drizzle would have been described by seamen simply as dirty weather.

Mr. Charles Harding agreed as to the great need for definitions of fog, mist, &c., and referred to the prognostics of fog in the United States, based on the distribution of pressure and the direction of the wind. He thought that as most of the stations reporting the fogs were on the coast, the temp. of the sea would be an important element.

Mr. Gaster, in referring to the definitions of fog and mist, said there were two classes of phenomena which obscured luminaries. One with low temp., dry air, calm and no sensation of drops of moisture; the other with low barometer, high temp., strong wind and wetness—the only characteristic in common being the obscuration. He thought it most necessary that the two should be distinguished.

Dr. Marcet thought the most striking fact was that the fogs referred to occur so frequently with the max. temp. when one would not expect condensation.

Mr. R. H. Curtis spoke of the confusion between London and country fogs, the irritating properties of fog being entirely due to town products, dry fogs being confined to towns, while country fogs are all more or less moist.

Mr. Symons referred to the great differences of opinion expressed in the previous discussion as to the definition of fog, mist, haze, and raised the question of the adoption of some measure of the intensity of fogs, asking whether two objects at different distances but subtending the same angle would be equally obscured.

Mr. H. N. Dixon said that on land dust nuclei and a saturated atmosphere were necessary for the condensation of mist, while at sea saline particles in the air would induce a fog or mist when the air was not saturated.

Mr. Scott, in replying, said that the Meteorological Office was not responsible for any definition of fog, but that the paper was based simply on the reports of the observers. The limits of an adjoining cyclone and anticyclone are absolutely undefined, and it is at times impossible to state in which a given fog area should be included. As a rule observations were not commenced till the vessels were far from land, so that no records at sea were available for the paper. At Kew observations had been made for some time on the visibility of objects

at various distances, but the results were affected enormously by variations of illumination and by the direction of the sun.

Mr. R. H. Curtis, F.R. Met. Soc., read a paper on "Some characteristic features of Gales and Strong Winds." After calling attention to the unsatisfactory state of anemometry, and after describing the "bridled" anemometer at Holyhead, Mr. Curtis stated that the greatest force of an individual gust which he had met with, was registered in December, 1891, and amounted to a rate of 111 miles per hour, which with the old factor would be equivalent to a rate of about 160 miles per hour. Gusts at a rate from 90 to 100 miles per hour have many times been recorded, but the usual limit for gusts may be taken to equal about 80 miles per hour, which on the old scale would be equivalent to about 120 miles per hour. Gales and strong winds differ in character very much, and as the result of a prolonged study of their general features as recorded by the bridled anemometer, the author has been able to group them into three general classes.

The first class comprises those gales which are essentially squally in character—in which the gusts constitute the main feature of the gale. In such a case the squalls and lulls alternate very rapidly, and indeed the wind is never constant in force for many seconds together. Usually it oscillates over a range of perhaps 10 or 20 miles at a mean strength of perhaps 40 miles per hour, but every now and again it bursts out with a velocity of perhaps 40 or 50 miles an hour above the average, and after a few seconds sinks to a rate of 10 or 20 miles below it. This is certainly the most usual character of the gales experienced on our coasts, although they vary immensely as regards the strength and frequency of the gusts and lulls, and also as to the average velocity which may be called the "normal of the gale."

The second class of gales is that in which the velocity of the wind is tolerably steady, much steadier than in the first. The "normal" of the gale covers a much smaller range, perhaps not more than a rate of five or six miles per hour, and the squalls are far less severe; and I have noticed that generally they are not accompanied by lulls falling much below the "normal," or if the lulls are frequent then the squalls above the "normal" are comparatively few. This is a rather curious feature, but I have noticed it in several cases.

The third class should perhaps have been the second, inasmuch as it is a distinctly squally variety of gale. But the characteristic by which it is distinguished is peculiar. The record made by the anemometer has two "normals," connected by a lighter band of shading. Indeed the gale appears to be made up of two series of rapidly succeeding squalls, the one series at a comparatively low rate of velocity, the other at a much higher one, the wind force shifting rapidly and very frequently from the one series to the other.

On looking carefully over the records, the author found, often-

times very distinctly marked, a long pulsation in the wind force which recurs again and again with more or less regularity at intervals of perhaps 20 minutes or half-an-hour in some cases, and in others at longer intervals of about an hour, more or less.

SUN SPOTS AND AIR TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—A.B.M. is persevering. He now, in your number for April, suggests, in regard to sun spots and air temperature, a difference in the summer and winter effects, and thinks that I have assumed that these must necessarily be similar. Not at all. The essence of my comparison was that January was compared with January, February with February, and so on. This should bring out any possible different effect at different seasons of the year. But to save space I did not, in the communication printed in your March number, give all the figures that might have been presented. Of the four columns of temperature there included, two refer to sun spot minima, and two to sun spot maxima, equally distributed, and therefore all equally representative (as regards sun spot influence) of the complete period discussed, 1763 to 1892, no monthly mean depending on less than five epochs of minima or maxima. I there compared Min. No. 1 with Max. No. 1, and Min. No. 2 with Max. No. 2. I now repeat these, giving in addition comparison of Min. No. 1 with Max. No. 2, and Min. No. 2 with Max. No. 1 :—

Month.	Min. No. 1 above Max. No. 1.	Min. No. 2 above Max. No. 2.	Min. No. 1 above Max. No. 2.	Min. No. 2 above Max. No. 1.
January	-0.13 ...	+0.48 ...	+0.75 ...	-0.40
February	-0.85 ...	-0.32 ...	-0.42 ...	-0.75
March	-0.17 ...	-0.92 ...	-1.54 ...	+0.45
April.....	+1.88 ...	-0.38 ...	-0.81 ...	+2.31
May	+1.04 ...	-0.51 ...	-0.43 ...	+0.96
June	+1.11 ...	+0.88 ...	+0.81 ...	+1.18
July	+0.95 ...	-1.45 ...	-0.69 ...	+0.19
August.....	+1.10 ...	-0.81 ...	+0.01 ...	+0.28
September	+2.15 ...	+0.35 ...	+1.04 ...	+1.46
October	+1.66 ...	-1.31 ...	+0.55 ...	-0.20
November	+2.18 ...	+0.13 ...	+0.43 ...	+1.88
December.....	-0.21 ...	-0.02 ...	-0.53 ...	+0.30
The Year.....	+0.88 ...	-0.32 ...	-0.07 ...	+0.63

The discordance between the four values, exhibited in individual months, arising probably from general irregularity of temperature due to various causes, seems to render it hopeless to endeavour from discussions of this nature to evolve any definite sun spot effect.

W. E.

June 18th, 1894.

THE ANTWERP CONGRESS.

IN connection with the International Exhibition now being held at Antwerp, there is to be on August 16th to 18th a congress of persons interested in the Science of the Atmosphere.

The General Secretary has requested us to bring the subject before our readers, and we have much pleasure in complying with his wish.

The aim of the Congress is not so ambitious as is its title. The Congress will be divided into two sections; the first will deal with:—

1. General theory of the currents of the atmosphere and of their causes.
2. Methods of observation at various altitudes.
3. Instruments, recording apparatus, &c.
4. Maps of the permanent and variable currents of the atmosphere and comparison with those of the oceans.

The second section will deal with Aerodynamics, divided as follows:—

1. Measures of the velocity of the wind.
Actions on plane and inclined surfaces; friction; experimental apparatus; effect of wind on bridges, buildings, towers, &c.; wind as a motor; aeroplanes, windmills, turbines, ship's sails; wind as a retarder of motion; transport by land, by sea, and by air.
2. Application of ascertained facts to the problem of Ærial navigation; Ærial propulsion by wheels, helices, &c.

We understand that the Congress will be under Royal Patronage, and if we may judge of all the officers by the two whom we know, they are probably the best of the country; for the President of Section I is M. Lancaster, Meteorological Inspector at the Royal Observatory, the well-known Astronomical Bibliographer and Editor of *Ciel et Terre*; and he is supported by M. Vincent, also of the Royal Observatory, who acts as Secretary.

The circular points out that while the problem of ærial navigation is the leading one for consideration, many other questions will be considered, and knowledge will be gained as to the motion of upper clouds, as to the effect of wind upon buildings, as to weather-forecasting and other matters, and, moreover, as there will be some other congresses in session at the same time, there will be various fêtes and public functions at which the members can be present.

The Committee invite communications, and members—Gentlemen's tickets 10 fr. (including a copy of the volume when published). Ladies' tickets 5 fr.

We wish the meeting good success, and conclude by giving the address of the General Secretary, to whom all communications and enquiries should be addressed.—Monsieur le Chevalier Le Clement de Saint Marcq, Rue du petit Chien, 16, Anvers.

SHORT NOTES.

A WHIRLWIND IN SURREY.—Mr. Sidney H. Burchall writes from Reigate under date of June 21st: Whilst standing to-day in an open hay field, situated about a mile south of this town, I and others witnessed what may be described as a whirlwind, but of such unusual character that it may perhaps be worth recording. The field lies on high ground, exposed to the south, and at the time of my visit about one o'clock, several men were engaged in turning over a heavy crop of hay. The day had been a brilliant one, and was then very warm, and I could not perceive any movement of the trees which bounded the field on the east and west sides. Without warning an extraordinary whirlwind broke on the field within a few yards of where I stood, catching up the hay with violence. For some moments the air was filled with wisps of hay, whirling in rapid movements, and in circles gradually getting larger and larger as they rose in the air; but, what was so striking, rising to a great height. At the same time that this happened several rooks were passing. These appeared also to be caught by the tornado, and were likewise carried up to a great elevation; in fact, until I could no longer follow them. The passage of the storm was from west to east, but it seemed to travel very slowly, and was ultimately dispelled by the trees at the opposite end of the field.

The above is of interest as giving (unconsciously) a graphic picture of the cause of the formation of whirlwinds. An open field, high and exposed to a brilliant sun, the air calm and very warm, therefore expanded and of light specific gravity, hence unstable equilibrium, suddenly broken with the inevitable result of circular motion and the lifting of light objects like the hay.

HARVEST WEATHER FORECASTS.—For some years the Meteorological Council (the Government Office be it understood—not the Council of the Royal Meteorological Society) have during the summer issued forecasts of what they expected the weather to be. These telegrams are sent at the public cost to certain counties so that their value or otherwise may be demonstrated. The following cutting from the *Ayrshire Observer* gives a general idea of the local arrangements.

CUMNOCK.—WEATHER TELEGRAMS.—The first of these telegrams, which are to be sent out by the Board of Agriculture for the next eight weeks, reached the Post Office here and was displayed in the window about 4 p.m. on Wednesday, June 27th. These weather warnings are being sent to all the telegraph Post Offices in Ayrshire and Haddingtonshire, and are meant to be of use to farmers in ordering their operations during the hay and grain-crop harvests. It should be borne in mind that the prognostications of the kind of weather which is likely to be experienced always refer to the day succeeding their arrival, and should be studied that night or next morning; and if the morning, then of course they refer to the day then entered upon. Most certainly they are well worthy the attention of farmers, for, as a rule, they will be found to foretell the weather with remarkable correctness. In every district a person has been appointed to keep a daily register of the weather actually experienced, and which, at the end of the eight weeks, will show how far these forecasts

have been accurate and may in future be depended on. "Our own Correspondent" of many years on "Weather, Farming, &c," has been appointed to keep the register here, and from the deep interest he has long taken in the subject, it is sure to secure his closest attention. These forecasts have commenced two full weeks too early for Scotland, and ought to have continued till the end of September, it being very seldom that the grain-harvest is over before that time. Ending, as is proposed, about the middle of August, hardly any crops will be reaped at that date. The Board of Agriculture ought to have consulted some leading agriculturists in Ayrshire and Haddingtonshire on the matter.

INJURY BY LIGHTNING.—Mr. Alfred Littlejohn, of The Bounds, Hernhill, near Faversham, Kent, writes of an extraordinary occurrence which took place in his farmyard during the recent thunderstorm. He says: "It may interest your readers to know that during the severe thunderstorm I had 100 head of poultry struck by lightning, three-parts of which were Aylesbury ducks, and the remainder young chickens. They were in a cherry orchard, with plenty of shelter, but were found early this (Saturday) morning lying about in all directions. They seemed to have been struck in the eye, as in most cases there was a black mark which extended about a quarter of an inch each side of the orbit, and had enlarged the pupil to a very great extent." The incident shows the necessity of ducks and chickens carrying about their own lightning conductors.—*Daily Telegraph, July 10th, 1894.*

This may well be described as an "extraordinary occurrence." Much additional information is desirable—*e.g.* Were any of the trees struck? Were the chickens mostly found under the trees? Was every one of the 100 killed; or were there more than 100 in the orchard, and only 100 killed; *i.e.*, were there any survivors?

THE SUNSHINE OF 1893.—The number of hours of bright sunshine recorded at Greenwich during 1893 by the Campbell-Stokes sunshine instrument was 1,454, the greatest number on record since the commencement of the registration in 1877. This is 171 hours above the average of the preceding 16 years, after allowance is made for the small difference of indication of the Campbell and Campbell-Stokes instruments. The aggregate number of hours during which the sun was above the horizon was 4,454, so that the mean proportion of sunshine for the year was 0.326, constant sunshine being represented by 1.

A WEATHER PROPHECY.—"July will be a dry month, and there will be very few days with a maximum temperature under 70°, and at times it will exceed 90°."—*Hugh Clements in "Hereford Times" of July 7th.*

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1894.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	52·0	11 ^a	13·1	5	43·2	32·6	34·8	87	76·8	14·3	2·87	25	7·1
Malta	63·8	25	42·0	18	59·1	47·4	46·0	84	114·2	35·5	4·00	19	7·2
<i>Cape of Good Hope</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	86·4	6	71·0	17	83·1	73·7	70·0	78	137·6	65·1	14·58	20	6·6
Calcutta	84·1	22	50·1	9	78·1	55·7	55·7	71	135·1	41·0	·00	0	6·6
Bombay	87·3	7	65·8	5	83·1	68·7	64·8	69	132·2	57·0	·22	1	0·3
Ceylon, Colombo	90·1	16	66·0	29	87·0	70·9	68·4	74	153·5	54·0	·62	5	4·4
<i>Melbourne</i>	102·5	21	52·0	15	80·2	58·6	57·4	69	149·2	45·6	·47	8	4·5
<i>Adelaide</i>	105·7	2	50·2	16	86·4	60·7	52·1	47	164·5	43·2	·68	4	2·7
<i>Sydney</i>	97·0	12	60·5	20	78·5	66·3	62·6	72	155·6	49·9	1·61	19	6·7
<i>Wellington</i>	80·0	13 ^b	44·0	30	71·9	58·4	55·9	75	145·0	30·0	6·84	11	4·6
<i>Auckland</i>	82·0	27	50·0	30	75·0	62·4	61·2	79	148·0	47·0	2·68	...	4·8
Jamaica, Kingston	89·0	30	64·3	19	84·8	66·7	65·2	76	...	...	·19	4	3·5
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	47·3	4	10·3	25 ^a	34·5	22·1	24·3	81	...	4·0	1·67	17	7·0
New Brunswick, Fredericton	49·8	25	—30·5	11	23·4	—1·9	9·7	80	...	...	2·99	13	5·0
Manitoba, Winnipeg	39·0	13	—46·1	24	4·9	—18·3	...	...	...	...	1·16	...	5·0
British Columbia, Esquimalt	51·0	14	24·3	6	41·4	32·9	35·0	91	...	...	7·24	21	8·0

a And 27. b And 15.

REMARKS.

MALTA.—Adopted mean temp. 52°·5; mean hourly velocity of wind 7·8 miles. TS on 12th, 27th, and 30th. L on 6 days. H on 5 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·5 below, dew point 0°·2 above, and rainfall 7·07 in. above, their respective averages. Mean hourly velocity of wind 13·5 miles, or 2·2 above average; extremes, 41·0 on 13th, and 1·9 on 16th; prevailing direction, E.S.E. to E. by N. L on 2nd, T on 8th, and T and L on 28th. Disturbed weather from the 9th to the 14th, during which a cyclone passed E. and S.E. of Mauritius. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Lightning was seen on the 12th. D. G. MANTELL.

Melbourne.—Lightning on the 3rd, 13th and 25th; thunder on the 6th.

R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·8 below the average of 37 years. Rainfall ·15 in. below the average. First half of the month very cool, latter half very hot.—C. TODD, F.R.S.

Sydney.—Weather generally hot and dry. H. C. RUSSELL, F.R.S.

Wellington.—Showery for first few days, wind S.E., then fine weather, with moderate N.W. wind, until the night of the 16th, when E came on from N.W. and continued until 19th, wind changing to S.E., 2·22 in. rain recorded on the 18th. Fine from 20th to 24th, then showery for remainder of month. Prevailing N.W. wind, and generally moderate. On the whole pleasant and warm weather. Slight earthquake on 11th at 10.15 p.m. R. B. GORE.

Auckland.—On the whole an average and seasonable month. Mean temp. slightly in excess of the average of the previous 27 years. Rainfall slightly below the average. T. F. CHEESEMAN.

JAMAICA.—Rainfall one-seventh of the average. Mean hourly velocity of wind 2·9 miles. For the whole Island the rainfall was only one-half the average.

R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
JUNE, 1894.

[For the Counties, Latitudes, and Longitudes of most of these Stations,
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	2·75	XI.	Rhayader, Nantgwillt..	2·55
„	Birchington, Thor	1·90	„	Lake Vyrnwy	3·08
„	Hailsham	1·64	„	Corwen, Rhug	1·24
„	Ryde, Thornbrough	1·86	„	Carnarvon, Cocksida ...	1·97
„	Emsworth, Redlands ...	1·80	„	I. of Man, Douglas	3·41
„	Alton, Ashdell	2·40	XII.	Stoneykirk, Ardwell Ho.	3·87
III.	Oxford, Magdalen Col...	2·77	„	New Galloway, Glenlee	3·25
„	Banbury, Bloxham	1·87	„	Melrose, Abbey Gate ...	3·38
„	Northampton, Sedgebrook	2·18	XIII.	N. Esk Res. [Penicuick]	3·10
„	Alconbury	2·10	„	Edinburgh, Blacket Pl..	2·65
„	Wisbech, Bank House..	2·67	XIV.	Glasgow, Queen's Park.	2·76
IV.	Southend	2·28	XV.	Inverary, Newtown	4·42
„	Harlow, Sheering	2·05	„	Islay, Gruinart School..	·83
„	Colchester, Lexden.....	2·01	XVI.	Dollar.....	2·99
„	Rendlesham Hall	2·81	„	Balquhiddier, Stronvar..	3·51
„	Diss	2·16	„	Balluluig	1·92
„	Swaffham	2·92	„	Dalnaspidal H.R.S. ...	2·86
V.	Salisbury, Alderbury ...	2·29	XVII.	Keith H.R.S.	1·54
„	Bishop's Cannings	2·82	„	Forres H.R.S.	1·38
„	Blandford, Whatcombe .	2·88	XVIII.	Fearn, Lower Pitkerrie.	1·54
„	Ashburton, Holne Vic....	2·51	„	Loch Shiel, Glenaladale	...
„	Okehampton, Oaklands.	2·43	„	N. Uist. Loch Maddy ...	2·37
„	Hartland Abbey	2·05	„	Invergarry	2·05
„	Lynmouth, Glenthorne.	1·79	„	Aviemore H.R.S.	1·68
„	Probus, Lamellyn	2·05	„	Loch Ness, Drumnadrochit	1·66
„	Wellington, Sunnyside..	1·76	XIX.	Invershin	1·59
„	Wincanton, Stowell Rec.	2·86	„	Scourie	1·90
VI.	Clifton, Pembroke Road	2·41	„	Watten H.R.S.	1·55
„	Ross, The Graig	1·76	XX.	Dunmanway, Coolkelure	3·36
„	Wem, Clive Vicarage ...	2·68	„	Fermoy, Gas Works ...	1·88
„	Cheadle, The Heath Ho.	2·51	„	Killarney, Woodlawn ...	2·57
„	Worcester, Diglis Lock	2·07	„	Tipperary, Henry Street	2·19
„	Coventry, Coundon	1·93	„	Limerick, Kilcornan ...	1·98
VII.	Ketton Hall [Stamford]	1·98	„	Ennis .....	...
„	Grantham, Stainby	1·88	„	Miltown Malbay.....	3·08
„	Horncastle, Bucknall ...	2·50	XXI.	Gorey, Courtown House	2·70
„	Worksop, Hodsck Priory	2·25	„	Athlone, Twyford	2·26
VIII.	Neston, Hinderton	2·14	„	Mullingar, Belvedere ...	2·58
„	Lancaster, Rose Bank... ..	2·81	„	Longford, Currygrane ...	1·84
„	Broughton-in-Furness..	5·01	XXII.	Galway, Queen's Coll... ..	2·75
IX.	Ripon, Mickley	3·76	„	Crossmolina, Enniscoe..	3·04
„	Scarborough, South Cliff	4·24	„	Collooney, Markree Obs.	2·52
„	East Layton [Darlington]	4·00	„	Ballinamore, Lawderdale	2·40
„	Middleton, Mickleton..	3·19	XXIII.	Lough Sheelin, Arley ..	1·89
X.	Haltwhistle, Unthank..	3·89	„	Warrenpoint	2·48
„	Bamburgh	2·09	„	Seaforde	3·92
„	Keswick, The Beeches... ..	3·86	„	Belfast, Springfield	4·25
XI.	Llanfrechfa Grange	2·59	„	Bushmills, Dundarave... ..	2·10
„	Llandovery	2·63	„	Stewartstown	3·24
„	Castle Malgwyn	1·74	„	Buncrana	2·19
„	Builth, Abergwessin Vic.	3·48	„	Lough Swilly, Carrablagh	2·24

JUNE, 1894.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Night below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which >0.1 or more fell.	Max.		Min.		In shade.	On grass
				Dpth	Date		Deg.	Date	Deg.	Date		
		inches.	inches.	in.								
I.	London (Camden Square) ...	1.84	— .17	.43	3	12	83.8	30	43.7	12	0	0
II.	Maidstone (Hunton Court)...	2.31	+ .69	.63	6	14	...	...	...	...	...	...
III.	Strathfield Turgiss	2.43	+ .63	.65	3	18	81.1	30	43.2	12	0	0
IV.	Hitchin .....	...	...	...	...	...	...	...	...	...	...	...
V.	Winslow (Addington)	2.57	+ .71	.89	4	14	83.0	30	39.0	1	0	...
VI.	Bury St. Edmunds (Westley)	2.43	+ .64	.50	15	14	74.0	30	43.0	14	0	...
VII.	Norwich (Brundall)	2.43	—	.75	15	15	73.4	30	42.0	1	0	1
VIII.	Weymouth(LangtonHerring)	1.91	— .32	.65	3	14	75.0	30	43.0	12	0	...
IX.	Torquay (Cary Green) ...	2.36	—	1.20	6	15	72.9	30	45.0	1	0	0
X.	Polapit Tamar [Launceston]..	1.80	— .41	.31	12	18	75.5	30	46.0	1	0	...
XI.	Stroud (Upfield)	1.72	— .67	.53	3	16	76.0	29 ^a	46.0	18	0	...
XII.	ChurchStretton(Woolstaston)	1.95	— .60	.29	3	17	76.5	30	39.0	7	0	1
XIII.	Tenbury (Orleton)	1.71	— .90	.44	3	13	82.2	30	34.8	1	0	1
XIV.	Leicester (Barkby)	1.91	— .44	.45	4	14	82.0	30	37.0	13 ^c	0	0
XV.	Boston	2.55	+ .66	.67	4	16	95.0	30	44.0	6	0	...
XVI.	Hesley Hall [Tickhill].....	2.41	+ .49	.98	4	12	86.0	30	36.0	1	0	...
XVII.	Manchester(PlymouthGrove)	3.29	+ .64	.88	4	16	85.0	30	40.0	6, 18	0	0
XVIII.	Wetherby (Ribston Hall) ...	3.58	+ 1.69	1.19	5	10	...	...	...	...	...	...
XIX.	Skipton (Arneliffe)	3.81	+ .45	.64	4	18	...	...	...	...	...	...
XX.	Hull (PearsonPark)	4.20	+ 2.45	.95	4	15	73.0	22 ^a	37.0	1	0	...
XXI.	Newcastle (Town Moor)	3.27	+ 1.63	.46	2, 10	16	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	7.19	+ .61	1.40	23	19	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	2.86	+ .43	.72	3	15	...	...	...	...	...	...
XXIV.	Haverfordwest	3.67	+ 1.11	.95	4	15	79.3	30	35.0	1	0	2
XXV.	Aberystwith, Gogerddan	2.05	—	.39	3	14	87.0	29	30.0	20	2	...
XXVI.	Llandudno	1.71	— .06	.51	3	14	...	...	...	...	...	...
XXVII.	Cargen [Dumfries]	4.03	+ 2.08	.86	4	17	83.6	30	35.6	1	0	...
XXVIII.	Jedburgh (Sunnyside).....	4.04	+ 2.30	1.10	10	16	85.0	30	35.0	7	0	...
XXIX.	Edmonell	2.60	—	.48	9	15	83.0	30	34.0	20	0	...
XXX.	Lochgilphead (Kilmory)	2.94	— .16	.50	16	14	...	...	35.0	20	0	...
XXXI.	Mull (Quinish)	3.88	+ .59	.94	16	15	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	2.40	+ .65	.70	11	8	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	2.00	+ .50	.60	4	17	74.8	26	38.0	6	0	...
XXXIV.	Braemar	2.02	+ .03	.50	4	12	80.0	30	30.9	1	2	11
XXXV.	Aberdeen (Cranford)	1.82	—	.36	10	13	70.0	30	38.0	17	0	...
XXXVI.	Strathconan [Beaully]	3.27	+ .78	.90	2	8	...	...	...	...	...	...
XXXVII.	Glencarron Lodge	4.38	—	.71	23	15	83.0	30	35.5	6	0	...
XXXVIII.	Cawdor [Nairn]	1.63	+ .23	.46	10	15	...	...	...	...	...	...
XXXIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...
XL.	S. Ronaldsay (Roeberry).....	1.84	+ .08	.40	16	15	72.0	27	42.0	4, 10	0	...
XLI.	Darrynane Abbey	2.44	—	.42	16	20	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	2.71	+ .64	.67	3	14	77.0	30	36.0	1	0	...
XLIII.	O'Briensbridge (Ross)	2.51	—	.93	4	16	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	2.52	+ .68	.77	4	13	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	1.65	— .01	.41	17	19	72.8	30	49.0	6	0	0
XLVI.	Ballinasloe	2.10	— .20	.42	17	15	76.0	28 ^b	41.0	12	0	...
XLVII.	Clifden (Kylemore)	4.59	—	.64	22	16	...	...	...	...	...	...
XLVIII.	Waringstown	3.64	+ 1.57	1.08	4	16	81.0	30	35.0	6	0	1
XLIX.	Londonderry (Creggan Res.)..	2.64	+ .22	.40	23	17	...	...	...	...	...	...
L.	Omagh (Edenfel)	2.62	+ .15	.40	24	16	80.0	30	39.0	5, 15	0	...

^a And 30. ^b And 29, 30. ^c And 20.

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

METEOROLOGICAL NOTES ON JUNE, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—The first half of the month was showery but warm, and the close of the month was very hot. All agricultural crops looked extremely well, and with an experience of 36 years I never saw the corn so fine. Hay very abundant and carried in the finest possible weather.

ADDINGTON.—From the 1st until the 21st dull and unsettled, from that date until the end, very fine; first rate weather for hay making. The last day of the month was very hot, although a brisk N.E. wind was blowing all day.

BURY ST. EDMUNDS.—Cold and wet till the 21st, then fine summer weather till the end of the month. The last week was very favourable for hay making. Distant T on 20th.

NORWICH, BRUNDALL.—Weather very cloudy and unsettled, with frequent R, during the first three weeks. The last ten days very fine and sunny, with heat tempered by a sea breeze from N.E. Strawberries ripe on 16th, or three weeks later than last year. Corn in ear on 21st. T and L on 5th, 15th, 18th, and 20th. Almost continuous R for 80 hours from 8th to 11th.

LANGTON HERRING.—From the beginning of the year to the end of June R fell on 100 days; this is the greatest number of rainy days in the first half of any year of the last 20, and is 22 above the average. Up to the 23rd the weather was cold and unsettled, but the last week of the month was fine and very hot and most favourable for securing the hay crop, which was exceptionally heavy. The mean temp. at 9 a.m. ($59^{\circ}0$) is $1^{\circ}3$ below the mean of 22 years. Fogs were frequent. Solar halos were observed on the 12th and 16th.

TORQUAY, CARY GREEN.—Rainfall $\cdot 02$ in. below, and wet days 1 above, the average. Mean temp. $57^{\circ}8$, or exactly the average. Amount of sunshine 184 hours 30 min., being 41 hours 30 min. below the average. Two sunless days.

STROUD, UPFIELD.—T and heavy R in early morning on 3rd.

WOOLSTASTON.—A splendid month for the hay harvest. The early part was rather cold, but the last fortnight was very dry and hot. Mean temp. $56^{\circ}3$.

TENBURY, ORLETON.—Very cold and wet till the 14th, then finer, the last week being brilliant, hot weather. Mean temp. for the month about $0^{\circ}5$ below the average. T and L on 4th.

LEICESTER, BARKBY.—Chilly and drizzly during the first fortnight, then dull and cloudy till the last few days, which were hot and cloudless. Mean temp. for the month $58^{\circ}2$.

MANCHESTER, PLYMOUTH GROVE.—The coldest June experienced since observations commenced 27 years ago, with the one exception of June, 1871, when the mean temp. was 54° . Weather up to the 25th very unsettled and unseasonable; from 26th to 30th fine and summer-like. Mean temp. $55^{\circ}5$.

WALES.

HAVERFORDWEST.—Up to the 26th there really was no day that could be called a summer day, and the shade temp. three times fell as low as 37° . On 26th the wind shifted to E., with sudden heat and bright sunshine to the end of the month. The keen frosts of the last days of May checked vegetation to such an extent as to dishearten those engaged in gardening and agriculture. The ash and oak—the former particularly—were brought almost to a standstill in putting forth their leaves, and in many places looked black and blasted. Fruit will not be nearly so abundant as was expected earlier. Corn looking well, and hay crops will be fully up to the average. Heavy TS at 3 a.m. on 3rd.

GOGERDDAN.—Very stormy and dull during the first three weeks of the month, but very hot, with bright sunshine, in the last week.

SCOTLAND.

CARGEN.—The mean temp. of the month was a little more than 2° below the average. The first 25 days were unusually cold, the mean temp. for that period being 4°·2 below the average for June. The last five days were very warm, the max. on the 30th being, with two exceptions, the highest recorded in June during 34 years. The range of temp. (48°) was unusually great. Light winds, mostly easterly and northerly, prevailed, with dull, wet weather, the hours of sunshine being greatly below the average. T on 1st.

JEDBURGH.—The weather of more than the first half of the month was cold and ungenial, with low night temp. ; but as there was a good deal of sunshine, vegetation progressed fairly. The heat of the last week was great. Prevailing winds E., N.E. and S.E. The apple blossom was completely destroyed by the frosts at the end of May.

COLMONELL.—Mean temp. 54°·8, being 1°·9 below the average of 18 years.

BRAEMAR.—Cold and unsettled, with frosts up to the 26th, afterwards hot and dry. Duration of sunshine 158 hours.

ROEBERRY.—The first half of the month was cold and dry, the latter half warmer. Mean temp. 52°·9, 1° below that of June, 1893.

IRELAND.

DARRYNANE ABBEY.—The first half of the month was cold and wet, the third week very foggy, and the end fine and hot.

O'BRIENSBRIDGE, ROSS.—Summer weather commenced on the 26th. T on the 4th.

DUBLIN.—Although somewhat cloudy and rather cool, this proved a favourable month, and its closing days were exceptionally warm and brilliant. The rainfall was frequent, but not heavy, and a decided advance in the night temperature was perceptible as compared with the frosty May. No electrical disturbances occurred. Mean temp. (57°·0) 0°·8 below the average. High winds were noted on 9 days, attaining the force of a gale on the 23rd. Temp. reached or exceeded 70° in the screen on only 2 days. H fell on the 10th and 18th ; fog occurred on the 3rd, 4th and 9th.

EDENFEL.—With the exception of the last few days, the weather possessed most of the unfavourable characteristics of May—great absence of sunshine, with temp. considerably below, and rainfall rather above, the average. The excess of R for the six months amounts to 8·02 in. On the 27th a brilliant hot spell of summer weather set in, breaking again, however, on the night of July 1st.

TWO RECENT RAINS.

AT Camden Square we had a sharp thundershower on July 9th ; the total fall was less than a quarter of an inch, but the fall was very heavy while it lasted. Rain began at 10·47 a.m., and in successive minutes the fall was ·05, ·03, ·02, ·01, ·01, ·02, ·02, ·02, ·02, or ·20 in. in nine minutes.

On the evening of July 10th rain began a little before 7 p.m., and the following was the fall in successive hours :—·08, ·10, ·13, ·15, ·21, ·17, ·14, ·04, ·08, ·02, or 1·12 in. in 10 hours. The fall was much heavier in the neighbourhood of Brighton. The following returns have been received :—Surrey House, Littlehampton, 2·25 in. ; Ditchling, Hassocks Gate, Sussex, 2·13 in. ; St. Martin's, Guernsey, 2·06 in. ; Benenden, Kent, 1·67 in. ; Chiddingfold, Godalming, Surrey, 1·47 in. ; Tenterden, Kent, 1·04 in. ; Emsworth, Hants, ·99 in.

THREE FLOOD-PRODUCING RAINS.

