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TOWN FOGS.

YEAR by year as winter comes round, hundreds of columns of the daily journals are filled with abuse of fogs, and anathemas of everything connected with them; full of such extravagant statements as "a mighty evil, every year increasing in intensity and slaying its tens of thousands before their time." "Cold kills, but cold with London smoke kills with double weight and leads to innumerable sudden deaths, as the Registrar-General's tables convincingly tell us."

Fortunately all this exaggerated declamation is as ephemeral as it is worthless, and the real literature of the subject is perhaps not so much overgrown and inflated with reproduction as is the case in many branches of knowledge.

In a paper read before the Meteorological Society, (*Quar. Jour.*, Vol. V, p. 157). the late Mr. George Dines set out very clearly the meteorological conditions which induce the formation of fog. Aitken in 1880 and subsequent years, clearly defined the physical conditions, counted and measured the particles, and proved that fog is one of the most active agents in removing the smaller solid impurities from the atmosphere. Dr. Russell in 1885 by washing foggy air analysed its constituents, and found that in foggy weather the amount of organic matter was double as much as existed in the air in merely dull weather, and that the amount of sulphates and chlorides increased under like conditions, but not to the same extent. The matter deposited on the glass roofs of plant houses at Chelsea, corresponded to a weight of 22lbs. to the acre, consisting chiefly of soot and dust rendered sticky by hydrocarbons; well described by Professor Thiselton Dyer as "like a brown paint, which would not wash off with water." At Manchester three days fog deposited per square mile of surface  $1\frac{1}{2}$ cwt. of sulphuric acid, and even at Owen's College 1 cwt. of acid and 13 cwt. of blacks.

It has been shown that the extra amount of gas supplied by the Gas Light and Coke Company during one foggy day in 1889 cost £3,000; but there are of course other gas companies, there are electric light companies, and considerable quantities of oil are burnt, it is probable therefore that one day's fog costs London for light

alone £4,000. The cost for damage to furniture and decorations, to goods exposed for sale, to art treasures of all sorts, and for accidents and for doctor's bills is incalculable.

In a valuable and impartial paper presented to the International Congress of Hygiene and Demography last year, Dr. Russell examined at some length the records of temperature and death rate in London, during times of fog, and the following extracts give his conclusions on the subject.—“By far the greater number of fogs occur when there is a great fall of temperature; and clearly this is closely followed after a few days by a great increase in the death rate; but how much of this increase is to be attributed to the fog and how much to the fall in temperature may be difficult to determine; but we have evidence that when fogs occur without fall of temperature they do not appear to be followed by any remarkable increase of death rate. . . . That many people suffer much, both physically and mentally from the effects of fog, there can be no doubt; but, as far as I can interpret these returns of the Registrar-General, they do not confirm the popular impression that fog is a deadly scourge; at the same time, it is beyond doubt that an atmosphere charged with soot, dust, and empyreumatic products is an unwholesome atmosphere to breathe.”

This indictment is sufficiently severe though it practically gives a verdict of “not guilty” as regards the capital crime.

We have thus contributions to a knowledge of the Physics, Economics (and why should we not say) the Chemics and Demographics of the subject. The Royal Horticultural Society has appointed a strong Committee to study its botanical aspects, and the question arises—Have Meteorological Observers done their share in the work? This we are afraid must be answered in the negative. As long ago as 1863 Dr. Gladstone, in a Friday evening lecture at the Royal Institution, after speaking of the utter confusion existing among observers on land as to what should be designated fog, suggested “that a pole, painted vermilion, should be set up at a hundred yards from the station, and that such an amount of mistiness as renders it invisible should alone be named fog.” In an article in the *Met. Mag.* in 1883 this was referred to, and a different plan was suggested, and illustrated, to meet the case of observers in towns, but we believe that the same utter confusion still prevails and that very few, if any, observers in towns have attempted to grapple with it.

That this confusion is real and so great that it cannot be neglected in any practical discussion of the subject, is clearly proved by a comparison of the observations at Camden Square, with the results given in a paper recently read before the Royal Meteorological Society by Mr. F. J. Brodie, “On the prevalence of Fog in London during the 20 years, 1871-90.” The paper states that “The sources from which the information has been derived are mainly the observations given in the *Daily Weather Reports*. These are taken in

the south-western parts of the Metropolis, either at Brixton or Westminster, but in preparing the tables I have included some few instances in which fog prevailed over a large portion of the London area, but in which it failed to affect the districts in question. Every endeavour has, in fact, been made to represent London as a whole; and as the same principle has been followed throughout the entire series of years the results are strictly comparable." This is not perfectly clear, but as the "observations given in the *Daily Weather Reports*" are for the hours 8 a.m. and 6 p.m., it implies that every day on which fog was recorded at either of those hours is counted, with the addition of "some few instances" when fog occurred in other districts.

At Camden Square the observations are taken at 9 a.m. and 9 p.m., and three degrees of fog are recognised, viz.: slight fog; fog; and dense fog; and all cases in which either of these occurred at the hour of observation are included. Westminster is roughly  $\frac{1}{2}$  a mile, and Brixton 3 miles, S. of Charing Cross, while Camden Square is  $2\frac{1}{2}$  miles N. Brixton is 77 feet above sea level and Camden Square 111 feet, so that there should not be much to choose between these two stations, for though Camden Square is higher ground, Brixton is further from the centre of London.

We may therefore fairly assume that for the morning observation the conditions are fairly comparable. In the evening observations there is a wide difference of time, and although 6 p.m. should apparently be less foggy than 9 p.m., Westminster is low ground, near the river, and more in town than the other localities. We should therefore expect a small difference in favour of Camden Square, but the discrepancy shown by the table on the following page is fairly staggering.

This table indicates that there are nearly three times as many fogs at Brixton and Westminster, as at Camden Square; a difference which appears to us incredible. We are not conscious of any indifference to fog, either in ourselves, or the other observers at Camden Square, and yet we cannot believe that so great a discrepancy can be accounted for by the difference of locality or of hour of observation.

As regards the relation of one year to another, the two records are in general agreement, and the Camden Square values show an even greater excess of the second ten years over the first, than do Mr. Brodie's figures.

That fog is not ignored at Camden Square is indicated in another way, by comparing the 9 a.m. and the 9 p.m. records, when we find that for the 20 years, for 421 fogs recorded at 9 a.m. only 139 were recorded at 9 p.m., which we believe to be in a great measure due to the 9 a.m. observations including many fogs too slight to be visible after dark.

Another indication that the Weather Report records convey an excessive idea of the fogginess of London is we think given by the Camden Square record of fog at 9 a.m. and 9 p.m. on the same day,

*Comparison of Fog Records at Brixton and Westminster, and Camden Square.*

YEARS.	BRIXTON & WESTMINSTER.		CAMDEN SQUARE.		Excess of Brixton and Westminster over Camden Square.
	No. of Days of Fog.	Per cent. of average.	No. of Days of Fog.	Per cent. of average.	
1871 .....	42	69	18	74	24
1872 .....	35	57	11	45	24
1873 .....	75	122	19	78	56
1874 .....	53	86	17	70	36
1875 .....	49	80	12	49	37
1876 .....	40	65	26	107	14
1877 .....	46	75	24	98	22
1878 .....	63	103	27	111	36
1879 .....	69	112	25	102	44
1880 .....	74	121	22	90	52
1881 .....	59	96	19	78	40
1882 .....	69	112	34	139	35
1883 .....	61	100	23	94	38
1884 .....	53	86	21	86	32
1885 .....	69	112	26	107	43
1886 .....	86	140	23	94	63
1887 .....	83	135	50	205	33
1888 .....	62	101	38	156	24
1889 .....	75	122	24	98	51
1890 .....	65	106	29	119	36
Mean .....	61·4	100	24·4	100	37·0
Mean 71-80 .....	54·6	89·0	20·1	82·4	34·5
Mean 81-90 .....	68·2	111·0	28·7	117·6	39·5

for a really bad fog even if it yields a little to the sun at mid-day rarely fails to return again in the evening, and yet out of the total number of 488 foggy days on only 72 was fog recorded both at 9 a.m. and 9 p.m.

All other comparisons of the two sets of results will of course vary to an equal extent in the total quantities, but the relative values may be none the less interesting, and we take next, monthly frequency.

AVERAGE NUMBER OF FOGGY DAYS AT BRIXTON AND WESTMINSTER AND AT CAMDEN SQUARE IN THE DIFFERENT MONTHS OF THE 20 YEARS 1871-90.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Brixton & Westminster } Camden Sq.....	8·9	6·6	5·6	2·2	1·1	0·9	0·7	1·4	5·9	9·2	8·8	10·2
	4·7	2·9	1·7	0·5	0·1	0·2	0·1	0·2	1·0	3·6	3·3	6·1

EXPRESSED AS PERCENTAGES OF THE TOTAL NUMBER.

Brixton & Westminster } Camden Sq.....	14	11	9	4	2	1	1	2	10	15	14	17
	19	12	7	2	0	1	0	1	4	15	14	25

These figures are in very close agreement except in January, October and December, Camden Square being much less foggy relatively in October and having an excess in the other two months. The figures for the summer months are however so small that they are not readily comparable, and probably the results will be more clearly shown by grouping them into seasons.

PERCENTAGE OF FOGGY DAYS IN THE FOUR SEASONS.

	Spring.	Summer.	Autumn.	Winter,	Year.
Brixton & Westminster	14·2	4·8	38·2	42·9	100
Camden Square	9·4	1·6	32·8	56·2	100

This shows a more marked excess of fogginess in the winter at Camden Square than at Brixton and Westminster.

As regards increase of fogginess in the different seasons, with the lapse of years, the figures, again expressed as percentages, of the total for the whole period are—

	1871-75.		1876-80.		1881-85.		1886-90.	
	BRIXTON	CAMDEN	BRIXTON	CAMDEN	BRIXTON	CAMDEN	BRIXTON	CAMDEN
Spring.....	23	13	21	20	27	37	29	30
Summer .....	30	25	17	25	22	25	32	25
Autumn .....	21	15	26	26	25	24	28	36
Winter .....	19	16	24	26	25	24	32	33
Mean .. .....	23	17	22	24	25	28	30	31

Again the Camden Square figures show the greater and more regular increase.

We consider the foregoing a very strong negative answer to our

question as to the contribution of Meteorological observers to the solution of the fog question. For until we know whether the number of foggy days in a year in London is 61 or 24 or whether there is three times as much fog at Brixton and Westminster, as at Camden Square, our knowledge of this branch of the subject is decidedly scanty.

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### WHO WAS FIRMINUS?

*To the Editor of the Meteorological Magazine.*

SIR,—You are quite right in stating on page 147 of your Magazine that Hippocrates is not the author of the scarce little book, “*Opusculū repertorii pronosticon*” (Venice, 1485, in small 4to), and that in the second edition issued in 1539 by Kerver, of Paris, the authorship is ascribed to “*Firminus*,” but I have strong doubts whether he was really the author.

Can you or any of the readers of your Magazine tell me anything about *Firminus*?

Certainly, men bearing this name have existed. There were several French saints and bishops in the sixth century, and later, named “*Firmin*,” but I have been unable to find out a learned man, “*Firmin*,” living in the 14th century, when the book must have been written, (an astronomical table in the earlier part being calculated for the year 1338). The real author therefore lived contemporaneously with, or a little later than, *Albertus Magnus*, whose authority is often quoted in the last chapter.

I am inclined to suppose that the editor of the second issue, *Philippus Iollainus Blereius*—he calls himself “*Turonensis*,” *i.e.*, from Tours—used for his edition and comments a MS. copy, in which a copyist had put erroneously the name *Firminus* as author, an error often committed in old MSS.

It is a curious fact that the commentator, *Philippus Iollainus Blereius*, does not say a single word in the praise of *Firminus*—he only calls him “*Astrologus*”—nor does he mention the first edition of 1485. In comparing the two editions, I have found some slight differences corroborating my opinion, that *Blereius* did not use, or perhaps even know of the *editio princeps*. This last supposition is supported by another fact.

A year later, in 1540, the same publisher, *Jacobus Kerver*, of Paris, issued a book of similar character under the following title, “*Alkindus De Temporum Mutationibus, sive de imbris, nunquam antea excussus. Nunc verò, per D. Io. Hieronymum à Scalingijs, emissus.*”

Well, the statement that this book of *Alkindus* was never printed before is not right, for it had been published more than 30 years previously, in 1507 at Venice by *Peter Liechtenstein*.

As to the scarceness of these books, I agree with you that the

“Opusculū” of 1485 is not *very* scarce. I have met with it in sale-catalogues twice within five years, only once with the second edition, and also once with both editions of Alkindus. However, in many large public libraries, all these early meteorological books are not to be found, and it would be difficult to get copies at any particular moment.

The “Opusculū” is of great interest for the history of meteorology, because it is the earliest printed collection of weather-prognostics, chiefly compiled from old Greek and Arabian astrologers. The first six chapters contain only astro-meteorological prognostics, the last one deals also with natural weather-signs. It seems to me a good testimony for the soundness of his views, that only in this part of the book is Albertus Magnus quoted.

The book is written in very barbarous Latin, and, although Blereius endeavoured to correct it, many obscure and unintelligible passages remain.

Hoping that this short notice may induce some one to make further inquiry as to the author of the “Opusculū,” I remain, Sir,

Yours truly,

G. HELLMANN.

*Berlin, January 12th, 1892.*

[Dr. Hellmann is so great an authority upon the writings of early meteorologists that when he is puzzled there are few able to help him.

We do not quite understand, if Firminus had no existence, why in the two introductory “Addresses to the Reader” of the 1539 edition—we find Ioannes Darud commencing—

Hoc opus excelsum firminus texiit, alter  
Qui verus cœli nuntius esse potest.

and further down Carolus Albosius Haedus says :—

Eccè sua tersus firminus nascitur arte :  
Atq : fluens niveo lacte profudit opus.

Blereius may have made a mistake, but would Darud and Haedus thus write of a person of whom they had never heard ?

However, Dr. Hellmann has the 1539 edition and evidently attaches no importance to these addresses, and therefore the questions remain—Did Firminus write the book ? If so, who was he ? and when and where did he live ?

It is not the first time that doubt has been thrown upon the authorship of this work. Jérôme De La Lande in his *Bibliographie Astronomique* 1803, gives the 1485 edition as anonymous. The 1539 edition he ascribes to “Firmini, antiqui autoris,” giving as his authority, *Duverdier*, Suppl. epit. bibl. Gesneri, but then he adds the following note :—“On ne trouve point de Firminus dans Fabricius, *Bibl. lat.*, mais seulement Julius Firmicus Maternus, qui avait fait huit livres de mathématiques. On ne trouve Jollainus, ni dans Gesner, ni dans les Bibliothèques de la Croix-du-Maine et Duverdier.

Therefore, according to him Jollainus and Firminus may be equally mythical. Moreover neither name is to be found either in the remarkable list of Astronomers in Sherburne's edition of *The Sphere of Manilius*, nor in Poggendorff's *Biographisch-Literarisches Handwörterbuch*, nor in any other list that we have been able to examine.

That however does not disprove the existence of Firminus, which is affirmed by the title page and by the head line of every page of the 1539 edition, is thrice mentioned in the preface, once in each of the two addresses dedicatory, (by the authors thereof), and several times in Jollainus's notes and comments.

However, we have the advantage of numbering among our readers M. Lancaster, the surviving editor of the *Bibliographie Générale de l'Astronomie*, in which work Vol. I., part 1., page 455, the 1539 edition is entered as—

**1051. FIRMINUS [FIRMICUS.]**

Repertorium de mutatione aeris, tam via astrologica quam metheorologica, pristino nitore restituta.

Fol., Parisiis, 1539 par P. Joallain [us].

C'est l'ouvrage précédent sous un autre titre.

We naturally look at the preceding entry and here it is :—

**1050. FIRMICUS MATERNUS, J.**

(De nativitatibus) Matheseos institutionis libri VII.

Fol. Venetiis 1497: 4 feuillets préliminaires et 115 feuillets numérotés, imprimés sur 2 colonnes en caractères romains; fig. dans le texte.

Très rare; un exemplaire à la Bibl. marciana de Venise.

We have referred to the copy of Firmicus in the British Museum, and can trace no resemblance whatever between the works above, numbered 1050 and 1051. Surely, the note that "This is the previous work [*i.e.*, 1050] under another title," must have been inserted by mistake.

We join in Dr. Hellmann's hope that someone will be able to clear the matter up.—ED.]

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**ORDNANCE BENCH MARKS.**

*To the Editor of the Meteorological Magazine.*

SIR,—The extent of the evil pointed out by Mr. Gilbert is shown by the following extract from the "Report of the Progress of the Ordnance Survey to the 31st December, 1889," referring to the re-survey of Lancashire and Yorkshire after an interval of 40 years.

"The re-levelling rendered necessary by the re-survey on the 1-2500 scale has shown that of the bench marks on the principal lines of levelling in the two counties, published in the "Abstracts of the Principal Lines of Levelling in England and Wales," 47 per cent. have been destroyed, 11 per cent. have been disturbed more than

1-10th of a foot, and only 42 per cent. remain undisturbed, that is, differ less than 1-10th of a foot from the published levels. It has also brought to light some interesting facts respecting the subsidence of the ground in the mining districts. At one point on the line, between Warrington and Adlington, the ground has sunk as much as 6·523 feet, and the bench mark on Wigan Old Church Tower has sunk 5·825 feet. In the latter case the levellers observed a subsidence of one foot in twelve months. In the neighbourhood of Barnsley, Doncaster, and Rotherham the ground has sunk (over an area of about 100 square miles) in some cases as much as 5 feet. It is most desirable that the bench marks, of which the levels have been determined with great accuracy and at much cost, should be placed under the care of some local authority with a view to their preservation from ignorant or wilful destruction."

One cause for the rapid disappearance of the marks is the very temporary nature of the objects selected by the survey officers to put them on. The new survey was carried out here about seven years ago, and a large number of new bench marks were cut; a great proportion of these were put on wooden gate posts, a good many on bridge parapets, while houses and other permanent buildings seem to have been to a great extent avoided. Several of those on gate posts have gone already and the rest must follow their fate before many more years have past. A line of their levels came close past here, but they put no mark on the house or other buildings adjacent; the nearest was on the parapet of a small bridge which was washed out by a flood soon afterwards and had to be rebuilt; the next nearest is on a small gate post which cannot last much longer. On the new maps the altitudes are given, to the nearest foot, of a number of points on the surface of the roads; and when the bench marks are gone, these will probably serve for most purposes where extreme accuracy is not required.

Yours truly,

HENRY MELLISH.

*Hodsock Priory, Worksop, Jan. 18th, 1892.*

[It seems to us that the proper plan would be for the Ordnance authorities to erect dwarf pillars with the altitude marked upon them, and for it to be made a misdemeanour for any one to interfere with them except with the written consent of the Director of the Ordnance Survey.—ED.]

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### ROYAL METEOROLOGICAL SOCIETY.

The Annual General Meeting of this Society was held on Wednesday evening, January 27th, at the Institution of Civil Engineers, 25, Great George Street. S.W. Dr. W. Marcet, F.R.S., Vice-President, in the chair.

The Report of the Council for the past year showed the Society to be in a very satisfactory position. In May, the library and offices were removed to more commodious premises at 22, Great George

Street. Thirty-four new Fellows were elected during the year, the total number on the roll of the Society now being 552.

Owing to the absence of the President, Mr. Baldwin Latham, M Inst. C. E., through an attack of influenza, his address on "Evaporation and Condensation" was read by the Secretary.

The question of evaporation is of as great importance as is the study of the precipitation of water on the face of the earth seeing that the available water supplies of the country entirely depend upon the differences between these two sets of observations. The earth receives moisture by means of rain, dew, hoar frost, and by direct condensation. It loses its moisture very rapidly by evaporation. Although evaporation mainly depends upon the difference between the tensional force of vapour due to the temperature of the evaporating surface, and the tensional force of the vapour already in the atmosphere, yet it is largely influenced by the movement of the air, and by its dryness, or the difference between the dew point temperature and that of the air. Evaporation goes on at night as long as the water surface is warmer than the dew point. With sea water the evaporation is about  $4\frac{1}{2}$  per cent. less than with rain water, while with water saturated with common salt the evaporation is 15 per cent. less than with rain water.

In his experiments, Mr. Latham used an evaporating gauge made of copper, 1 foot in diameter (and containing one foot in depth of water) which was floated by means of a hollow copper ring placed 6 inches distant from the body of the evaporator, and attached to it by four radial arms. It was floated in a tank 4 feet in diameter, containing 30 inches depth of water. This form of evaporator was found extremely convenient in carrying on all evaporation experiments. During the period of 13 years, from January, 1879, to December, 1891, this evaporator has never once been out of order or been interfered with in the slightest degree by frost.

Experiments were made, with some 5-inch evaporators, as to the effect of colour on the amount of evaporation, one being painted white, another black, and the results given by these gauges were compared with those by a copper gauge exposed under similar conditions. This comparison was the means of showing that the greatest errors in evaporating gauges arise from the water rising on the sides of the gauge by capillarity, and thus inordinately increasing the amount of evaporation. Consequently a small gauge having a relatively larger amount of side area than a larger gauge, gives a very much greater amount of evaporation.

The results from the floating evaporator, one foot in diameter, show that the average amount of water evaporated annually during 1879-91 was 19.95 inches. It was found however, that, as a rule, during the period from October to March, there were certain occasions when condensation was measured. The amount of these condensations in thirteen years averaged .31 inch per annum, so that the resultant total loss is 19.64 inches per annum. A 5-inch

evaporating gauge freely exposed to atmospheric influences, gave during the same period (1879-91), an average annual depth of evaporation equal to 38·19 inches or almost double. The average annual evaporation, during the three years, 1879-81, from the 5-inch copper gauge standing in water was 27·90 ins. ; from one painted black, 22·97 ins., and from another painted white, 21·74 ins. ; whilst a gauge of the same dimensions freely exposed in the atmosphere, lost, in the same period 36·96 ins., and the 1 foot floating evaporator, 19·40 ins. The 5-in. copper gauge gave a larger amount of evaporation than the gauge painted black.

Mr. Latham next described the percolation experiments which were carried out by Mr. C. Greaves, at Old Ford, by Messrs. Dickinson and Evans, at Hemel Hempstead, and by Sir J. B. Lawes and Dr. Gilbert, at Rothamsted. He then detailed the results of his own experiments, and also the gaugings of the underground waters in the drainage areas of the rivers Wandle and Graveney.

He further stated that in the course of his observations on the flow of underground water, he had observed that at certain particular seasons of the year it was possible to indicate the direction and volume of the flow of underground streams, even when they were at a considerable depth, owing to the formation of peculiar lines of fog.

Dr. C. Theodore Williams was elected President for the ensuing year.

#### REVIEW.

*The Natural History and Scientific Book Circular, No. 115.—Meteorology, Electricity, Magnetism and Galvanism.*—W. WESLEY & SON, Essex Street, Strand. 8vo. 40 pages.

DURING the existence of the *Meteorological Magazine*—i.e., during more than a quarter of a century, no English bookseller has to our recollection, published a catalogue which as regards Meteorology can compare with the above. Even from Mr. Quaritch, who occasionally brings out catalogues thousands of pages thick, we do not remember ever having had such a collection on Meteorology.

The majority of the works are modern, and both among the early and the late ones there are books which we have never before seen, and which may be regarded as rarities ; such as Bartholinus E. De Naturæ Mirabilibus, 1674, with the second earliest engraving of snow crystals—reprinted from the 1660 edition—and an edition of Bloxham's Meteorology of Newport, dated 1858.

The misprints would be few in number were the work a bibliography, for a sale catalogue they are exceptionally rare—in fact we have noticed only on p. 70 Brown, for Broun, and some queer classification (for the works are classed under subjects) in the section on Ocean currents, Tides and Waves—in which it is rather amusing to see Hazen and Woodruff "On cold waves," Kapp "On alternate-current transformers" and the late Dr. Radcliffe's "Behind the Tides," though as regards the last-named work it is not easy to say in what other section it could have been placed.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1891.

STATIONS.  <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.									
England, London .....	84·3	17	44·6	28	70·6	52·8	51·8	74	127·1	40·3	3·82	17	5·8
Malta.....	97·2	10	65·2	28	88·0	70·0	65·7	67	151·6	59·5	·00	0	0·5
<i>Cape of Good Hope</i> ...	76·4	7	36·6	16	64·4	48·6	...	...	...	...	7·35	10	5·2
<i>Mauritius</i> .....	75·0	16	58·0	2	72·9	62·9	59·4	76	128·2	47·3	2·06	24	5·0
Calcutta.....	94·2	2	76·2	30	88·0	78·7	78·5	86	158·3	74·9	8·28	14	7·7
Bombay.....	88·4	12	73·7	21	84·4	77·8	76·6	87	140·8	70·9	32·48	28	9·3
Ceylon, Colombo .....	86·7	10	72·3	24	84·7	76·7	72·2	79	144·0	68·0	4·59	17	5·1
<i>Melbourne</i> .....	61·3	8	33·9	31	55·7	43·5	44·7	84	114·4	29·5	7·02	14	6·4
<i>Adelaide</i> .....	67·6	4	37·4	31	58·7	44·1	43·5	75	124·2	26·8	2·83	19	5·7
<i>Tasmania, Hobart</i> .....	58·7	5, 9	34·0	27	53·2	39·6	43·1	87	114·0	26·3	2·61	19	6·1
<i>Wellington</i> .....	57·5	30	31·3	13	51·3	39·5	40·7	85	104·0	20·0	5·23	22	4·8
<i>Auckland</i> .....	63·0	5	40·5	25	56·4	47·0	42·8	72	117·0	27·0	5·23	16	6·1
Jamaica, Kingston.....	96·1	3	72·0	1	90·4	75·0	69·7	64	...	...	·49	...	...
Trinidad .....	92·0	27	68·0	9	87·5	71·1	72·5	80	155·0	65·0	11·88	24	...
Toronto .....	83·9	13	45·0	27	73·6	54·7	54·6	73	...	39·0	2·16	12	5·3
New Brunswick, } Fredericton .....	83·5	14	46·5	23	75·2	53·9	58·2	76	...	...	5·15	15	5·5
Manitoba, Winnipeg } British Columbia, } Esquimalt .....	80·8	14	36·0	19	72·9	49·5	54·3	77	...	...	2·01	15	4·6
	88·6	23	43·9	7	71·0	51·3	55·3	85	...	...	·02	2	3·1

REMARKS.

MALTA.—Mean temp. 77°·7 ; mean hourly velocity of wind 7·3 miles. The Sea temp. rose from 80°·0 to 82°·2. J. SCOLES.

*Mauritius*.—Mean temp. of air 1°·1 below, mean dew point 0°·1 above, and rainfall ·23 in. below their respective averages. Mean hourly velocity of wind 10·2 miles, or 1·7 below average ; extremes, 22·3 on 17th and 1·7 on 27th ; prevailing direction S.E. by E. C. MELDRUM, F.R.S.

*Melbourne*.—Mean temp. of air 1°·9, of dew point 3°·3, rainfall 5·27 in., humidity 4, and amount of cloud 0·1 above their respective averages. Prevailing wind N. ; strong on 8 days. Heavy dews on 10 days. Hoar frost on 10th. Heavy downpour of R on 11th and 12th. T and L on the 5th, L on the 6th and 8th. Lunar halos on 4 days. R. L. J. ELLERY, F.R.S.

*Adelaide*.—Mean temp. 0°·2 below the average of 34 years. Rainfall ·21 in. above the average. Resultant direction of wind for the month N.N.W. C. TODD, F.R.S.

*Wellington*.—Generally showery and cold, with prevailing S. wind. Fine towards the end of the month. Generally moderate winds ; foggy on 5 days ; sleet and H on 31st. Mean temp. 2°·2 and rainfall ·66 in. below their averages. R. B. GORE.

*Auckland*.—Very heavy rain on the 4th, 2·46 in. being registered. Mean temp. slightly below the average ; barometric pressure and rainfall slightly above. T. F. CHEESEMAN

SUPPLEMENTARY TABLE OF RAINFALL,  
JANUARY, 1892.

[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.			in.
II.	Dorking, Abinger Hall.	·82	XI.	Builth, Abergwessin Vic.	6·22
„	Birchington, Thor .....	·96	„	Rhayader, Nantgwillt..	5·28
„	Brighton Prestonville Rd	1·04	„	Corwen, Rhug .....	2·37
„	Hailsham .....	1·19	„	Carnarvon, Cocksidia ...	3·67
„	Ryde, Thornbrough .....	1·23	„	I. of Man, Douglas .....	3·46
„	Alton, Ashdell .....	·93	XII.	Stoneykirk, Ardwell Ho.	4·45
III.	Oxford, Magdalen Col...	·45	„	New Galloway, Glenlee	4·46
„	Banbury, Bloxham .....	·94	„	Melrose, Abbey Gate ...	1·74
„	Northampton, Sedgebrook	1·01	XIII.	N. Esk Res. [Penicuik]	2·00
„	Cambridge, Fulbourne..	·86	„	Edinburgh, Blacket Pl..	1·05
„	Wisbech, Bank House..	·97	XIV.	Glasgow, Queen's Park.	2·32
IV.	Southend .....	·31	XV.	Islay, Gruinart School..	5·66
„	Harlow, Sheering .....	·56	XVI.	Dollar .....	2·57
„	Rendlesham Hall .....	1·05	„	Balquhider, Stronvar..	7·37
„	Diss .....	1·04	„	Coupar Angus Station..	1·69
„	Swaffham .....	·91	„	Dunkeld, Inver Braan..	3·00
V.	Salisbury, Alderbury ...	1·10	„	Dalnaspidal H.R.S. ...	7·17
„	Bishop's Cannings .....	·87	XVII.	Keith H.R.S. ....	...
„	Blandford, Whatcombe .	1·92	„	Forres H.R.S. ....	2·40
„	Ashburton, Holne Vic...	2·91	XVIII.	Fearn, Lower Pitkerrie.	1·89
„	Okehampton, Oaklands.	3·77	„	Loch Shiel, Glenaladale	...
„	Hartland Abbey .....	2·71	„	N. Uist, Loch Maddy ...	7·28
„	Lynmouth, Glenthorne.	1·98	„	Invergarry .....	3·91
„	Probus, Lamellyn .....	2·47	„	Aviemore H.R.S. ....	...
„	Wincanton, Stowell Rec.	2·42	„	Loch Ness, Drumnadrochit	5·64
„	Clevedon, Charleville ...	...	XIX.	Laig H.R.S. ....	3·10
VI.	Bristol, Clifton .....	1·49	„	Scourie .....	3·70
„	Ross, The Graig .....	1·90	„	Watten H.R.S. ....	2·64
„	Wem, Clive Vicarage ...	2·16	XX.	Dunmanway, Coolkelure	5·62
„	Cheadle, The Heath Ho.	2·63	„	Fermoy, Gas Works ...	2·60
„	Worcester, Diglis Lock	2·01	„	Killarney, Woodlawn ...	5·26
„	Coventry, Coundon ....	1·31	„	Tipperary, Henry Street	3·16
VII.	Ketton Hall [Stamford]	1·25	„	Limerick, Kilcornan ...	2·30
„	Grantham, Stainby .....	1·17	„	Ennis .....	3·02
„	Horncastle, Bucknall ...	·83	„	Miltown Malbay .....	2·52
„	Worksop, Hodsck Priory	1·23	XXI.	Gorey, Courtown House	·91
VIII.	Neston, Hinderton .....	2·49	„	Mullingar, Belvedere ...	1·65
„	Knutsford, Heathside...	3·89	„	Athlone, Twyford .....	1·50
„	Lancaster .....	...	„	Longford, Currygrane...	1·21
„	Broughton-in-Furness..	6·69	XXII.	Galway, Queen's Coll...	2·22
IX.	Ripon, Mickley .....	1·46	„	Crossmolina, Enniscoe..	5·80
„	Scarborough, West Bank	1·38	„	Collooney, Markree Obs.	3·07
„	East Layton [Darlington]	1·67	„	Ballinamore, Lawderdale	2·75
„	Middleton, Mickleton..	2·03	XXIII.	Lough Sheelin, Arley ..	1·64
X.	Haltwhistle, Unthank..	2·22	„	Warrenpoint .....	2·94
„	Bamburgh .....	1·41	„	Seaforde .....	3·18
„	Newton Reigney .....	2·25	„	Belfast, New Barnsley..	3·98
XI.	Llanfrechfa Grange .....	2·21	„	Bushmills, Dundarave...	3·22
„	Llandoverly .....	3·05	„	Stewartstown .....	2·83
„	Castle Malgwyn .....	2·08	„	Buncrana .....	3·23

JANUARY, 1892.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which -01 or more fell.	TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Max.		Min.		In shade.	On Grass.		
				Dpth	Date			Deg.	Date			Deg.	Date
I.	London (Camden Square) ...	.50	- 1.12	.13	22	13	52.0	29	22.8	12	1	26	
II.	Maidstone (Hunton Court)...	.51	- 1.04	.12	23	8	...	...	...	...	...	...	
„	Strathfield Turgiss .....	.70	- 1.11	.11	6	14	51.1	30	18.6	12	22	27	
III.	Hitchin .....	.84	- .70	.17	8	14	52.0	31	14.0	11	20	...	
„	Winslow (Addington) .....	.97	- .84	.16	10	15	53.0	31	12.0	12	20	27	
IV.	Bury St. Edmunds (Westley)	1.16	- .31	.24	5	11	52.0	29	9.0	9	...	...	
„	Norwich (Cossey) .....	1.04	- .45	.22	5	9	...	...	...	...	...	...	
V.	Weymouth (Langton Herring)	2.00	- .34	.82	16	13	51.0	30 <sup>a</sup>	22.0	10	16	...	
„	Torquay, Babbacombe .....	1.43	- 1.39	.53	16	13	53.8	30	23.8	9	12	17	
„	Bodmin (Fore Street) .....	3.86	- .15	.71	16	25	...	...	...	...	...	...	
VI.	Stroud (Upfield) .....	1.14	- 1.06	.27	18	20	53.0	30	23.0	11	21	...	
„	Church Stretton (Woolstaston)	2.74	+ .58	.53	18	20	50.5	29	19.0	9	19	26	
„	Tenbury (Orleton) .....	2.11	- .03	.63	16	17	54.5	29	11.0	12	19	23	
VII.	Leicester (Barkby) .....	1.03	- .73	.19	10	17	53.0	30	4.7	11	22	28	
„	Boston .....	.92	- .47	.45	11	6	52.0	28	17.0	10 <sup>d</sup>	22	...	
„	Hesley Hall [Tickhill] .....	.94	- .83	.14	10	16	54.0	29	7.0	16	23	...	
VIII.	Manchester (Plymouth Grove)	3.18	+ .72	.55	27	17	52.0	29	17.0	8	16	22	
IX.	Wetherby (Ribston Hall) ...	.76	- 1.13	.18	11	9	...	...	...	...	...	...	
„	Skipton (Arncliffe) .....	4.90	- .74	.74	28	19	58.0	5	14.0	16	14	...	
„	Hull (Pearson Park) .....	1.15	- .62	.25	27	18	52.0	29 <sup>b</sup>	20.0	16	21	25	
X.	Newcastle (Town Moor) .....	1.47	- .34	.50	9	12	...	...	...	...	...	...	
„	Borrowdale (Seathwaite) .....	14.44	+ 2.26	2.31	28	23	...	...	...	...	...	...	
XI.	Cardiff (Ely) .....	2.54	- .75	.55	16	17	...	...	...	...	...	...	
„	Haverfordwest .....	3.03	- 1.39	.62	17	23	49.8	29 <sup>b</sup>	12.0	10 <sup>e</sup>	12	17	
„	Aberystwith, Goggerddan ..	3.27	- .26	.75	29	17	49.0	27 <sup>c</sup>	8.0	9	15	...	
„	Llandudno .....	2.73	+ .45	.50	17	18	51.0	29 <sup>b</sup>	27.0	15 <sup>d</sup>	8	...	
XII.	Cargen [Dumfries] .....	3.34	- .43	1.06	17	20	54.8	29	19.0	16	19	...	
„	Jedburgh (Sunnyside) .....	1.39	- .33	.37	18	9	53.0	29	13.0	16	20	...	
XIV.	Old Cumnock .....	3.39	- .60	.62	23	25	...	...	...	...	...	...	
XV.	Lochgilthead (Kilmory) .....	5.82	- .32	.79	28	22	...	...	15.0	9	18	...	
„	Oban (Craigvarren) .....	6.33	...	1.09	23	27	49.8	26	23.0	9	10	...	
„	Mull (Quinish) .....	6.67	+ 1.00	1.01	26	25	...	...	...	...	...	...	
XVI.	Loch Leven Sluices .....	2.00	- .90	.80	19	10	...	...	...	...	...	...	
„	Dundee (Eastern Necropolis)	1.60	- .37	.75	18	9	59.6	29	13.9	13	17	...	
XVII.	Braemar .....	2.50	- .19	.44	7	18	50.3	29	13.0	15	21	27	
„	Aberdeen (Cranford) .....	3.58	...	1.30	18	21	58.0	28	13.0	12	17	...	
XVIII.	Strome Ferry .....	8.14	+ 2.15	1.85	28	25	...	...	...	...	...	...	
„	Cawdor [Nairn] .....	3.41	+ 1.24	.98	7	23	...	...	...	...	...	...	
XIX.	Dunrobin .....	3.23	+ .77	.40	28	21	52.0	29	20.0	13	18	...	
„	S. Ronaldsay (Roeberry) .....	4.85	+ 1.90	.83	28	28	49.0	29	25.0	6	13	...	
XX.	Darrynane Abbey .....	3.97	...	.60	15	29	...	...	...	...	...	...	
„	Waterford (Brook Lodge) ...	1.40	- 2.16	.46	16	11	56.5	29	19.0	12	14	...	
„	O'Briensbridge (Ross) .....	2.84	...	.57	7	23	52.0	30 <sup>a</sup>	24.0	11	19	...	
XXI.	Carlow (Browne's Hill) .....	1.58	- 1.32	.43	16	12	...	...	...	...	...	...	
„	Dublin (Fitz William Square)	1.70	- .16	.62	16	20	54.0	29	22.2	10	15	25	
XXII.	Ballinasloe .....	1.70	- 1.38	.27	31	18	48.0	29	15.0	10	24	...	
„	Cliffden (Kylemore) .....	6.45	...	1.27	21	30	...	...	...	...	...	...	
XXIII.	Waringstown .....	3.27	+ .62	1.40	8	21	55.0	29	16.0	15	23	24	
„	Londonderry (Creggan Res.) ..	4.48	+ 1.06	.88	7	25	...	...	...	...	...	...	
„	Omagh (Edenfel) .....	2.40	- .62	.35	8	26	53.0	29	17.0	11	18	23	

<sup>a</sup> And 31.    <sup>b</sup> And 30.    <sup>c</sup> And 28.    <sup>d</sup> And 16.    <sup>e</sup> And 12.

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

## METEOROLOGICAL NOTES ON JANUARY, 1892.

**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 month opened fine and clear with a high bar, but by the 7th pressure had decreased an inch, followed by fog and light rains and a very little S. The middle portion was fairly fine with slight R; and the month closed with rough but warm winds. Honey bee seen for the first time on 24th.

**ADDINGTON.**—The morning of the 6th was mild, the temp. at 9 a.m. being 40° when a loud peal of T occurred, followed immediately by a violent H storm, reducing the temperature to 35° in a few minutes. Intense frost on 12th, 14th and 16th; no other low readings during the month. A great rise of temp. occurred on the 29th, the max. of that, and the two following days, being above 50°. The first S of the winter fell on the 7th, and on the 9th a fall of 3 or 4 inches occurred.

**BURY ST. EDMUNDS, WESTLEY.**—A cold period prevailed from the 7th to the 17th; S falling on the 7th, 8th and 10th. Distant T on 11th.

**LANGTON HERRING.**—From the 1st to the 15th the weather was fine and cold, with slight S showers on the 7th and 8th. From the 16th to the end of the month it was mild, and on the last three days the temp. rose to 50° and 51°. On the whole the mean temp. at 9 a.m. was 2°·1 below the average of 20 years. A lunar rainbow was observed on the 6th. Fogs on the 17th, 18th and 22nd.

**TORQUAY, BABBACOMBE.**—A dry, fine, sunny, but rather cold month, with excess of N.W. wind and a rather low bar. R or S showers were frequent from 3rd to 11th, and on 14th; more than half of the month's R fell on 16th and 17th and showers were frequent on 22nd, 23rd, 27th and 28th. It was fine and sunny on the 1st, 4th, 15th, 24th and 25th; mostly dull and gloomy on the 16th, 17th, 18th, 20th and 22nd; cold from 2nd to 5th and 7th to 15th (especially on 10th) and on 20th, 21st and 26th; warm on 17th, 18th, 22nd to 24th and 27th to 31st. The max. in shade rose to, or above 50° on 6 days, but only rose to 31° on the 10th. Gales on 2 days; T and L on only 1 day; S on 6, H on 2, fog on 6, Solar Halos on 2.

**BODMIN.**—Up to the 22nd the coldest January for some years, with some S, H and sleet, but the remainder very mild. Fogs on 4 days.

**STROUD, UPFIELD.**—About an inch of S fell on 10th and again on 16th.

**WOOLSTASTON.**—A cold month. S fell on 11 days in the first three weeks; heavily on the 5th, 6th and 7th, mean temp. 35°·0.

**TENBURY, ORLETON.**—A cold month, the mean temp. being more than 2° below the average; much S and frost from the 6th to the 16th. Aurora Borealis on the 4th.

**LEICESTER, BARKBY.**—A variable month; very cloudy. On the afternoon of the 30th the upper clouds had a remarkably broad edge of prismatic colours most unusual and striking.

**MANCHESTER, PLYMOUTH GROVE.**—A fall of 4 or 5 inches of S occurred on the 7th, and some S and sleet fell on the 14th; dense fog and hard frost occurred on the 9th, and thick fogs on 12th, 15th and 25th. During the last fortnight the weather was mostly mild, damp and foggy. Mean temp. 35°·8.

**HULL, PEARSON PARK.**—S fell on the 5th, 8th, 9th, 10th and 14th; Fogs occurred on 9th, 16th, 20th, 21st, and dense on 23rd; H on 7th, 9th and 14th.

## WALES.

**HAVERFORDWEST.**—Frost set in on the 7th increasing in intensity; S fell on the 8th and notably on the 9th, so as to measure on the level from 7 to 9 in., and higher up towards the hills the level depth was 13 in.; after this the frost became much more intense, and the temp. on the morning of the 10th fell to

12° in the screen 4 ft. from the ground, and again to the same point on the 12th; on the 15th the min. was 17°·5, after which the frost gradually broke up. The rest of the month was wet, chilly and stormy. The coldest January since 1881.

#### SCOTLAND.

**CARGEN.**—The first 20 days of the month were cold, the mean temp. of the period being only 32°·3. Mild weather prevailed during the last week, the mean temp. being 44°·1, about 1° below the mean temp. of April. Several days of thick fog were experienced about the middle of the month. I was seen on the evening of the 7th; S fell on 8 days.

**JEDBURGH.**—The weather was cold up to the middle of the month, but there was comparatively little S for January. Snowdrops in bloom on 25th. S on 5 days.

**OLD CUMNOCK.**—S on 6 days; frost on 8th and 9th. High winds from the 26th to the end of the month.

**OBAN.**—The month was memorable for severe weather of every type; blizzards and floods of R. In the hurricane of S from the 3rd to the 13th many roads were impassable and as much as 15 ft. drifts were met with, so that the mail carts were stopped and even on horseback the postmen in several cases had to return without reaching their destination. The cold was intense. This was followed by great floods of R to the close, but little injury was done.

**MULL, QUINISH.**—Heavy S storm and gale from N. on 6th, 7th and 8th.

**S. RONALDSAY, ROEBERRY.**—A very wet and rough month. The wettest January for 25 years, but exceeding January 1884 by only ·01 in.

#### IRELAND.

**DARRYNANE ABBEY.**—A heavy fall of S occurred from the 6th to the 9th both included, which lay on low ground until the 16th, an event which has not occurred since January 1881. Hard frost prevailed from the 9th to the 13th; during the rest of the month constant small R fell. Thick fogs occurred on the last 4 days. Heavy H showers on 14th.

**WATERFORD, BROOK LODGE.**—Slight S fell on the 7th, 8th and 9th and heavy S on the 10th. Thick fogs occurred on 18th, 19th and 20th; a gale from S.E. with H on 16th; bees out working on 29th. Mean temp. 38°·6.

**O'BRIENSBRIDGE, ROSS.**—Severe frost prevailed from the 6th to the 16th, and S fell almost daily. The temp. was very low up to the 20th, but gradually rose after that date reaching a mean of 43° by the end of the month.

**DUBLIN.**—An inclement, cold, and cloudy month. A period of cold, which was ushered in by frequent snowstorms early in the month, lasted, with slight and temporary intermissions, until the 23rd, when the South Westerly type of weather became established, strong S.W. to W. winds, high but variable temp. and frequent showers and gales prevailing day after day to the end of the month. To this decided change is due the fact that the mean temp. of the month is only 2°·7 below the average, notwithstanding the cold of the first three weeks of the new year.

**BALLINASLOE.**—S on the 3rd and 8th. Gales on 15th, 16th and 31st. Thick fog all day on 18th, 19th and 20th.

**WARINGSTOWN.**—Very heavy S with high winds on the 6th, 7th and 8th, fully 1 ft. deep over all, and some heavy drifts.

**EDENFEL.**—The month commenced in raw dull weather which with a falling temp. was accompanied by more or less S from the 3rd onwards, culminating on the 8th in the heaviest fall since January, 1867, viz. : an average of 10 in., but reaching to several feet in drifts over the fields and roads. Curiously the lowest temp. of the month 17° was reached at 2.30 in the day of Monday the 11th, from which however it speedily rebounded to 28° A dull slow thaw with an almost motionless ther. about 33° set in on the 13th and much of the snow remained till near the end of the month.