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SUNBURN.

WHY do the pale denizens of cities become more rapidly brown in some localities than in others? This does not appear a very difficult question, and yet we are not sure that Dr. Bowles* has answered it perfectly. It is, of course, rash for any one not versed in physiology to even hint that a doctor may be wrong; and very possibly we shall have to pay the penalty and be one more proof of the proverb, which we prefer not to quote, as to certain persons entering where certain spirits are wiser. But we risk the penalty in order to obtain a certain and absolute reply to the question with which we began.

Dr. Bowles has for many years spent the early summer months (*i.e.*, before the majority of tourists go there, and before much of the snow is melted) in the Alps, and in the pamphlet we have quoted strings together his experience. On the very first page there is a paragraph which epitomizes so much that we quote it verbatim:—

"It will, I think, be readily conceded by Alpine climbers that sun on snow burns more quickly than on rocks or in the heated valleys at a lower elevation, although one may feel the heat more in the two latter situations; it is when one reaches the snow that one adopts veils, masks, and snow-glasses."

In order to put Dr. Bowles's case quite clearly, we must set out in as few words as possible the principal arguments and statements in the pamphlet. All persons, however, who desire to master the subject must go back to the pamphlet and read every word of it. Now for the epitome.

(1) Glass workers, iron workers, and many others exposed to intense heat do not suffer from sunburn.

(2) Although it is much hotter in valleys than on snow-covered mountains, sunburn is found only in the cooler place.

(3) One may lie long on one's back with the face exposed to the sun, and yet not become sunburnt; therefore heat alone is not the cause.

* "Sunburn on the Alps," by Robert L. Bowles, M.D., F.R.C.P. (Lond.) London, Stanford, 1890. 8vo., 20 pages.

(4) Dr. Tyndall said that he was never more burnt on Alpine snows than while experimenting with the electric light at the North Foreland, where the heat was not great, and there was no snow.

(5) A gentleman crossed the Findelen glacier to ascend the Findelen Rothhorn (11,214 ft.); he felt no inconvenience until he was near the top, and then for about ten minutes he was on new snow; in five minutes he began to feel sunburn, and in the evening the symptoms were fully developed.

(6) A gentleman and lady say that they were never more sunburnt than on a day without a gleam of sun, on which they ascended the Pigne d' Arolla (12,472 ft.). They were so enveloped in cloud that the guides nearly lost their way, and it was so cold that the lady's hands were blue and senseless.

(7) Dr. Bowles, in order to try the preservative effect of colour, painted his face brown, and on a brilliant day, when there was much snow, ascended the Gorner Grat (10,289 ft.), accompanied by about 80 persons out of the 100 staying at the Riffel Hotel. Everyone, except Dr. Bowles, who made the ascent suffered in the evening from sunburn, but he, and the 20 who had remained near the hotel, escaped.

(8) The Fijians, who usually paint their faces with red and white stripes, invariably blacken them when they go fishing on the reef in the full glare of the sun.

(9) On the Sikhim Hills the natives blacken the skin round their eyes to palliate the glare of the sun from fresh snow.

(10) Those who winter at Davos (5,105 ft.) become extremely brown, more so than those who are there in summer, unless the latter go above the snow line.

(11) Such portions of the wood of chalets, in lofty situations, as are protected from snow glare are a dirty white; those exposed to it are brown.

Dr. Bowles considers that—

(12) Heat *quâ* heat is not the cause of sunburn.

(13) Sunburn is probably due to ultra violet rays reflected from snow.

(14) Altitude alone does not explain sunburn; one may be free from it among rocks at 10,000 ft., and suffer on descending to 6,000 ft. among snow.

(15) Captain Abney finds an excess of violet or ultra violet rays at great altitudes, and thinks that sunburn depends largely on altitude.

(16) Prof. Langley thus describes his experience when climbing to the summit of Mount Whitney (15,000 ft.) :—

"In the desert at the bottom of the mountain the heat was found almost

unbearable—237° in the sun, and not much less in the tent.* And now come the points of interest in relation to my own observations on Sunburn. The desert sun had tanned the faces of the travellers to, 'a leather-like brown.' As they ascended they found the cooler air delightful, 'but soon,' says Professor Langley, 'the cooler it grew the more the sun burnt the skin—quite literally burnt, I may say, so that by the end of the third day my face and hands, case-hardened as I thought in the desert, began to look as if they had been seared with red-hot irons, here in the cold where the thermometer had fallen to freezing at night; and still as we ascended the paradoxical effect increased; the colder it grew about us, the hotter the sun blazed above. We have all heard probably of this curious effect of burning in the midst of cold, and some of us may have experienced it in the Alps, where it may be aided by reflection from the snow, which we did not have about us at any time except in scattered patches; but here by the end of the fourth day my face was scarcely recognizable, and it almost seemed as though sunbeams up here were different things, and contained something which the air filters out before they reach us in our customary abodes. Radiation here is increased by the absence of water vapour too, and on the whole this intimate personal experience fell in almost too well with our anticipations that the air is even a more elaborate trap to catch sunbeams than had been surmised, and that this effect of selective absorption and radiation was intimately connected with that change of the primal energies and primal colour of the sun which we had climbed towards [it] to study.'"

We have already intimated that we criticize this pamphlet chiefly in order to elicit further information, and with perfect readiness—nay, desire—to be corrected where we go wrong.

As regards **2** it is as well explained by **15** as by **13**.

As **3** is a distinct statement, we cannot say more than that we were not previously aware of it.

How does the author reconcile **4** and **6** with **13**?

8 does not seem to show more than that precautions are necessary where there is no snow.

Considering the difference between a man's face and a fir plank, the support derived from the fact stated in **11** does not seem great.

* Feeling sure that this statement required explanation, we have obtained a copy of the lecture given by Prof. Langley at the Royal Institution, which Dr. Bowles has paraphrased in the above words. But he has not quite caught the facts as then stated by Prof. Langley, who said, "Close by these tents a thermometer, covered by a single sheet of glass, and surrounded by wool, rose to 237° in the sun, and sometimes in the tent which was darkened for the study of separate rays, the heat was absolutely beyond human endurance." The temperature in such a box proves little; we have seen it above 212° in England, and from an examination of Prof. Langley's official report, we fancy that he was quoting from memory, mixing up his low level and high level observations, and giving the reading of 236° which occurred, not at Lone Pine 3760 ft., but at Mountain Camp, 11,625 ft. above sea level, and when the air temperature was only 60°·8! That it was very hot in the dark tent at the low level station at Lone Pine we do not doubt, but the highest shade temperature that we can find recorded there was 91°·5 at 0·35 p.m., on August 20th, 1881, when the wet bulb (with a bad covering) read 61°·4, so that the air was extremely dry, and therefore the heat would not be serious—of course, in a dark tent it would be uncomfortable.

14 and 15 do not agree, and 16 (when toned down to less vivid language) implies that sunburn may be due to (A) the direct heating rays of the sun, (B) increased altitude, or (C) increased dryness.

We are not quite clear as to what the author calls sunburn, because sometimes he seems to imply merely the browning of the skin, at other times he refers to "face . . . immensely swollen, red and painful . . . all covered with yellow blisters." When these blisters peal off, is the new skin brown?

BROCKEN SPECTRE IN THE LAKE DISTRICT.

RETURNING yesterday, August 27th, from an ascent of Scawfell Pike with my friend Charles James Spence, of Newcastle, and our sons, we were witnesses of a rare and striking spectacle. It had rained doggedly for two hours during our descent on the Piers Ghyll side, heavy clouds beneath us obscuring the valley. Taking the most direct line for Buttermere, we went over the summit of Base Brown, 2,100 ft., by which time the rain had ceased. The mist clouds were rising and curling majestically up the sides of the mountain ranges around us, and when the sunlight, almost suddenly, at 6.15 p.m., shot through a break in the clouds, above Brandreth on our west, we all at once observed a circular double rainbow athwart the mist-cloud on the opposite, or Borrowdale, side of us. The colours were perfect, although not particularly brilliant; and the two rings of each series of colours were complete. The figures of our party were represented in shadow right across the double rainbow circle, considerably magnified, and every movement we made of our arms and legs, and the waving of our hats and waterproofs, was pantomimically repeated by our gigantic and glorified counterparts. This exciting spectacle lasted about six or seven minutes.

I have been tolerably familiar with Cumberland mountain scenery for the last forty years, and have made many ascents at all times of the day and night, but this is the first time I have witnessed this beautiful phenomenon, and as it is rare, it may be worth while to place it on record.—EDMUND PROCTOR, Loweswater, Cockermouth. —*Pall Mall Gazette.*

ERRATA IN "METEOROLOGICAL MAGAZINE," 1889.

REGULAR TABLE.

Strathfield Turgis,	Nov., should be...	...	·84 in.
Boston,	March, ,, ,, ...	...	2·17 ,,
Wetherby, Ribston Hall,	July, ,, ,, ...	...	1·69 ,,
Lochgilphead, Kilmory,	Dec., ,, ,, ...	...	7·96 ,,

SUPPLEMENTARY TABLE.

Wakefield	July, should be...	...	1·51 in.
,,	Aug., ,, ,, ...	...	3·56 ,,
,,	Nov., ,, ,, ...	...	·75 ,,
Llanfrechfa Grange,	May, ,, ,, ...	...	3·86 ,,
New Galloway, Glenlee,	Sept., ,, ,, ...	...	2·07 ,,
Tipperary, Henry Street,	Jan., ,, ,, ...	...	2·99 ,,
Galway, Queen's College,	Jan., ,, ,, ...	..	3·72 ,,
,, ,, ,,	April, ,, ,, ...	...	2·01 ,,

TWO TORRENTIAL RAINS ON AUGUST 19TH.

To the Editor of the Meteorological Magazine.

SIR,—We have had another heavy rain in this locality which you may be glad to hear of. It lasted about the same time as the July rain, but came down more in heavy storms than that rain, though it did not, I believe, cease raining all the time. It began a little before seven on the evening of the 19th, and continued to about 5 a.m. on the 20th. Here I registered 2·34 in.; at the Abingdon Sewage Farm, a quarter of a mile west of this, 1·85 in.; at Long Wittenham, one gauge 1·50 in., the other 1·58 in.; at Milton Hill, about three miles south, just under the Berkshire downs, 3·80 in. was registered, but unfortunately the gauge overflowed, but not, it is believed, to any great extent. I imagine that the heavy rainfall must have been very local, as the weather reports do not speak of any heavy rainfall.—I am, yours faithfully,

F. C. CLUTTERBUCK.

Culham Vicarage, Abingdon, August 22nd, 1890.

SIR,—The rainfall at Upminster, both for July and August, was over 4½ inches, but on only one occasion did we get the fringe of what you describe as "torrential" rain, viz., August 19th, when 1·47 in. fell in about two hours; but a mile north, in a band between Brentwood and Harold Wood, stretching from Little Warley to Noak Hill, the fall was greater than I have ever seen, and even now some of the roads are like a sea beach or the beds of mountain torrents. The rain fell in short, sharp showers, with large hot drops, and even on the sides of some of the hills was running nearly two inches deep. On my way home there was no rain at Ilford, and at Romford only a little, while at Harold Wood the water was running down the line (G.E.R.), washing the sleepers out. I could only just get over the Ingrebourne at Harold Wood, and a little farther on the water came up to the bottom of my cart, and the roar of the water and rain was so great that I could scarcely hear the thunder. About half a mile on I went out of the storm like going out of a wall of water. I know of no rain gauge in this district, but a visit to the district even now would convince you that my story is not overdrawn.—Yours faithfully,

G. P. HOPE.

Upminster Hall, Essex, September 4th.

N.B.—In some places the water rose above the marks of August 1st, two years ago.

AUTUMN CONGRESSES.

FOR some persons there is no peace. Three autumnal congresses have already been held, at each of which meteorological subjects have been discussed.

The Association Française met at Limoges, under the presidency of one of the greatest physicists of the present day, Prof. Cornu, who delivered one of those delightful addresses for which he has an unequalled reputation. We have not a complete list of the members present, but we see that Prof. Ragona, of Modena, and Mr. Lawrence Rotch, of the Blue Hill Observatory, were there as Honorary Presidents, M. Leon Teisserenc de Bort as President, and Dr. Fines as Vice-President, so that it was evidently a strong, if not large gathering. As we understand that the papers and proceedings will be reported in our contemporary the *American Meteorological Journal*, we refer our readers to its pages, as it is unwise to set up the same details in both journals.

The Sanitary Institute held its Congress at Brighton, and naturally a paper on the climate of that excellent health resort was among the best sent in—from it we have drawn up the following abstract.

On "The Climate of Brighton," by F. E. SAWYER, F.S.A.

TEMPERATURE.

The proximity of Brighton to the sea affects its climate in three ways :—

1. By reducing the mean daily range of temperature.
2. By raising the temperature in the winter months.
3. By lowering the temperature in the summer months.

The appendix to this paper contains a summary of meteorological observations for more than twenty years. From Table I. it will be seen the mean daily range of temperature yearly was 11·8 deg.; being 15·9 deg. in June, diminishing to 7·7 deg. in January. These daily ranges are of course small compared with those of inland places. The lowest temperature was 11·4 deg. on January 22nd, 1881 (the time of "the great snow-storm"). On the 15th of that month the min. temp. was 15·5 deg.; on the 17th, 16·7 deg.; and the 20th, 17·3 deg. With the exception of these four days no lower temperature than 18 deg. was recorded, viz., in December, 1870 (the winter of the Franco-Prussian War). This clearly shows the influence of the sea, as in the interior of the country we find the temperature fell below zero at many places. Fashion has, perhaps, somewhat empirically, fixed the Brighton season for the period from the end of September to the middle of December; and it is a curious fact that it is then that the advantages of Brighton are most apparent, the chills of autumn being avoided, and the mean

temperature in excess of that at Greenwich, as will be seen by the following table :—

MEAN MONTHLY TEMPERATURE.
(arithmetical mean daily max. and min. temperatures.)

	BRIGHTON. deg.	GREENWICH. deg.	DIFFERENCE. deg.
September	58·0	56·6	— 1·4
October	50·4	49·5	— ·9
November	43·8	42·4	— 1·4
Mean	50·7	49·5	— 1·2

The mitigating influence of the sea on the heat of summer is proved by the fact that the temperature has not risen above 90 deg. The highest in my own register during twenty-three years, being 86·7 deg. on July 17th, 1868. During the summer months the well-known phenomena of the land and sea breezes are particularly noticeable at Brighton, the most marked being the easterly. The land breeze N.E. or E. blows until from 10 to 11 a.m., and a morning will open very sultry and oppressive until the cool sea breeze sets in. This lasts until sunset, or sometimes until midnight, when the land breezes begin again. A cool and comfortable day is thus enjoyed, even in the height of summer. When these breezes are westerly, the land breeze is from N.W. or W., and the sea breeze from the S.W. or S., occasionally S.E. Sometimes the land breeze begins in N.E., is followed by S. or S.W. sea breeze and then a N.W. or N. land breeze again, or the reverse way, but this is not often.

The mean temperature of the year (arithmetical mean of daily max. and min. temperatures) is 49·8 deg., the monthly means ranging from 63 deg. in July to 38·8 deg. in January. The warmest month in the last twenty-three years was July, 1868, with a mean of 66·8 deg., and the coldest January, 1881, with one of 33·2 deg.

WIND.

The climate of Brighton has been classed amongst the *bracing*, but this must be from the fact that its pure air is almost always in motion rather than from any lowness of temperature, which, as already seen, is not experienced here.

From September, 1872, to December, 1874, the velocity of the wind was recorded by a Robinson's anemometer, erected at the Chain Pier-head, Brighton; and from the observations of twenty-seven months it appears that the mean horizontal distance travelled by the wind daily during that period was 329 miles, or 13·7 miles per hour, so that there is no lack of fresh air.

RAINFALL.

The mean annual rainfall of twenty years was 28·35 inches; and, as will be seen by Table III., the most rainy month is November, with a total of 3·40 inches; and the driest March, with 1·67 inches.

The greatest fall in twenty-four hours was 1·99 inches, on June 22nd, 1876, being the largest recorded by any observer in Brighton. It is somewhat remarkable that no heavier fall of rain has occurred, but it may be due to the fact that the town is very free from thunderstorms.

(To be continued).

THUNDERSTORM, AUGUST 2ND.

To the Editor of the Meteorological Magazine.

SIR,—I now give you an account of a singular storm of which I was witness on August 2nd (Saturday last). It threatened rain, and thunder was heard at 3 p.m.; but that storm passed by, and I ordered the carriage to take me to a neighbour's about six miles off this place to the S.W. The house stands on an eminence, and the window of our room faces almost due N. From this window, about 5 p.m., I watched the approach of a fresh storm. The view commanded about three miles of plain, backed by wooded high ground. Having passed this high ground, the cloud swept on exactly like a black pall trailed over the surface of the ground. In front of it, and rising from the ground, was a sparse white cloud, which I took to be smoke. It was not, however, smoke, but vapour, for when the storm had passed on to be exactly over the house there showed in front of it a quantity of white curling vapour not more than 100 feet high. The rain was violent, and there were some claps of thunder, the lightning being vivid and *red*, as it always is when seen through vapour.

I account for the smoke-like vapour thus :—Just before, at 3 p.m., as I said, there had been a copious shower, followed by bright sunshine, which permitted of rapid evaporation of all the drops that hung in the vegetation. Then, when the air was full, during the bright sunshine, of invisible vapour, came the dark thick thundercloud, which suddenly reducing the temperature, caused the ascending vapour to become visible, and so seemed to swallow it up and carry it on with it, filling up the usual space between the ground and a cloud with newly-formed visible vapour.

The rainfall with us was not great for both showers together, 0·16 in. only.—Yours truly,

JOHN SLATTER.

Whitchurch (Oxon.), near Reading, August 8th, 1890.

REMARKS ON THE DISCUSSION CONCERNING BAROMETRIC DEPRESSIONS.

To the Editor of the Meteorological Magazine.

SIR,—Prof. Hazen's letter has suggested to me the following calculation, which may perhaps interest some of your readers :—

A fall of 1·00 inch of rain supplies a little over 5 lbs. of water to each square foot of surface, and the latent heat set free by the condensation of this water at ordinary temperatures is about 5,000 thermal units. Taking Joule's mechanical equivalent of heat as 772 foot pounds, we get the large amount of 3,860,000 foot pounds of energy set free over every square foot of the earth's surface on which rain falls to the depth of 1·00 in. The weight of air resting on each square foot is about 2,100 lbs. ; and thus, if the whole energy were used in imparting motion to this air, we should get the extreme velocity of about 240 miles per hour in the whole mass of air resting upon the rainfall area. For a velocity of 60 miles per hour, which is seldom exceeded in our most violent gales, only $(\frac{1}{4})^2$ of 1·00, that is, less than ·07 in. of rain, is required.

No doubt the whole of the energy set free does not take the form of direct motion ; but a large part of it must go to raising the temperature of the air, or perhaps it should be said, to counteracting the fall of temperature which causes the rain ; still, considering the small proportion of the energy that is required, even when the rain which accompanies the cyclone is moderate, it is strange that anyone should say that the cause is incapable of producing the effect.

Of course, it does not follow that because the cause assigned by Prof. Ferrel is capable of producing the effects, it must therefore be the actual cause, but it seems only reasonable to suppose that when such a large supply of energy is afforded by the condensation of vapour, some small part of it should take the form of kinetic energy and appear as wind, and I agree with Mr. Clement Ley in thinking that the indications of Prof. Ferrel's theory being the true one are unmistakable.

W. H. DINES.

SIR,—Some of your readers will, I hope, be grateful to me for having, by the mention of his name, elicited a letter from Prof. Hazen. It is common and natural that those who are in a minority should deny that their arguments "have had full attention paid to them." For my own part, I have given much attention to Prof. Hazen's publications, and I do not think that all his arguments should be "ignored as unworthy of attention." That he sometimes makes a statement which is not strictly permissible to a scientific man, and which even reads like one of the expressions of the opponents of science, is shown by the last sentence of his letter in this Magazine for August, 1890, p. 101. The law on which Ferrel's theory is chiefly based has been rightly stated by Messrs. Davis and

Curry to be "thoroughly in accord with well-tried physical principles; it has been abundantly tested by experiment, both on a small scale in the laboratory and, as we may say, on a large scale in nature; it is universally accepted by men eminent in physical study, whose original ability and careful studious work have led them to be regarded as authorities in their science, but who, being authorities, have not thereby become arbitrary and irrational. It is therefore difficult to understand why the question should be so confused by Hazen, as appears in his recent articles."

I did not, as it happens, either state or imply that the work of W. Ferrel is "fundamental and conclusive," but I implied and unhesitatingly state that no one at the present day can expect to receive attention on the subject of the formation of barometric depressions who has not given full attention to Ferrel's writings. Prof. Hazen says that I ought to have mentioned that Ferrel is "second in the field," because he draws largely (as does every scientific man) from the works of his predecessors. Ferrel derives many ideas not only from numerous cis-Atlantic predecessors, but perhaps especially from Espy, to whose work he refers not fewer than ten times in his latest treatise. Prof. Hazen himself gives a specimen of one of such references: and a student who, following my advice, reads Ferrel's works, will find this out for himself, even supposing him actually to have never heard of the "Philosophy of Storms" before. Prof. Hazen would, I presume, think it unjust to recommend the study of the works of the greatest living mathematicians, unless he at the same time mentioned Lagrange?

There is one remark of Prof. Hazen's which is suggestive. He speaks of the "inwardness" noticeable in American meteorologists. If he means that most of them give undue prominence to American sources of information, he ought, I think, to except Ferrel. If, on the other hand, he means that some of them (*pre-eminently and beyond all other men* Ferrel himself) combine with the studious collection of observations and thorough sifting of *objective* facts abundance of *subjective* and intellectual reasoning and careful mathematical demonstration, I for one cordially agree with him. The same may be said of many of our great continental meteorologists. I wish it were equally true of ourselves. To make, collect, and pigeon-hole as many observations as possible seems to be the sole object of many whom we term "meteorologists" in England. But this fact would not of itself deter many of our own ablest mathematicians from the study of meteorological problems. It is the unfortunate fecundity of pet theories, propagated by those who think a little but who do not read at all, belonging to a race which is somewhat lazy and, from a linguistic point of view, very "inward" indeed, which has lent a deterrent aspect of quackery to a most interesting branch of science. Let me take a single example from the discussion I have roughly reviewed. One writer, who is ostentatiously and professedly a non-reader, supposes our anti-cyclones and cyclones to result from air-

waves with interspaces between them, flowing polewards from the equatorial regions, unobserved over the trades, and (as I presume) the monsoons, unobserved over the tropical belts of high pressure, spreading themselves out laterally (over converging meridians), and causing our changes of pressure and weather—(*Met. Mag.*, July, 1890, p. 86)—and he both imagines this idea to be new, and apparently thinks it altogether the better for being new! How rarely do we meet with an English Guldberg, Mohn, Reye, Hann, Köppen, Woeikoff, Sprung, Ekholm, Vettin, Van Bebber, Hertz, or Helmann! How few are the meteorological treatises by an English Helmholtz. And I might well multiply names, not of *absolute authorities*, but of important writers. If the cause of this our great lack be what I suppose, we should endeavour to remedy it.—Yours truly,

W. CLEMENT LEY.

HAILSTORM, AUGUST 24TH.

SIR,—A somewhat remarkable hailstorm occurred here yesterday evening. Having been, in this locality, unaccompanied by thunder and lightning, it will not be reported in thunderstorm observations; but it was in some respects phenomenal. The day had been on the whole fine, but with passing showers, and many Cumulo-Nimbi. The min. temp. of the previous night had been very low, 40·°0 at a height of five feet from the ground. The cloud formed apparently at a short distance N.W. of the town, and rapidly increased in size and extent. Large drops of rain began to fall about 5.25 p.m., which soon changed to hail, which fell with extraordinary persistency for quite 15 minutes. The stones were of a uniform size, the largest the size of large peas. The lawn was quite white, and remained so for some time after the hail ceased, notwithstanding heavy rain, which lasted intermittently till after 6.30 p.m. The stones were drifted several inches deep in the corners of windows facing the storm. The characteristic of the storm was more that of the soft hail frequent in the spring months than of a summer thunderstorm; and this was fortunate, or from the thickness with which the hail fell, the damage would have been enormous. As I said before, no electrical phenomena occurred here, though I see that in London there was a violent thunderstorm. The shower was quite local. The evening, after 7 p.m., was clear and cold, barometer nearly steady at 29·67 in.; total fall of rain during the storm, 0·65 in., and during the 24 hours ending at 9 a.m. to-day, 0·68 in.—Your truly,

C. N. PEARSON.

24, Portland Place, Reading, August 25th, 1890.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEB., 1890.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		0-10
England, London	49·3	1	27·1	28	43·4	33·2	34·2	87	83·4	21·8	1·05	9	6·6
Malta	67·1	20	42·7	13	59·6	49·9	46·5	80	121·2	38·9	5·14	10	5·5
Cape of Good Hope	92·0	14*a*	50·0	1	78·4	59·9	...	...	...	...	1·27	...	3·8
Mauritius	84·0	19	68·6	2	81·8	73·0	70·8	83	138·7	63·1	11·02	27	6·4
Calcutta	90·8	26	50·7	12	83·5	59·5	58·6	67	143·4	40·5	·00	0	0·7
Bombay	89·6	22	67 6	4, 9	85·2	70·6	66·2	67	138·6	54·8	·00	...	0·7
Ceylon, Colombo	90·5	10	69·3	8	87·3	72·3	69·2	74	145·0	63·7	4·36	10	3·4
Melbourne	103·4	6	52·5	24	82·0	60·4	56·4	63	152·3	43·5	·56	5	5·3
Adelaide	97·4	2	56·0	9	85·0	64·0	56·4	54	162·0	47·4	1·93	3	3·3
Wellington	82·0	10	43·0	9	71·4	54·7	51·9	67	139·0	34·0	·24	5	3·7
Auckland	82·0	11	52·0	3	76·4	60·2	54·2	61	147·0	46·0	·07	3	3·7
Jamaica, Kingston	89·1	25	60·2	4	86·9	64·2	65·9	74	...	...	·37	...	...
Trinidad	88·0	25	62·5	12	85·1	66·0	66 6	78	157·0	60·0	·51	6	...
Toronto	53·8	4	3·0	21	35·6	19·7	25·5	85	...	0·0	3·48	22	8·2
New Brunswick, Fredericton	47·8	...	—20·9	...	27·6	2·1	16·3	75	...	...	4·17	13	4·9
Manitoba, Winnipeg	35·3	13	—36·4	26	5·7	—19·1	—1·5	97	...	...	·82	11	4·7
British Columbia, Victoria	49·0	5	12·0	26	29·0	28·9	...	...	...	...	2·33	10	...

a And 22.

REMARKS, FEBRUARY, 1890.

MALTA.—Mean temp. 54°·1 ; mean hourly velocity of wind 12·7 miles. Sea temp. fell to 58°·9. TSS on 5 days ; L on 8th ; H on 3rd, 7th and 12th ; R nearly four times the average. J. SCOLES.

Mauritius.—Mean temp. of air 1°·4 below, of dew point 0°·8 above, and R 4·81 in. above, their respective averages. Mean hourly velocity of wind 7·9 miles, or 3·3 miles below average ; extremes, 21·2 on 17th, and 1·7 on 1st ; prevailing direction of wind, E.S.E. to E. by N. T and L on six days ; T on three days, and L on two days. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on three days, and L was seen on five other days. J. C. H. CLARKE, Lt. Col. R.A.

Melbourne.—Mean temp. of air 4°·8, and of dew point 3°·2 above average. Humidity 3, and R 1·36 in., below average. Prevailing direction of wind S.E. and S. Strong on eight days. The weather during the greater part of the month was very sultry and hazy, and during the earlier part, at times very oppressive. L in S.W., and W. on the evening of the 12th. R. L. J. ELLERY, F.R.S.

Adelaide.—Continued hot weather during the first part of the month, then comparatively mild ; mean temp. 0°·7 above the average of 33 years ; mean pressure slightly below average. C. TODD, F.R.S.

Wellington.—Very fine weather during this month, with little rainfall. Prevailing winds S.E. and S., strong on three days from N.W. Mean temp. 0°·6 above the average. R less than one twelfth of the average. R. B. GORE.

Auckland.—A fine, hot, and almost rainless month. Bar. slightly above the average. Mean temp. 1° above the average ; R almost nil, and the least ever recorded for any month in Auckland. T. F. CHEESEMAN.

TRINIDAD.—R 1·30 in. below the average of 25 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1890.

[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.	3·02	XI.	Castle Malgwyn	2·69
,,	Margate, Birchington...	3·70	,,	Builth(Llanwrtyd Wells)	6·40
,,	Littlehampton	2·52	,,	Rhayader, Nantgwillt..	7·08
,,	Hailsham	3·95	,,	Carno, Tybrith	5·57
,,	Ryde, Thornbrough	3·99	,,	Corwen, Rhug	4·80
,,	Alton, Ashdell.....	3·53	,,	I. of Man, Douglas	3·84
III.	Oxford, Magdalen Col...	2·26	XII.	Stoneykirk, Ardwell Ho.	2·94
,,	Banbury, Bloxham	1·98	,,	New Galloway, Glenlee	3·09
,,	Northampton	1·60	,,	Melrose, Abbey Gate...	4·95
,,	Cambridge, Fulbourne..	1·33	XIII.	N. Esk Res. [Penicuick]	5·60
,,	Wisbech, Bank House..	2·07	XIV.	Ballantrae, Glendrishaig	2·34
IV.	Southend	2·83	,,	Glasgow, Queen's Park.	3·16
,,	Harlow, Sheering	2·78	XV.	Islay, Gruinart School..	5·10
,,	Rendlesham Hall	2·05	XVI.	Dollar.....	2·80
,,	Diss	2·44	,,	Balquhidder, Stronvar..	3·66
,,	Swaffham	2·63	,,	Coupar Angus Station..	2·05
V.	Salisbury, Alderbury...	2·62	,,	Dunkeld, Inver Braan..	2·36
,,	Warminster	2·73	,,	Dalnaspidal H.R.S. ...	4·18
,,	Bishop's Cannings	2·36	XVII.	Keith H.R.S.	4·78
,,	Ashburton, Holne Vic....	...	,,	Forres H.R.S.	4·55
,,	Hatherleigh, Winsford.	3·31	XVIII.	Fearn, Lower Pitkerrie.	3·76
,,	Lynmouth, Glenthorne.	4·11	,,	Loch Shiel, Glenaladale	9·82
,,	Probus, Lamellyn	3·52	,,	N. Uist. Loch Maddy ...	3·66
,,	Launceston, S. Petherwin	4·00	,,	Invergarry	4·07
,,	Wincanton, Stowell Rec.	3·12	,,	Aviemore H.R.S.	2·89
,,	Taunton, Lydeard Ho...	...	,,	Loch Ness, Drumnadrochit	3·25
,,	Wells, Westbury.....	2·92	XIX.	Lairg H.R.S.	3·42
VI.	Bristol, Clifton	2·93	,,	Scourie	6·14
,,	Ross	2·92	,,	Watten H.R.S.	3·83
,,	Wem, Clive Vicarage ...	3·13	XX.	Dunmanway, Coolkelure	3·95
,,	Cheadle, The Heath Ho.	3·56	,,	Fermoy, Gas Works ...	1·79
,,	Worcester, Diglis Lock	2·44	,,	Tipperary, Henry Street	2·86
,,	Coventry, Coundon	2·98	,,	Limerick, Kilcornan ...	2·60
VII.	Ketton Hall [Stamford]	1·76	,,	Miltown Malbay.....	4·77
,,	Grantham, Stainby	2·26	XXI.	Gorey, Courtown House	2·61
,,	Horncastle, Bucknall ...	1·65	,,	Navan, Balrath	3·68
,,	Worksop(Hodsock Priory)	2·15	,,	Mullingar, Belvedere ...	2·93
VIII.	Neston, Hinderton	4·30	,,	Athlone, Twyford	2·62
,,	Knutsford, Heathside ...	3·85	,,	Longford, Currygrane...	3·04
,,	Lancaster, South Road.	6·57	XXII.	Galway, Queen's Coll...	2·86
,,	Broughton-in-Furness ..	6·90	,,	Clifden, Kylemore	4·59
IX.	Wakefield Prison	3·41	,,	Crossmolina, Enniscoe..	4·36
,,	Ripon, Mickley	5·12	,,	Collooney, Markree Obs.	5·04
,,	Scarborough, West Bank	3·87	,,	Ballinamore, Lawderdale	3·98
,,	East Layton[Darlington]	5·39	XXIII.	Warrenpoint	2·87
,,	Middleton, Mickleton..	5·63	,,	Seaforde	3·05
X.	Haltwhistle, Unthank..	6·54	,,	Belfast, New Barnsley..	3·58
,,	Shap, Copy Hill	5·71	,,	Bushmills, Dundarave...	4·69
XI.	Llanfrechfa Grange	3·46	,,	Stewartstown	3·08
,,	Llandovery	4·77	,,	Buncrana	5·20

AUGUST, 1890.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average. 1880–9	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date.	Days on which ·01 or more fell.	TEMPERATURE Max. Deg.	Max. Date	Min. Deg.	Min. Date	No. of Night below 32° In shade.	No. of Night below 32° On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·55	— ·33	·40	19	13	79·7	5	40·4	31	0	0
II.	ENGLAND.	Maidstone (Hunton Court)...	2·49	+ ·80	·68	26	14	...	...	...	...	...	...
,,	ENGLAND.	Strathfield Turgiss	2·31	+ ·60	·81	19	14	78·8	5	36·0	30	0	1
III.	ENGLAND.	Hitchin	2·03	+ ·21	·43	19	18	75·0	5	39·0	31	0	...
,,	ENGLAND.	Winslow (Addington)	1·99	+ ·02	·32	26	16	80·0	5	34·0	30	0	1
IV.	ENGLAND.	Bury St. Edmunds (Westley)	2·20	·00	1·15	10	13	...	...	...	...	...	...
,,	ENGLAND.	Norwich (Cossey)	1·87	...	·57	10	14	...	...	...	...	...	...
V.	ENGLAND.	Weymouth(LangtonHerring)	2·19	+ ·26	·58	9	20	73·0	9, 12	45·0	30	0	...
,,	ENGLAND.	Barnstaple	3·03	+ ·07	·97	9	17	77·0	8	45·0	29	0	...
,,	ENGLAND.	Bodmin (Fore Street)	3·62	+ ·77	·47	9	20	...	...	...	...	...	...
VI.	ENGLAND.	Stroud (Upfield)	2·82	+ ·73	·85	9	18	79·0	6	39·0	29	0	...
,,	ENGLAND.	ChurchStretton(Woolstaston)	4·16	+ 1·40	·91	1	20	72·0	4	42·0	30	0	...
,,	ENGLAND.	Tenbury (Orleton)	2·79	+ ·67	·38	10	19	77·3	4	33·8	30	0	1
VII.	ENGLAND.	Leicester (Barkby)	2·59	+ ·15	·57	22	21	87·0	5	31·0	31	2	4
,,	ENGLAND.	Boston	1·15	+ ·97	·32	10	15	87·0	5	41·0	30	0	...
,,	ENGLAND.	Hesley Hall [Tickhill].....	2·68	+ ·52	1·02	10	18	80·0	5	38·0	31	0	...
VIII.	ENGLAND.	Manchester(PlymouthGrove)	4·52	+ 1·43	·66	10	18	77·0	4, 5	37·0	29*c*	0	2
IX.	ENGLAND.	Wetherby (Ribston Hall) ...	4·44	+ 2·10	·94	11	12	...	...	...	...	...	...
,,	ENGLAND.	Skipton (Arncliffe)	7·12	+ 2·79	1·09	22	22	78·0	5	33·0	31	0	...
,,	ENGLAND.	Hull (The Park)	3·12	+ ·48	·52	10	18	...	...	...	...	...	...
X.	ENGLAND.	North Shields	5·73	+ 2·89	2·21	13	17	78·5	4	...	...	...	...
,,	ENGLAND.	Borrowdale (Seathwaite).....	9·79	+ 1·34	1·36	15	20	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	3·58	— ·03	·81	9	18	...	...	...	...	...	...
,,	WALES.	Haverfordwest	2·95	— ·23	·76	9	17	73·6	7	35·0	29	0	3
,,	WALES.	Plinlimmon (Cwmsymlog) ...	5.57	...	1·00	22	17	...	...	...	...	...	...
,,	WALES.	Llandudno.....	3·95	+ 1·59	·92	10	19	72·9	4	43·5	30	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·08	+ ·09	·74	14	20	73·0	4	33·4	31	0	...
,,	SCOTLAND.	Jedburgh (Sunnyside).....	...	...	...	...	...	...	...	...	...	...	...
XIV.	SCOTLAND.	Old Cumnock	3·45	+ ·03	·44	22	19	77·5	7	31·0	30	1	...
XV.	SCOTLAND.	Lochgilphead (Kilmory).....	4·86	+ ·30	·75	15	22	...	...	37·0	30	...	...
,,	SCOTLAND.	Oban (Craigvarren)	4·90	...	·94	4	19	70·3	10	41·6	31	0	...
,,	SCOTLAND.	Mull (Quinish).....	5·88	+ 1·73	·97	4	20	...	...	...	...	...	...
XVI.	SCOTLAND.	Loch Leven Sluices	3·00	+ ·06	1·00	13	12	...	...	...	...	...	...
,,	SCOTLAND.	Dundee (Eastern Necropolis)	2·65	+ ·08	·50	24	16	72·2	5	37·9	31	0	...
XVII.	SCOTLAND.	Braemar	3·49	+ ·16	·95	12	21	70·2	5	31·7	31	1	3
,,	SCOTLAND.	Aberdeen (Cranford)	3·28	...	·86	15	26	78·0	5	38·0	28*d*	...	...
XVIII	SCOTLAND.	Strome Ferry.....	6·01	+ 1·34	·91	5	26	72·0	9, 10	39·0	31	0	...
,,	SCOTLAND.	Inverness (Culloden)	3·74	+ 1·74	1·32	27	...	71·0	4, 10	37·0	31	0	1
XIX.	SCOTLAND.	Dunrobin	3·46	+ 1·06	·87	26	16	70·0	16	42·5	31	0	...
,,	SCOTLAND.	S. Ronaldsay (Roeberry).....	2·58	+ ·02	·43	15	20	67·0	4	44·0	30*c*	0	...
XX.	IRELAND.	Cork (Blackrock).....	1·92	— 1·40	·40	1	13	76·0	4	40·0	30	0	...
,,	IRELAND.	Dromore Castle	4·65	— ·33	·60	17	19	70·0	18	42·0	30	0	...
,,	IRELAND.	Waterford (Brook Lodge) ...	2·18	— 1·24	·31	9	21	70·0	7	39·0	29	0	...
,,	IRELAND.	O'Briensbridge (Ross)	2·97	...	1·02	22	18	78·0	3*a*	44·0	31	0	...
XXI.	IRELAND.	Carlow (Browne's Hill)	2·70	— ·27	·58	22	17	...	...	...	...	...	...
,,	IRELAND.	Dublin (FitzWilliam Square)	2·80	+ ·28	·85	22	19	74·8	4	41·5	31	0	0
XXII.	IRELAND.	Ballinasloe	2·86	— ·32	·76	22	20	70·0	4*b*	35·0	31	0	...
XXIII	IRELAND.	Waringstown	2·53	— ·58	·41	10	17	79·0	7	36·0	30	0	2
,,	IRELAND.	Londonderry (Creggan Res.).	6·48	+ 2·36	1·40	14	25	..	...	...	...	...	...
,,	IRELAND.	Omagh (Edenfel)	4·74	+ 1·25	·72	27	20	73·0	8	41·0	29	...	...

a And 4, 5, 6, 7, 8. *b* And 7, 8. *c* And 31. *d* And 29, 31.

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

METEOROLOGICAL NOTES ON AUGUST, 1890.

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.

LONDON, CAMDEN SQUARE.—*Erratum*:—Min. temp. for July 42°·4 on 12th, not 45°·1 on 4th as printed.

STRATHFIELD TURGISS.—A cold uncanny month, savouring much of autumn. With the exception of a few fine summer days from the 3rd to the 6th, the temperature was low with strong winds, and heavy rains. From the 19th the thermometer was but little above 60°. Harvest operations were seriously retarded, and the corn much damaged by the wind and R. The close of the month was very cold and unseasonable, but brighter. The first frost on the grass (31°·7) occurred on the 30th. Sharp TS on the 2nd.

ADDINGTON.—A good deal of unsettled weather occurred during the month. The 5th was the only really hot day being the only one on which the temp. in shade rose above 75°. Towards the end of the month the nights were very cold, the min. on grass falling to 31° on 30th. Heavy TS from 4 to 5 p.m. on 2nd and another on 11th.

BURY ST. EDMUNDS, WESTLEY.—The month was a cold one, the 1st and 5th being the only hot days. A very heavy R of 1·15 in. fell on the 10th, with distant T. Although R fell on 13 days, the quantities were small, and being accompanied by drying winds, most of the corn was harvested in good condition.

LANGTON HERRING.—This month like the preceeding two months was wet and cold. The mean temp. at 9 a.m. being 2°·2 below the average. The long continuance of wind from W. S.W. was noticeable. T and L on 9th, 18th and 27th.

BODMIN, FORE STREET.—On the 9th, between 9.30 and 10.30 p.m., a storm of incessant L, loud T, and a downpour of R occurred. A very cold month for August, with many rainy days. Splendid weather during] the last four days. Sharp frost on the morning of 30th.

STROUD, UPFIELD.—TS at 4 a.m. on the 19th; three or four vivid flashes of L, and a tree struck. Slight T at 9 a.m. on 16th.

WOOLSTASTON.—Another cold and sunless month, with frequent R; very prejudicial to the corn harvest. T and L on 1st and 15th. Mean temp. 56°·7.

ORLETON.—The first half of the month was very warm and pleasant, but the remainder was cold with much R, the mean temperature being nearly 1° lower than the average, though rather above that of August, 1889. Very heavy storms of R in the early mornings of 16th and 23rd. T on 16th and 27th.

BARKBY.—T on 11th, 16th, 20th, 24th, 26th, 27th and 28th. H on the 24th. Mean temp. 59°·1.

MANCHESTER, PLYMOUTH GROVE.—Summer weather prevailed on the first nine days, and on the 18th; the remainder of the month was changeable and unsettled, and very showery and cold. T on 24th and 29th. T and L on 26th. Mean temp. 58°·1.

HULL, PEARSON PARK.—The weather during the month was generally wet, especially so during the middle and latter part, but a period of fine bright weather occurred from the 3rd to the 9th.

N. SHIELDS.—T on 13th.

SEATHWAITE.—T, L and H on 25th.

WALES.

HAVERFORDWEST.—A con siderable improvement took place in the weather as regards sunshine, warmth and moisture at the begining of the month, which continued up to the 11th; t he weather then relapsed into a stormy, wet and unsettled condition, with a rather low temp. for August. During the last week the temp. was much below the average, and it was generally wet except

the last three days, which were fine and cold, with bright sunshine and high wind. Mean temp. 55°·9, 2°·8 below the average of 10 years. Prevailing winds W.S.W. and N.N.W., the latter predominant. Crops looking well, and harvest prospects favourable except potatoes, which are bad. R though frequent, not disastrous. Temp. reached 70° only four times.

SCOTLAND.

CARGEN.—Mean temp. of the month 55°·9, 2°·5 below the average. The first twelve days were very fine, the mean temp. for the period being 61°·1. For the last 19 days the mean temp. was only 52°·7, remarkably low for August. The nights of the last week were very cold, and on the 31st the thermometer fell to 33°·4, the lowest in August since 1869, when 32°·4 was recorded. Harvest operations were much interfered with, and the constant wet and low temp. greatly injured potatoes, which are much diseased. T on 29th ; H on 26th and 29th.

OBAN.—The continuance of heavy R since May last has not been interrupted, and temp. remained low throughout the month. The crops are very backward, and in many places potatoes are showing disease. The hay is seriously damaged, but much is still uncut, awaiting a fair autumn.

CULLODEN.—The month was cold and wet, and very deficient in sunshine. Crops promising, but late.

IRELAND.

CORK.—A cold and unseasonable month, with much damp and sunless weather. Mean temp. 59°·2, 2°·3 below the average of 14 years.

DROMORE.—Weather very unsettled. Crops not up to the average. Potatoes very poor, owing to blight. Turf scarce, as owing to the continuous R it is difficult to get it dry, consequently great fears are entertained in this part as to the fires for winter.

WATERFORD, BROOK LODGE.—All the early part of the month was very broken weather, but after the 27th the weather was most favourable for harvest work. Mean temp. 57°·0.

O'BRIENSBRIDGE, ROSS.—The month began with a fine week, and closed with two very fine and warm days ; nearly all the rest was rainy or misty, and as a result unfavourable to harvesting.

DUBLIN.—Except for a fine warm period, extending from the 2nd to the 5th inclusive, and for a few isolated fine but cold days afterwards, the month proved showery, cold and squally. Prevailing wind N.W., temp. 2°·5 below the average. High winds prevailed on 11 days, and attained the force of a gale on 15th and 22nd. Fog on 1st, L on 15th, TS with H on 26th. Temp. reached 70° in screen on two days. H fell on 23rd.

WARINGSTOWN.—The R of this month was less than the average of 28 years, and that of July was the same, which will surprise those who are crying out about excessive R. Very little potatoe disease in this district, except in gardens, and in the early varieties which are well-known always to be liable to its ravages. 30th and 31st, two remarkably cold nights for the season.

OMAGH, EDENFEL.—The month seemed to commence in settled summer weather, and for the first and only occasions during the year temperatures of 70° and upwards were twice registered during the first week. The second week was wet and unsettled, the third somewhat better, but from the 20th to the end a period of persistent and heavy R (amounting in the eleven days to 3·21in.) followed, accompanied by low temperatures doing much, but not irretrievable, damage to all crops, especially potatoes. A peculiarity of the bad weather of this summer has been that much of it has been accompanied by a high and steady barometer.