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EXCESSIVE RAINS IN OCTOBER.

Although it is yet too early to pronounce decisively on the characteristics of the rainfall of October, 1872—the following table and notes will show that it has been, in several respects, unusual.

Station.	County.	October.		Jan.-Oct. inclusive	
		Amount inches.	Per cent. of average	Amount inches.	Per cent. of average
Camden Square, London	Middlesex	5·20	218	25·53	119
Tanfield Lodge, Croydon	Surrey	5·43	207	28·57	130
Kew Observatory.....	„	4·32	200	20·30	102
Linton Park, Maidstone.....	Kent	4·48	163	28·03	125
Uckfield	Sussex	5·03	133	25·89	102
Selborne	Hampshire	6·81	188	37·17	132
Long Wittenham, Abingdon.....	Berkshire	2·94	104	23·67	102
Berkhampstead	Hertfordshire	4·75	185	29·57	121
Hitchin	„	3·73	165	22·51	111
Banbury	Oxford	3·45	149	26·46	121
Culford, Bury St. Edmunds	Suffolk	3·12	126	26·80	132
Bridport	Dorset	6·76	196	33·24	128
Broadhembury, Honiton	Devon	5·86	163	37·30	132
Bodmin.....	Cornwall	8·10	156	54·54	146
Cirencester	Gloucester	3·65	117	32·98	122
Houghton Hall, Shifnal	Shropshire	6·07	276	37·14	178
Orleton, Tenbury.....	Worcester	4·52	153	34·88	135
Wigston	Leicester	3·72	156	32·54	154
Derby	Derby.....	4·56	166	33·08	146
Manchester	Lancashire.....	4·40	119	43·97	156
Bolton	„	5·32	94	48·64	124
York	York	3·94	177	31·91	158
Arncliffe, Skipton	„	7·28	121	62·78	132
North Shields	Northumberland.....	5·96	220	32·32	152
Seathwaite	Cumberland	19·13	128	143·04	120
Haverfordwest	Pembroke	7·93	154	51·08	131
Llandudno	Carnarvon	8·17	226	38·57	156
Guernsey	Guernsey	11·98	300	42·18	146
Dumfries	Dumfries	4·61	112	41·09	136
Nookton, Leven	Fife	3·58	117	35·97	151
Deanston	Perth	3·43	77	45·06	125

The averages with which the above values are compared are those of

the same stations during the ten years, 1860-69, which are at present the longest and most uniform series available.

It appears that the excess has been greatest in the three following isolated localities, Guernsey, Shifnal, Shropshire, and in Northumberland. We have still sadly too few stations in the vicinity of the Scottish borders, but the following indicates that in that district the excess has been very considerable.

Station.	Fall in October. in.		Average in October, 1863-71. in.		October per cent of 9 year average.
North Shields	5·96	.....	3·07	.. ..	194
Howick.....	6·85	.....	3·12	.....	220
Middleton	7·07	.....	2·95	.....	240

In the above the average, 1863-71, is used instead of 1860-69, because neither at Howick nor Middleton were trustworthy observations made before 1863. It will be seen that the North Shields average, 1863-71, is higher than that for 1860-69, and therefore, probably, the same is the case at Howick and Middleton, thus showing a gradual increase in the excess as we approach Berwick, where unfortunately we have no correspondent. On the other side of the Border it again decreases, being 5·56 in. at Melrose, and only 3·08 at Edinburgh. On the Western coasts the fall though large (at several stations it exceeded 15 inches) has not been much in excess, but Broughton in Furness had a remarkable fall on the 7th, of 3·01 whereof 2·93 in. fell in 14 hours, producing a great flood in the Duddon.

REMARKS BY EARL GREY ON THE RAINFALL OF OCTOBER 10TH AND
11TH, AT HOWICK, NORTHUMBERLAND.

This was the heaviest fall of rain there has been for 20 years. The 10th was a beautiful morning but it clouded over between 1 and 2 p.m., and about 3 o'clock extraordinary thick and black clouds came up from the sea, with a light air from the S.E. It became almost dark and began raining about 3.40--at first the rain was not at all heavy, but in about half an hour became exceedingly so and the wind suddenly chopped round to the N.W. blowing strong, and before bed-time it had increased to a heavy gale, varying from N.W. to North, the rain continuing with scarcely any intermission till the following afternoon, when it became much more moderate, and there were several fair intervals. There was, however, more or less rain during the night. Between 3.40 p.m. on the 10th, when the rain began, and 9 a.m. of the 12th, 2.96 of rain had fallen, of which somewhat less than half an inch fell after 3 p.m. on the 11th, so that about 2½ inches had fallen in 24 hours. The worst of the storm seems to have been just about this place. There was considerably less rain, according to the account published in the *Times*, at North Shields less than 40 miles to the South, and much less at Ford Castle, 30 miles to the N.W.

NORTH SUNDERLAND, 3 p.m. Oct. 11th 1872.—SIR, I have to-day recorded the heaviest fall registered since I began to observe; it may interest you. After a fine morning yesterday, S.S.W., the wind

backed to S. and S.E., till about 5 p.m. when it began to rain; wind continued backing to E. and E.N.E. till 10 p.m. when the wind freshened and rain fell heavily; continued to back to N. till about midnight, from which time we had a furious gale and very heavy rain all night, the rainfall measured at 9 a.m. to-day being 1·61 for 16 hours. Storm still continues at 3 p.m. with only slight abatement at intervals but rain not so heavy. Barometer continuously falling (with two slight rises on 7th and 9th) since the 5th p.m. from 30·14 to 29·01—to day rising but slowly, the wind working to the West and just now N.W.—Oct. 12TH, 1872. Storm continued all last night, and to-day (though with some abatement) from N.W., to N.N.W. Rainfall for the 24 hours taken at 9 a.m. to-day, 1·28: barometer slowly recovering at 9 a.m., 29·27—3 p.m. 29·33. Less rain fallen to-day, but gale still high and much sea on; more land flooded than for 30 years.—F. R. SIMPSON.

THUNDERSTORM AT WINCHMORE HILL.

To the Editor of the Meteorological Magazine.

SIR,—A violent thunderstorm passed over this neighbourhood to-day; thunder was first heard in S. at 11.15 a.m.—11.35. Heavy thunder in S.S.W. 0.45 p.m.—Violent thunderstorm, lightning intensely vivid; right overhead from 0.49 to 0.55 p.m. The storm abated at 1.15 p.m., thunder ceased at 2 p.m. Heavy splashes of rain from 12 noon to 12.20 p.m., amount gauged ·18in.; the rainfall to the N. and E. was very heavy and accompanied by hailstones of immense size. No hail fell here. A telegraph post at Edmonton was struck by lightning.—Yours truly,

THOS. PAULIN.

Winchmore Hill, 3rd October, 1872.

DECREASE OF RAINFALL WITH ELEVATION.

To the Editor of the Meteorological Magazine.

SIR,—Will you kindly allow me to ask those of your correspondents, who have for months past so ably discussed this subject, why it is that the point in question being simply, "The Cause of the Decrease of Rainfall with Elevation," they have not, in *the first instance*, given more attention to those cases, exceptional though they may be, in which the elevated gauge and the gauge placed near the ground, receive the same shower under circumstances as nearly similar as it is possible, with our present knowledge to obtain them, viz., during the absence of that great disturbing element and sure fore-runner of endless complications—the wind. I refer more particularly to those instances in which a heavy rainfall occurs during a perfectly calm state of the atmosphere.—I remain, Sir, yours truly,

EDWD. MAWLEY.

Addiscombe, Croydon, 10th Oct., 1872.

CORRECTIONS FOR DAILY RANGE.

To the Editor of the Meteorological Magazine.

SIR,—It has long been doubtful with me how far observers in distant parts of England from Greenwich are doing right in reducing their thermometer observations, made at the hours of say 9 or 10 o'clock, by the table of reductions given by Drew in his "Practical Meteorology," p.p. 63, 169, to bring the observed to the true readings. I have given up the correction applicable to the maximum and minimum observations, see above p. 72., as wisely suggested by the Scottish Meteorological Society, but, as I conclude *both* tables, viz: for the correction of the wet and dry bulbs, *and* the maximum and minimum Thermometer readings are deduced from the observations made at Greenwich, I should, with your permission, wish to ascertain the judgment of the readers of the magazine as to whether it is not desirable to *discontinue* (or ascertain some sufficient reason for continuing) the application of the usual correction to the wet and dry bulb thermometers also. Reductions may be suitable and true for Greenwich, no doubt are so, and perhaps the neighbourhood of London generally, yet can hardly I consider be consistent for Gloucestershire or Yorkshire.—Believe me, faithfully yours,

WILLIAM L. W. EYRE.

Huntley, Gloucester, Oct. 22, 1872.

HEAT AS INDICATED BY THE STATE OF THE CROPS v. THE THERMOMETER.

To the Editor of the Meteorological Magazine.

SIR,—In your last number there appeared a letter on the above subject from Mr. Robson. Allow me to call attention to several apparent errors and omissions with regard to it: (1) the writer says (alluding especially to wheat), "that heat hastens on crops," but omits to state that excessive moisture retards wheat, however considerable the warmth that accompanies or follows that moisture. In 1844 the mean temperature of the period from the 1st May to 12th August (the period Mr. Robson refers to in his letter), was $58^{\circ}3$. In 1864, the mean of the corresponding period was also exactly $58^{\circ}3$. In the present year the mean of the same period was $58^{\circ}4$, that is about $0^{\circ}5$ above the average of 101 years. The former seasons being very dry gave us good and early harvests; the latter period (1872) although slightly ($0^{\circ}1$) warmer than those of 1844 and 1864, gave us an indifferent and somewhat late harvest in consequence of the superabundance of wet. The heat being about the same in each of these three periods the difference in the commencement of harvest is, I think, clearly not to be attributed to temperature. In 1864 the summer was remarkably dry, but by no means remarkably warm in the early part. If your readers will refer to *British Rainfall* for 1864, they will see that your Linton Park correspondent speaks of June of that year as "often cold" after the first week, and the following month as "very dry, bright sun, with drying winds," but does not call it a hot or even a warm July. On the same page your Taunton correspondent says

"harvest has commenced generally." So the harvest began as early as July, in 1864, notwithstanding the "cold" weather of June and the absence of any particular heat in July. We may, therefore, conclude that the early maturity of wheat indicates the previous prevalence of dry weather as much or more than it does that of shade heat. We may also conclude that the failure of the wheat plant to correspond in its progressive stages with the heat of the past season is to be attributed to the retarding influence of excessive moisture, especially in May, and considerable portions of June and July. (2.) Mr. Robson calls May a summer month. That it most certainly is not, as a rule. Luke Howard, the father of British Meteorology, in his work on the *Climate of London*, Vol. I., p. 247, says, "Summer begins the 7th June and lasts ninety-three days," that is to the 7th of September. This year the summer commenced a few days after the 7th of June, and lasted ninety-seven days. (3.) June of this year was not a cold month after the 12th, for, after that date, there were only five days when the mean temperature was below the average at Greenwich. (4.) Mr. Robson says, "the heat of a portion of July was counterbalanced by some dull cold periods of the same month." This was not the case at Greenwich. At that observatory the warm days were to the cool ones as two to one, there having been twenty-one days when the mean temperature was in excess and only ten days when it was in defect. The mean of the whole month was $65^{\circ}0$, which is $3^{\circ}6$ above the average of 101 years. Mr. Robson may think that these figures do not express with absolute accuracy the heat of last July; but surely the Greenwich method of determining the mean temperature of the month is better than merely guessing that one portion of it was "counterbalanced" by another, as Mr. Robson appears to have done. If that gentleman will kindly take the trouble to compare the mean temperature of last July with the mean of the same month for eighteen years past, I believe he will find that last July at Linton was about one degree above the average. An average of six or seven years past would not be sufficient to compare it with, because July has so often been unusually hot since 1864. I know Mr. Robson's table extends seventeen or eighteen years back, because in your Magazine for March last (p. 32) he gives his mean temperature for February, 1855. So if I am wrong in my belief that July last was considerably warmer than the seventeen or eighteen year average at Linton, Mr. Robson can easily prove me to be so by producing the figures asked for. (5.) Your correspondent also says, "the meteorologist draws his conclusion simply from two especial periods of perhaps only a few minutes each—the highest and lowest points attained by his instruments." Now, it ought in fairness to be stated that the Greenwich daily means are not obtained in this way; they are determined from a number of observations sufficient to give the true mean of the whole twenty-four hours. According to these reliable means last summer was remarkably hot. The mean temperature of the three months of summer, from the middle of June to the middle of September, was about three degrees above the average of 101 years. It

was *hotter than any other three months* in the last fifty-eight years, excepting in 1818, 1826, 1846, 1857, 1859, and 1868, and in the periods between these years there was no summer anything like so hot. It appears then that as the wheat plant is seriously affected by drought and rainfall (and I might add blight), it cannot indicate the warmth of summer so well as the thermometer, which is not so affected.

GEORGE D. BRUMHAM.

31st October, 1872.

To the Editor of the Meteorological Magazine.

SIR,—I have read the article on "Heat as indicated by the state of the crops" &c., on pp. 158–60 of your Magazine for the current year, and would like to point out (1) that the writer of the article, after stating in effect that the present system of registering heat and cold is defective and unreliable, wishes (p. 159, line 35) to call in that very system to confirm his theory; and (2) that, although evidently willing to abide by the result if confirmatory, practically refuses (line 41) to give heed to it if contradictory.—I remain, Sir, truly yours,

E. G. ALDRIDGE.

3, Bonny-street, Camden-road, 18th Oct., 1872.

P.S.—I may state that, in my humble opinion, plants, being much affected by rain, blight, &c., as well as by heat and cold, will prove very poor thermometers.

DISTRIBUTION OF RAIN OVER THE BRITISH ISLANDS IN SEPTEMBER, 1872.

In the month of August we went into considerable detail in describing the conditions under which the various falls of rain were produced in our islands. In the present and future months the remarks will be more brief, but it is hoped that at the end of the year some general conclusions may be arrived at of value to all who study meteorology.

On the 1st, southerly winds being present in England and Ireland, with northerly and north-westerly breezes in Scotland, we find rain throughout the two former countries, but very little in the north of Scotland. The next day the Scotch winds drew into east, forming part of the general circulation round some disturbance in the north-west, and immediately we find the heaviest rains on the north coasts, while in the south the weather became finer. On the 3rd and 4th thunderstorms, with variable winds, were the prominent features. The rains were general but variable in intensity. For some days after this a series of depressions passed over us; the first which crossed our islands between the 5th and 7th, produced wet weather in the west and north on the 5th. As its centre crossed to the southward of the Scotch stations, most of the Scotch reports showed very little rain on the 6th; but on the 7th the north-west wind in the rear of the depression brought a little. In addition to this, a slight south-westerly breeze at our southern stations gave about 0.03 in. along our channel coast. On the 9th a new depression crossed Scotland from west to east, giving us rain on all our coasts. The 10th showed another in the

north-west, which, as it passed, brought rain, except to the south-east, on the 10th and 11th. The path of the next depression lay considerably to the north of us, and, consequently, the rain which it produced on the 12th and 13th was confined to our western and northern coasts, while on the 14th only slight showers were reported. The 15th and 16th brought a slight disturbance, and showers to the extreme western and northern districts; but on the 17th and 18th as a small bourasque crossed Scotland the falls of rain extended to all but our southern stations, and, in addition, a slight disturbance in France was accompanied by showers on the French coasts. For a time the passage of definite depressions over the United Kingdom ceased, and northerly winds became general. The northerly current was, however, more or less interrupted on the 19th and 20th by thunderstorms, with showers; and on the 21st, as it increased in strength to a gale in the west, the showers increased, and even snow fell in some places. On the 22nd a local depression showed itself in the north of England, reversing temporarily the direction of wind in England, and producing a general rain in the north-west and north. The 23rd found the depression over the North Sea, but several slight disturbances over our islands, from a great intermingling of the south-west and north-west winds, produced rain throughout the north-west of Europe. The 24th gave thunderstorms, with very variable amounts of rain; while on the 25th the northerly current being then restored in great strength, *very* heavy rains were reported all along the east coast of Great Britain, and some in central Britain. At this time the passage of depressions from west to east across our islands was resumed, and continued till the end of the month; these gave us a great deal of rain, especially in the west and north.

Thus we see that the excess of rain at the west and northern stations appears to be owing to the extension over them of several depressions whose influence was not felt in the south and east. Even the bad weather of the 25th, which produced so much rain on our *east* coasts, was still more severely felt in the east of Scotland.

F. G.

DAILY VARIATIONS IN THE PREVALENCE OF RAIN DURING OCTOBER, 1872.

THE month of October has been marked by the passage over us of a series of depressions, travelling chiefly in an easterly or a north-easterly direction. Some of these just skirted the west coast of Ireland and north-west of Scotland; others crossed over the centre of our islands, while many were accompanied by additional local disturbances, which brought much rain to the neighbourhoods near which they passed. One depression (17th to 19th) travelled slowly in a north-westerly direction; and another, which once disappeared over France, *apparently* formed again subsequently.

The first wind system by which we were affected had shown itself on our north-west coasts on the 30th September, when it brought a

considerable quantity of rain to the west and north of the kingdom. During the 1st and 2nd the disturbed weather spread over the whole of north-western Europe, while its centre travelled slowly eastwards to the northward of the Scotch coasts, the rain in the north diminishing in quantity as the wind drew into west. During the 3rd and 4th, however, a local depression crossed to the southern central parts of England, and while the weather dried up in the north-east rain returned to the western and southern districts, with thunder and lightning in several places. Some snow and hail fell in the north, with a northerly breeze. The next general disturbance began on the 6th, manifesting itself first, as before, to the north-westward of Scotland, and bringing rain to the western and northern stations. For the next two days the wet weather extended gradually to all parts of our islands, and large quantities fell in the west and north-west. On the 8th the disturbance was supplemented by a slight local depression crossing the south of Ireland and centre of England in an easterly direction, but as it passed off leaving finer weather in its rear. The change was, however, only temporary, for the night of the 9th brought a new storm to the west coast of Ireland, which travelled east-north-eastwards, and at 8 a.m., 11th, had its centre over the North Sea. Ireland first felt the rain, but during the 10th all parts of north-western Europe were involved in the downpour. Even our north-east coasts, which had the northerly winds, came in for a large quantity, 1.65 in. falling at Shields in the twenty-four hours, and 1.14 in. at Aberdeen next day. As the bourasque passed towards Denmark on the 11th and 12th, the weather continued showery, with thunder and lightning in several places, and heavy rain in the west of France. The 13th was rather finer generally; the 14th very much so, though still showery in Ireland. The 15th brought fresh disturbances and rain, a well-defined but local depression showing itself over our southern counties by 8 a.m. 16th, in addition to a larger but shallower one lying between the Scotch and Norwegian coasts. These quickly gave way to low pressures in the Bay of Biscay on the 17th, which travelled to the entrance of the English channel by the following morning, and then north-westwards to the south of Ireland. In this manner rain continued in Great Britain, and returned to Ireland on the 18th, after a temporary absence during the north-easterly winds of the 17th. With the exception of some showers locally the 19th was finer, but on the 20th pressure became comparatively low in a band lying from south-west to north-east over the British isles, the north of France, and the North Sea, and two shallow depressions formed in the south of England. Wet weather again returned, to be continued on the following day by a new and more serious disturbance in Scotland. On the 22nd this gradually passed off; but night time brought a new fall of pressure to our western stations, which, together with rainy weather, spread eastwards, till on the 24th and 25th rain fell in all parts of the country. With a general rise of the barometer this bourasque disappeared late on the 26th, and a fresh but slight depression appeared in the north-west of Scotland, and

travelled eastwards, thus keeping the atmosphere in a damp and unsettled condition generally. What is more strange, however, is that the southern depression re-appeared over France in the night of the 27th, causing the wind at our southern stations to return to the northward and north-eastward, with rain again, while finer weather visited the northern parts of the country. From late on the 28th till the end of the month a very large depression passed over us, bringing a return of southerly and westwardly winds to all our coasts, with very much rain, commencing in the west and north on the 28th. In this disturbance the barometer fell as low as 28·6 in. in the west of Norway, and no less than five inches of rain fell at Seathwaite on the 29th.

F. G.

REMARKABLE COMPLEX FLASH OF LIGHTNING.

To the Editor of the Meteorological Magazine.

SIR,—I do not see anything complex in the very lucid description of the effects of a flash of lightning at Lynwood, by Admiral the Hon. Sir F. W. Grey, on the 13th July. Any one who has been in a thunder-storm must know that the concussion in the air by a flash of lightning that reaches the earth, is much greater than that of any great gun when fired. The gallant admiral must be far better acquainted with the fact than I am, though he may never have been closer than I have been to the flash, and it is quite possible that he made no comparison of it with the effects of that with which he was so familiar. Your own remarks in your October number show that though you notice the “expansion of air or steam inside” the greenhouse, in your opinion there were “ramifications of this flash,” affecting objects in “an area of 315 by 146 ft.” From many and close observations of the effects of electricity I am inclined to think that the conductor on the chimney, 52 ft. high, had nothing to do with it, but that the water or the metal in the greenhouse attracted the “bright double flash,” with a single discharge “like that of a gun.”* Taking the greenhouse as the centre, the trees that were injured form points in the diameters of circles, the longest radius being about 250 ft. We know that windows of houses are broken by the concussion of guns fired at much greater distances than this, and we must remember that in the month of July the bark of trees is easily removed. The effect of these concussions on trees is remarkable; as far as I have been allowed to examine the subject, a violent deflection of the tree takes place, and, as it returns, the bark is thrown off with violence. This action would account for some of the bark of *F* being found inside the greenhouse, while the fact of its being there goes to prove the cause. The deflection of the tree was *from* the centre of concussion in the greenhouse, the recoil of the tree and the scattering of the bark was therefore *towards* the greenhouse. I have seen the bark of trees scattered to greater distances, while the ply of the tree necessarily removes the earth more or less around the

* All electric discharges when close to us sound as one explosion; it is, I believe, the reverberation that makes the rolling thunder.

roots. There is one more proof of the correctness of this interpretation: the tree F was more injured than the other four, simply because it was nearest to the concussion centre. While explaining this case from cases which I have seen, I do not deny the possibility of one flash spreading sufficiently to do the whole damage instantaneously, but in this case I think that scorching of the trees would have been noticed by observers, who even remarked that the red lead on the joints had been "disturbed," and that the force of the explosion apparently acted "outwards" from the interior of the pipe.—I am yours obediently,
H. P. MALET.

Nettlebed, Oxon, 22nd October, 1872.

THE BRITISH ASSOCIATION AT BRIGHTON.

(Continued from page 164.)

GEOGRAPHICAL DISTRIBUTION OF FORESTS IN INDIA.

A paper on this subject, read by Dr. Brandis, next occupied the attention of the section. Commencing with the observation, that the character of the forest vegetation in all countries was influenced by soil, climate, and the action of man, and that, in India, the distribution of moisture was one of the most important elements in the production of vegetation, he at once plunged into details. In the north-west corner of India there is an arid tract extending from the coast of Cutch and Sindh in the south to the Salt range in the north; and from the hills of Beluchistan in the west to the Aravalli range in the east: the rainfall being less than fifteen inches. Vegetation in this district was extremely scanty, consisting of a thin sprinkling of low thorny scrub on the hills. The work of the forester was limited to those tracts which stretch along the Indus and its principal tributaries, and which are watered by the annual overflow of the river during summer. In Sindh there were on both sides of the Indus 352,000 acres of government forest, maintained solely by the overflow of the river and by percolation. In another part of Sindh the Babool forest covered upwards of 30,000 acres, and the shade in them was so dense that very little grass and herb would grow. But when the river forsook its old bed and broke through in another direction, a part of the forest was left dry, and eventually perished. Outside this arid belt, there were two belts with a rainfall between 15 and 30 inches, which might be called the dry zones of India. The spontaneous arborescent vegetation was scanty, save in the moist lands along the great rivers, but it was better than in the arid tract. In the southern dry zone, comprising part of the Deccan, was the country of the sandal wood, a small tree which did not grow gregariously, and did not form continuous forests. Here, too, were the ancient irrigation works, tanks, and gigantic stone dams across rivers, and where water was thus supplied fields and gardens were most luxuriant. In the rest of India, outside these dry and arid belts, the annual rainfall exceeded 30 inches, save north of the first great range of the Himalaya, where the fall of rain was scanty, and consequently the country was arid and bare. With these exceptions, the rainfall of India was greater than that of Europe. Nevertheless, even in those moister parts, the conditions for forest vegetation were not everywhere as favourable in India as in Europe. Really thriving forests were only found where the fall exceeded 45 inches, and luxuriant vegetation was limited to those belts which had a much higher rainfall. There were two moist zones, where the annual rain exceeded 75 inches, the smaller one along the western coast of the peninsula, and the more extensive one on the outer Himalaya ranges, the hills of Bengal, and the coasts of Burmah. On the western coast the rainfall was moderate as far down as Surat, 47 inches, and Bombay had 72 inches; but Janna, only a few miles inland, had 102. Further down the coast the rainfall was heavier. Rutchahem had 115, and Canara had 123 inches. Approaching the southern extremity of the peninsula, the rainfall gradually diminished to 28 inches at Cape

Comorin. In this narrow moist belt were found some of the finest forests in India. The teak forests of North Canara, protected by the difficult nature of the country, the teak and blackwood forests of Wynaad and the Anamallays, and the forests of Travancore, were reputable forests, which might stand comparison with the oak and beech forests of the Spensart, and the oak forests of Central France. The teak plantations of Nellumboor, in Malabar, which were commenced in 1844, and now covered upwards of 2,400 acres, were a splendid instance of luxuriant forest growth on a good soil, in a foreign climate, and under good management. The moist region of the Himalaya, and the eastern part of India, had a much larger extent. The Kangra valley, in the Punjab, had a rainfall of 100 inches, and from here the moist narrow belt, but widening gradually, ran in a south-westerly direction as far as Sikkim. Near Simla, the width of this belt, with a rainfall of 75 inches, was not more than 30 miles. Near Darjeeling, it extended into and comprised the whole of Assam, Eastern Bengal, as far as Dacca and British Burmah. A second belt of between 60 and 75 inches, ran outside the foot of the Himalaya, comprising the estuary of the Ganges and part of Orissa. Within these moist regions of northern and eastern India, were a great variety of good forests. Only a small portion of the deodar forests of the north-west Himalaya fell within this belt, the greater part lying inland, where the rainfall was less than 60 inches. The india-rubber forests of Assam and Cachar were within the range of the heavy rainfall, as well as the ironwood forests of Arracan and the teak forests of British Burmah. Between the dry and moist belts there lay a vast tract of country with an annual rainfall varying from 30 to 60 inches. Within the moist regions, with a rainfall exceeding 60 inches (in one place rising to 250 inches) and in Eastern India, there was a great variety of good forests. Of the deodar forests of the north-west Himalaya, a small portion only fell into this belt, the greater part lying in land where the rainfall was less than 60 inches. Between the dry and moist regions was a vast tract of country with an annual rainfall of more than 30, but less than 60 inches, comprising the greater portion of the upper Gangetic plain, the whole of Central India, and the western side of the peninsula. In this part of India the main obstacle to a luxuriant forest growth was, not so much an insufficient supply of moisture, as its unequal distribution over the seasons of the year. The jungle fires were also most fatal to forest growth in these regions of India. The protection of forests against this scourge was not an easy matter, but thanks to the energy of Colonel Pearson, fires had been excluded from several forest districts of the Central Provinces ever since 1864, and the improvement in their condition was marvellous. Up to the present time, however, many otherwise observant people in India, and even officers connected with the administration of the public forests, had been of opinion that these fires were not mischievous, and might in some cases be beneficial. The action of man upon the forests of India had until within the last few years been directed towards their deterioration and destruction. It was indeed remarkable that in a great portion of the arid and dry regions of India large extents of forest land had been preserved by the native rulers. The beginnings of forest conservancy were thus found where forests were scarce and grew under unfavourable conditions; but effectual conservancy was now only possible in those forests over which Government had complete control. The operations of forest officers in India, therefore, must be directed towards obtaining a separation of private and public rights in the forest land. These public domains, clothed with forests, which, as a rule, it would not be to the interest of the private proprietor to maintain, would not only serve to supply the future requirements of the country, but would be a source of strength, financially and politically, to the British Government in India.

TEMPERATURE CORRECTION OF THE ANEROID.

Professor Phillips read a paper on the temperature correction of the aneroid; he argued that with care in the use of the instrument, and in the application of temperature corrections, the aneroid was more reliable than Mr. Scott and some other meteorologists seemed to think, and he stated his own experience with an aneroid for which he had drawn up a table of corrections for varying temperatures,

In spite of very rough usage, the instrument continued to give very accurate results when the temperature correction was applied. He had also obtained some instruments which professed to be compensated for temperature, and had found the compensation of some of them to be nearly perfect.

Mr. Glaisher stated that from his experiments at the Observatory at Greenwich, those aneroids, which professedly were "compensated," proved, on being tested, worse than the others.

Professor Babbage said that travelling on horseback with aneroids, as he had done in Australia, tended to render their indications unreliable, because of the jolting.

A NEW HYGROMETER.

Mr. George Dines read the following paper on his new hygrometer.*

Before describing the instrument to which this paper refers, I will briefly state the circumstances which led to its production. In making some experiments upon evaporation, it was considered necessary to determine the temperature of the dew point accurately. Circumstances connected with those experiments, which need not be alluded to, made me doubt as to whether the dry and wet bulbs were sufficiently accurate for the purpose. One of Daniel's hygrometers was therefore obtained, but not being accustomed to its use, I found it extremely difficult to manage; the ether was also rather expensive. I therefore cast about for some other means of determining the dew point—the instrument here described is the result. For using this instrument, water only of a lower temperature than the dew point is required; in summer well water will generally be found sufficiently cold, but, if not, ice is recommended as the simplest means of cooling the water. In severe frost, when ice is always to be obtained, salt mixed with the ice will generally give a temperature sufficiently low for the purposes required. The water is placed in the vessel A; the tap B is opened, which allows the water from A to flow through the chamber D, and to cool the THIN black glass E with which that chamber is covered. As soon as the dew appears upon the surface of the glass, the tap B is turned off, thus preventing any further flow of the water, and the attached thermometer, the bulb of which is placed inside D, close under the surface of the glass, gives the temperature of the dew point. Before deciding upon the use of black glass as a cover to D, I had tried most of the metals. Owing to the non-conducting and other properties of glass, doubts have been expressed as to its fitness for the purpose. I have therefore made one of these hygrometers, the chamber D of which holds nearly a quart of water. This is covered partly with glass and partly with highly-polished gilt metal. That hygrometer is now upon the table, and I hope to give you the opportunity of judging for yourselves whether glass or metal is the best. After using this instrument for some time, and under different conditions, I have come to the same conclusion as the late Professor Daniell—that the metal possesses no advantage over the black glass—the colour of the glass, its highly polished surface, combined with small cost, are great recommendations when compared with the metal. The time at my disposal for work of this description is limited, but I have made many observations with the hygrometer side by side with the dry and wet bulbs. I do not wish, at present, to speak positively upon the subject, but the conclusion arrived at in my own mind is this—that, whatever tables may be used, the dry and wet bulbs can never be depended upon as giving more than an approximation to the dew point. I find also that on many days the amount of moisture in the air is very unequally distributed—that it is subject to rapid and frequent changes. I have elsewhere described it as badly mixed, and also to "masses of air, very differently charged with moisture, rolling over the surface of the earth in the same manner as the clouds above, the difference being that they are invisible."

* A notice and engraving of this hygrometer appeared in this Magazine, Vol. VI. p. 147, but several additional facts are mentioned in the present paper, and for that reason, as well as because we consider the instrument of great utility, we insert it verbatim.

OCTOBER, 1872.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°		
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Days on which .01 or more fell.	Max.		Min.		In shade	On grass.	
				Dpth	Date.		Deg.	Date.	Deg.	Date.			
I.	Camden Town	5.20	+ 2.61	1.05	21	20	65.3	3	31.8	13	2	6	
II.	Maidstone (Linton Park)	4.48	+ 1.38	.52	31	22	67.0	2	30.0	12	...	...
III.	Selborne (The Wakes)	6.81	+ 2.60	1.30	24	20	63.0	2	29.0	17*	9	10	
IV.	Hitchin	3.73	+ 1.18	.48	24	24	62.0	3	31.0	5†	3	...	
V.	Banbury	3.45	+ 1.02	.48	10	21	62.0	1, 2	26.0	14	4	...	
VI.	Bury St. Edmunds (Culford)	3.12	+ .41	.56	20	23	66.0	2	29.0	13	5	9	
VII.	Bridport	6.76	+ 2.73	1.35	24	23	63.0	7	27.0	15	5	...	
VIII.	Barnstaple	7.41	+ 3.29	1.09	30	28	65.0	16	31.5	15	...	...
IX.	Bodmin	8.10	+ 2.78	1.30	30	27	60.0	6	41.0	14	0	2	
X.	Cirencester	3.65	+ .16	.60	24	17	...	...	...	...	...	...
XI.	Shifnal (Haughton Hall)	6.07	+ 3.83	1.14	20	20	61.0	2	28.0	15	6	...	
XII.	Tenbury (Orleton)	4.52	+ 1.29	.67	20	22	63.0	2	29.0	15	7	11	
XIII.	Leicester (Wigston)	3.72	+ 1.02	.83	20	21	65.0	2	27.0	13	7	...	
XIV.	Boston	3.17	+ 1.05	.47	20	24	64.0	3	31.0	15	1	...	
XV.	Grimsby (Killingholme)	3.04	...	.37	20	20	63.5	2	31.5	15	1	...
XVI.	Derby	4.56	+ 1.72	.99	20	21	61.0	2	30.0	13	2	...	
XVII.	Manchester	4.40	+ .59	.86	21	23	62.5	2	28.0	20	...	...
XVIII.	York	3.94	+ 1.42	.60	20	23	61.5	2	30.5	16	2	...	
XIX.	Skipton (Arncliffe)	7.28	+ .62	.82	10	23	59.0	3	26.0	14	5	...	
XX.	North Shields	5.96	+ 2.68	1.76	10	21	59.8	2	32.2	15	0	2	
XXI.	Borrowdale (Seathwaite)	19.13	+ 2.81	5.00	29	20	...	...	...	...	...	...
XXII.	Cardiff (Ely)	5.76	+ .01	.64	31	25	...	...	...	...	...	...
XXIII.	Haverfordwest	7.93	+ 2.74	1.21	16	23	61.0	2	30.0	12†	4	5	
XXIV.	Rhayader (Cefnfaes)	8.60	+ 3.00	1.30	10	18	61.0	...	26.0	...	...	...
XXV.	Llandudno	8.17	+ 4.21	1.10	21	23	60.4	1	35.1	5	...	...
XXVI.	Dumfries	4.6131	.84	10	18	60.0	2	28.0	15	5	...
XXVII.	Hawick (Silverbut Hall)	3.86	...	.87	21	20	...	...	...	...	...	...
XXVIII.	Ayr (Auchendrane House)	4.0788	1.00	6	21	59.0	1, 2	24.0	5	4	7
XXIX.	Castle Toward	5.71	...	.04	1.32	1	19	...	...	...	...	...
XXX.	Leven (Nookton)	3.5817	.70	21	16	61.0	2	28.0	5§	4	16
XXXI.	Stirling (Deanston)	3.48	...	1.48	.78	29	20	58.8	2	23.0	5	5	8
XXXII.	Logierait	4.98	...	.78	24	22	...	...	...	...	...	...
XXXIII.	Ballater .....	...	...	...	...	...	...	...	...	...	...	...
XXXIV.	Aberdeen	4.38	...	1.06	11	26	57.4	2	34.9	5	0	12	
XXXV.	Inverness (Culloden)	3.37	+ .71	.87	22	22	58.0	1	33.9	5	0	8	
XXXVI.	Portree	7.68	...	3.10	1.08	1	31	...	...	...	...	...
XXXVII.	Loch Broom	7.72	...	1.63	22	28	...	...	...	...	...	...
XXXVIII.	Helmsdale	5.03	...	1.10	21	28	...	...	...	...	...	...
XXXIX.	Sandwick	4.7220	.82	21	27	57.9	2	34.7	5	0	5
XL.	Cork	5.27	...	.80	17	17	...	...	...	...	...	...
XLI.	Waterford	3.31	...	1.09	.50	23	24	61.0	2	33.0	5	0	...
XLII.	Killaloe	5.69	+ .67	1.07	29	22	62.0	2	29.0	5, 16	2	10	
XLIII.	Portlarnington	4.2291	.63	7	29	59.0	1	29.5	4	3	...
XLIV.	Monkstown	3.56	...	.36	.52	16	18	...	...	...	...	...
XLV.	Galway	6.45	...	.67	29	23	69.0	6	31.0	5	3	...
XLVI.	Bunninadden (Doo Castle)	6.33	...	.68	9	30	...	...	...	...	...	...
XLVII.	Bawnboy (Owendoon) .....	...	...	...	...	...	...	...	...	...	...	...
XLVIII.	Waringstown	4.51	...	.89	10	18	62.0	2	28.0	3	3	13
XLIX.	Strabane (Leckpatrick)	5.18	...	.74	30	25	...	...	...	...	...	...

* And 23. †And 13, 16. ‡And 22. §And 6, 15.

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

METEOROLOGICAL NOTES ON OCTOBER.

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

ENGLAND.

LINTON PARK.—A mild but wet month; high winds on 16th, 24th, 27th, and 30th. TS on 26th. Winds mostly S. and S.W. Bar., which was high on the 7th, became very unsteady afterwards, and fell to the lowest point, 28·83, on 25th. The latter part of the month very unfavourable for farming and other outdoor work.

SELBORNE.—The wettest month this year excepting January; hitherto a very wet year, no less than 37·17 in. having fallen at the end of October, 10 months; altogether a damp and dreary month; prevailing winds S.W. and W., and occasionally very violent; slight TS on 3rd; very high wind on 10th, with heavy R; a little H and S fell on the 11th. Thrush singing all the morning of the 27th.

BANBURY.—Bar. 28·8 at 56° on 10th at 11 p.m., and on the 24th at 52° at 5 p.m.

CULFORD.—A month of continuous rainfall, and in no instance more than two days together free from R. The weather has also been cold for the season, the mean temp. being 47°. T on 3rd; swallows last seen on the 5th or 6th; high wind (bar. 28·60) on 10th; H on 13th.

BRIDPORT.—A very wet month and low bar.; the total is the greatest amount registered (with the exception of December, 1868, when the total fall was 6·88, September, 1867, 7·39, and October, 1865=7·70) for the last 15 years; very sharp white frost on 15th; very heavy storm at 3 a.m. on the 26th; gale on 29th.

BODMIN.—Aurora at 10 p.m. on 21st.

CIRENCESTER.—The fall of rain for August 7th was 1·42, but entered at ·42, the true monthly total is 3·27.

SHIFNAL.—Another month of almost daily R till the 27th. R commenced at 3.30 p.m. on 20th, and continued till midnight on the 22nd, total fall, 1·90; wind varied from N.W. to S.W. till 16th, when it changed to N.E. and S.E. for five days, and continued to change every three or four days to the end; most farmers unable to plough for wheat even on light soil; potatoes a light crop, very small, and sadly diseased; fieldfares first seen on the 19th. The wettest October for 38 years, and perhaps more, the nearest to it that of 1843, when 5·22 in. fell; 13·14 in. now above the average for the year at this place.

ORLETON.—A very rainy month, and remarkably cold, except a few days at the beginning and again at the end. Mean temp. nearly 4½° below the average; S on the hills on the 12th; frequent frosts in the nights followed by R; rivers flooded on the 22nd; distant T on the 30th. No violent winds, but bar. generally low.

WIGSTON.—Mean temp. below the average. The continued showery weather throughout the month has interfered with agricultural operations.

BOSTON.—Total rainfall for ten months ending October 31, is 26·67 in., or 8·22 in. in excess of average of previous ten years, and 4·19 above the total due for the whole year. Temp. for month 2·2° below average previous eight years. Rain ·90 above average; prevailing wind S.W., blowing nineteen days from that quarter; bar. ·22 below average; on 21st and 22nd rain was incessant for thirty-six hours, and amounted to ·82.

GRIMSBY.—Thick fog on the Humber on the 15th; low bar.; very few fine days; the ground too wet for sowing wheat on heavy lands; last day of the month drying, with a high wind; L on 31st, and high wind on the 29th.

DERBY.—A very wet, disagreeable month. The rainfall of the 20th and 21st flooded all the low lying land about here; the fall during the month is 2 in. above the average, and the yearly mean of rainfall has already been exceeded by 7·0 in. and the average up to the end of October by 11 in.; temp. 3° below the mean.

YORK.—L at 7.30 p.m. on 31st.

ARNcliffe.—A very wet month.

N. SHIELDS.—Heavy storm on the 10th, 2·28 in. of R fell between 3 p.m. on 10th and 11 a.m. on the 11th.

W A L E S.

HAVERFORDWEST.—The month commenced stormy and wet; the only fine weather occurred from the 3rd to the 6th, when it was fine and frosty; from that time to the end it was one continued downpour, at times very stormy, especially about the 24th, when the bar. corrected for temp. stood at 28·97 at 9 p.m.; H, R, T, and L during the day and evening of the 25th; heavy floods during the last days of the month. Much corn still in the fields, necessarily much loss will be experienced, as the weather still continues hopelessly bad. General health, good.

RHAYADER.—A month of wet, ungenial weather. Temp. low; wind N.E. and S.W.

LLANDUDNO.—No swallows seen after the 2nd; S on the distant hills on the 3rd, 4th, 5th, and 6th, and from 10th to 14th; H on 9th and 11th; heavy gale on 23rd, and till 9 a.m., 24th.

S C O T L A N D.

DUMFRIES.—This month on the whole has been wet, and occasionally stormy. Temp. 1°·7 below the mean of the corresponding month of last five years; S on 16th. Harvest completed by the middle of the month, the crops less injured than expected; potatoes much diseased.

HAWICK.—The severe frost on the 3rd, 4th, and 5th completely ruined the flower garden, but with the exception of the night of the 14th, we had no other frosts during the month. There was a great deal of L, and one or two peals of T on the very stormy night of the 29th, but the month on the whole has been remarkably mild, most of the R has fallen in the night.

AUCHENDRANE.—Bright aurora on the night of the 13th; L on the night of the 24th; slight gale on 29th and 30th; L and distant T on night of 30th and morning of 31st.

CASTLE TOWARD.—Beginning of month dull and wet, the middle mild and bright, towards the end cloudy and dull; the Arran hill tops covered with S on the 4th; a severe storm of T and L, followed by high winds from the W. on the 30th and 31st. Potatoes very scarce, and turnips not half as many as last year.

NOOKTON.—Storm on 31st.

DEANSTON.—Some smart frosts in the beginning of the month, but fair and favourable for the ingathering of crops. Potatoes in most cases diseased. The last few days of the month very stormy, blowing a S.W. gale, with R, T, and much L, on the morning of the 30th and throughout the day.

ABERDEEN.—A month of average temp., but stormy and wet. Bar. and temp. below the average of 15 years; rainfall and pressure of wind above it.

PORTREE.—The month was very wet and stormy, and has failed for once of proving itself to be the Highlanders' harvest, as it is wont to be. T, L, and H showers all through the night of the 29th till 8 a.m. on 30th, and a perfect gale blew continuously from the S. and S.W. from 1 a.m. on 30th to 9 a.m. on 31st. Much of the corn is yet unsecured, and the greater part of the potato crop is still in the ground.

LOCHBROOM.—Every day but three was wet and stormy; September was bad, but October was worse, having one less fine day, and nearly an inch more R. Crops housed in a very bad state, grain and straw much damaged; potatoes not good, and only about half the quantity. A terrific TS on the night of the 31st, stopping telegraphic communication, and breaking an A B C instrument.

SANDWICK.—October is generally our wettest month, and though the R in each month since March has exceeded the mean, yet October exceeds them all, but it is only just about the mean for October. Temp. 1°·2 below the mean, and the weather unfavourable for the conclusion of harvest operations, particularly for taking up potatoes, which are but a poor crop, and much diseased. Aurora on 3rd, followed by a gale of 65 miles an hour; bright double rainbow on the 9th; a gale of 50 miles an hour, or 1107 miles, between 10 a.m. on 30th and 10 a.m. on 31st, and following aurora on 29th, and a bar marking 28·63 on 30th.

I R E L A N D.

MONKSTOWN.—Month very wet, but not cold, scarce any frost; T and L on 19th; swallows flying about on 27th, but none seen on 28th or since that time.

DOO CASTLE.—A continual downpour, floods immense, and land, even hilly land, completely saturated. Fuel very scarce. Potato yield but small, and much diseased.

WARINGSTOWN.—Very wet; such a continuously wet autumn is not supposed to have occurred since 1816. Some grain still in stook, and most of the potatoes still undug.

A BIRCH TREE STRUCK BY LIGHTNING.

To the Editor of the Meteorological Magazine.

SIR,—I think there is an opinion amongst students of electricity that the beech, birch, and maple are very seldom struck by lightning. An instance to the contrary occurred in Cheshire, in one of the storms of August. The storm had been gathering for some time, with every appearance of heaviness; it discharged itself in one thunderclap, unattended with rain. The lightning took effect on a good sized birch tree, the trunk of which was about $2\frac{1}{2}$ ft. in diameter, standing nearly alone in a hedge, and must have struck it horizontally. The tree now has the appearance of having been cut in two by a cannon shot midway; the lower part is pretty clean cut. Part of the head lies prostrate along the hedge about due E., and is only connected with the butt by a strip of wood and bark about as thick as two fingers. It is scorched all through the branches and leaves, as is also the hedge for three or four yards on either side. The intermediate portion (about 6 or 7 ft.) is split up into many pieces, one of which is as much as I can lift, all carried in one direction (about S. by E.) to a distance of eight or ten yards into the field, the ground from the root to the bottom of the ditch is considerably disturbed as if by a slight explosion underneath. I have seen trees struck by lightning to the extent of having the bark ripped open, and a branch or so knocked off, but never saw or heard of one so utterly smashed up as this, nor so evidently by a horizontal blow. The keeper on the ground when it occurred was in the field adjoining, and saw it done.—Yours truly,

F. GARTSIDE TIPPINGE.

Sansaw, Shrewsbury, Oct. 20, 1872.