

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CIII.]

AUGUST, 1874.

[PRICE FOURPENCE,
or 5s. per ann. post free.]

THE RAINFALL OF JULY 11TH, 1874.

THERE were several local heavy rains on the above date, one of which, occurring in a low-lying and densely populous part of London, caused such inconvenience as to attract general attention.

Taking the most southerly records first, our Tenterden correspondent writes :—

“The heavy fall on 11th did not extend to Smallhythe, a part of this borough, about $2\frac{1}{2}$ miles south of the town; nor was there a large fall at my Benenden gauge, though in other parts of the same parish, and also at Rolvenden it was very heavy. At Hythe there was but $\cdot 11$, and scarcely any generally in Romney Marsh. The storm began here at 11.25 a.m., and lasted till 1.10 p.m., giving a fall of 1.03 in an hour and three quarters, the other $\cdot 25$ fell in two or three showers in the evening and following night. I found $\cdot 20$ had fallen in one quarter of an hour, $\cdot 23$ in another, and $\cdot 50$ in another, from 12.55 to 1.10 p.m. Did not see any hail; but there was some at Rolvenden.”

At Hartley, near Cranbrook, in Kent, thunderstorms occurred on the 11th at 3 a.m., noon, and 2 p.m.; 0.50 in. fell before 9 a.m., and 1.10 in. fell after that hour; 0.90 in. fell in 35 minutes at 2 p.m., of which the greater part fell in 20 minutes.

From Tunbridge Mr. Punnett writes :—

“A most extraordinary thunderstorm passed over Tonbridge on Saturday afternoon, 11th, the violence, I should think, has never been exceeded in Tonbridge; it commenced with distant thunder in the S.W. at 2.15 p.m., with vivid flashes of lightning; at 2.30 darkness rapidly set in, and then it began to rain, or rather a sheet of water came down, for neither I nor anyone in the town, I should think, ever saw it come down so fast before: the water ran down our road like a stream. You will, of course, like to know the rate at which the rain fell; it commenced falling at 2.30 p.m., the storm and rain continued till 4.30 p.m. and the total amount of rain that fell in those two hours was 3 inches exactly. The following I have copied out of our newspaper, which may perhaps interest you :—
‘Tonbridge.—Thunderstorm.—During the destructive storm which

passed over this town on Saturday afternoon, a valuable horse was killed near Cannon Bridge. A large piece of wall was forced away by the water at the Grammar School, another piece at Bordyke, and houses at Hildenboro' and Hadlow were struck and seriously damaged by the electric fluid."

It was nearly as bad at Sevenoaks, for the Rev. J. Burn Murdoch, of Riverhead Vicarage, writes :--

"It may interest you to know that this neighbourhood was visited with a severe thunderstorm on Saturday afternoon, the 11th inst., and that the heaviest fall of rain took place in one hour (between 2.45 p.m. and 3.45 p.m.) it has ever been my lot to observe in this country, viz. : 1.82 inches. A few drops fell before a quarter to 3, and a little more rain fell between 5 and 6 o'clock, but none afterwards. The total fall between half-past 2 and 6 o'clock was 2 inches.

"The roads in this parish have sustained very great damage. On the side of one of them, near the Sevenoaks Railway Station, a huge chasm, between 40 and 50 feet long, 12 or 15 wide, and about 10 deep, was formed by the rush of water. I may mention in corroboration of my measurements and observations on Saturday, that having occasion to go to the station about half-past 6 in the evening, the book-stall manager told me that a previously empty tub standing in his yard showed a fall of 2 inches in one hour."

We believe that both of the above described rains were quite local, and so also was that in the north-east of London, respecting which the following report, abridged from the *Hackney Gazette*, will be sufficient, as we believe that it may be implicitly relied upon :—

On Saturday afternoon, shortly before four o'clock, a violent thunderstorm burst over the north-eastern district of London. The heat of the day had been intense, and at times a most sultry oppressiveness of the atmosphere prevailed. Heavy clouds rose from the south-east about the same time, and soon covered the sky, and then a terrific display of forked lightning ensued, the flashes being intensely vivid, and following each other in rapid succession. The peals of thunder were very loud. Hailstones fell, as big as beans, whilst a heavy driving wind beat them along, blowing down tree branches and leaves, breaking windows and greenhouse sashes, and destroying garden produce. The North London Railway, in some of its cuttings, was under water from the accumulation of rain ; and at one time the water was so high that it was feared that the engine fires would be extinguished. Between Blackwall and Poplar it was four feet deep, and the traffic thence to Broad-street was suspended for four hours. At Dalston Junction the greatest precautions had to be used, as the water was so high that the large piles of sleepers lying along the side ready for the new line of rails under construction were floating about, and labourers were wading knee-deep in the water to fish them out of the way of passing trains. The streets were like rivers, the water rushing along with impetuous velocity, and in many cases—owing to the stoppage of drains—flooding the cellars to a depth of a couple of feet. At Edmonton and Tottenham, the basements of many houses were filled with water, and the furniture floated about. In a part of the roadway the water was up to the horses' breasts, and, for a time, the omnibuses had to cease running. In some parts of Hackney and Homerton the same thing occurred. The rain fell so rapidly that it was impossible to see across the road ; and very few of our neighbours escaped a flooding of their basements, more particularly in Hackney on the line of the old Hackney Brook, the new sewer being found quite insufficient to carry off the storm waters.

The most evil effects of the inability of the Board of Works to cope with a tropical rain, combined with its inattention to the requirements, were again exhibited in the Richmond-road, several of the houses on the south side of which were actually the recipients of the surface water of London Fields, which was drained into them. At Mr. Bennett's, and Mr. W. U. Crook's, the water reached to the height of five feet in the breakfast rooms and kitchen, floating pianos, tables, breaking partitions, forcing doors, and doing damage which will cost some hundreds of pounds to put right. It was past two on Sunday morning before the water was carried off, and then only by the Fire Brigade pumping it out.

The wind played great havoc with a large number of unfinished houses, and many trees were uprooted. The lower parts of the houses in the Victoria Park-road, and the Prince of Wales's-road, Victoria-park, were completely submerged, whilst a refreshment tent belonging to the Queen's hotel was carried away. The rain and hail did much destruction to the corn crops and market gardens in the direction of Homerton and Leyton. Tradesmen's goods at Hackney, Bow, Kingsland, and Clapton were damaged by water to a great extent. The Lea and the Regent's Canal overflowed their banks, whilst locomotion in the streets, as above indicated, was in many instances impossible.

The following is the *Times'* report of a subsequent discussion in the Corporation :—

THE RECENT INUNDATIONS.

Mr. Deputy HORA asked whether the Metropolitan Board of Works were taking any, and, if any, what, steps to prevent the serious inundations, increasing in frequency and violence, which happen after rain-storms, causing great destruction of property, pecuniary loss, and danger to the public health.

Mr. Deputy LOWMAN TAYLOR, in reply, read a letter on the subject from Sir Joseph W. Bazalgette, the Engineer to the Metropolitan Board of Works, in which he said :—"This Board have diminished the extent and frequency of floodings by carrying off through the intercepting sewers rainfall to the amount of a quarter of an inch in depth spread over London in 24 hours. But on the 11th inst. the rainfall in the East of London amounted to an inch and a half in one hour, or 150 times more than our intercepting sewers and pumps could take. Such storms can only be carried off by what are termed "the storm overflows," which discharge by gravity into the river. These must be above the level of low water, and many of the basements connected with them are so deep, that when the sewers are full the water flows back into them. This is the great cause of flooding. This Board are, nevertheless, carefully watching, and from time to time introducing, improvements which assist the more rapid discharge of flood waters into the river, and thereby decrease the liability of these low basements to be flooded in times of rain. The subject is now under the consideration of the Works Committee, who will make some such recommendation to the Board."

We may now pass to a summary of the records with which we have been favoured :—

RAINFALL AT STATIONS WITHIN 4 MILES RADIUS FROM VICTORIA PARK, LONDON.

County.	Stations.	Depth.	County.	Stations.	Depth.
		in.			in.
Essex ...	Walthamstow	·59	Middlesex	St. Mary's Rd., Islington.	·74
Middlesex	Stamford Hill.....	1·02	"	Guildhall.....	1·14
"	Hadham House	1·70	"	" (on roof).....	1·31
"	Compton Terrace	·49	Kent	Deptford Pumping Station	1·07
			"	Royal Obs. Greenwich ...	1·03

RAINFALL AT STATIONS IN AND NEAR LONDON, BUT BEYOND
THE ABOVE CIRCLE.

Surrey.....	Addiscombe	·10	Kent	Crossness Pumping Statn.	·24
Kent	Park Side, Beckenham ...	·02	Middlesex	Spring Gardens	·15
„	Fox Grove „ ..	·03	„	Royal Botanic Gardens ...	·22
„	Forest Hill	·11	„	Camden Square	·17
„	The Downs, Dartford.....	·56	„	Squires Mount, Hampstd.	·17
Surrey.....	Halford House, Richmond	·23	„	The Nurseries, Highgate.	·20
„	Kew Observatory	·20	„	Muswell Hill	·10
Kent	Eltham Green	·10			
„	Blessington Road, Lee ...	·33			

REMARKS.

WALTHAMSTOW.—The greater part fell between noon and 3 p.m., during a severe TS, which was most terrific about 1 p.m., when also the rain was heaviest. Two elms struck at Leyton.

NAVARINO ROAD, DALSTON.—Rain gauge unfortunately not observed, but rain very heavy; several houses had from two to five feet of water in their lower rooms.

STAMFORD HILL.—0·93 in. fell before 5.30 p.m.

HADHAM HOUSE, UPPER CLAPTON.—Nearly 1·70 in. fell between 4 and 6 p.m.

COMPTON TERRACE, ISLINGTON.—By far the greater part of the 0·49 fell between 4 and 6 p.m., during the prevalence of a severe TS, which did not entirely pass away for some time, and rain fell moderately at intervals for some hours.

ST. MARY'S ROAD, ISLINGTON.—Rain began about 3 p.m., fell very heavily for an hour, and ceased about 8 p.m.

DEPTFORD, PUMPING STATION.—The fall of rain (1·07) commenced at 3.45 p.m., and ended at 4.45 p.m.

ROYAL OBSERVATORY, GREENWICH.—The rain began suddenly at 3.58 p.m., by 4.2 p.m. 0·25 in. had fallen; by 4.6 p.m. another 0·25 fell; by 4.11 p.m. 0.20 more had fallen; and by about 5 p.m. a total of 1·03 had fallen.

ADDISCOMBE.—Distant T from 1.45 p.m. Steady rain commenced at 2.40, continuing till 3.10; again from 4.5 to 5 p.m.; and again, for a few minutes, about 6 p.m. Total fall, 0·10; wind, N.

PARKSIDE, BECKENHAM.—TS from about 2 to 6 p.m., with but very little R, merely a few light showers.

FOREST HILL.—We only had the southern edge of the severe TS. L only seen once; T frequent; and very dark clouds in N. and N.W. The wind here S.E.

THE DOWNS, DARTFORD.—From 3.28 p.m. till 4.1 p.m. 0·56 in. of R fell during TS. Sudden shift of wind from N. to S.

HALFORD HOUSE, RICHMOND.—The 0·23 fell during the afternoon and evening, but the exact time of beginning and ending is not known.

KEW OBSERVATORY.—R began to fall at 4.30 p.m., raining more or less for an hour, the amount recorded being ·08; at 6.55 p.m. it re-commenced, and, raining heavily for 15 minutes, increased the day's fall by ·12, making ·20.

CROSSNESS.—R commenced at 3.15 p.m., and ceased at 5.30 p.m., when ·24 had fallen. Violent T and L.

SQUIRE'S MOUNT, HAMPSTEAD.—The fall so small that no special notice was taken of it.

MUSWELL HILL.—At Edmonton, about 5 miles E.N.E., at Watford about 12 miles N.W., and in the middle of the City, 6 miles S, such heavy R fell as produced temporary floods in the two former places, whilst here the R amounted to 0·10 in. only.

Although there is no doubt that the storm was a violent one, and the rain heavy, readers of *British Rainfall* will not need to be reminded that a fall of an inch in an hour, or 1·70 in two hours, is by no means a rare phenomenon. What would be the condition of North-East London with the above-mentioned Tunbridge fall of three inches in two hours.

THE WATER SUPPLY OF NORTH-WESTERN EUROPE DURING THE SUMMER OF 1874.

WE have had the pleasure, since the publication of our last number, of receiving from Capt. Hoffmeyer the data from which the following table has been constructed. Our readers will see that it is in all respects similar to those given last month, and they will readily understand that it was only through the time necessarily occupied in postal communication that we were not able to insert it in our last.

DENMARK.

Copenhagen. Lat. 55°41' Lon. 12°35' E.			Tarm. Lat. 55°51' Lon. 8°25' E.			Smidstrup. Lat. 57°24' Lon. 10°0' E.		
Average for 13 yrs.	Actual 1873-74.	Ratio average = 100.	Average for 13 yrs.	Actual 1873-74.	Ratio average = 100.	Average for 13 yrs.	Actual 1873-74.	Ratio average = 100.
1·88	2·16	115	2·95	3·35	114	2·84	2·25	79
1·69	1·32	78	2·06	2·20	107	2·57	1·89	74
1·27	1·55	122	2·22	2·42	109	2·12	2·07	98
1·32	·29	22	1·58	·28	18	1·82	·60	33
1·23	1·76	143	1·35	1·75	130	1·52	1·67	110
1·27	1·22	96	1·22	·96	79	1·40	1·73	123
1·64	·60	37	1·46	1·15	79	1·63	1·54	94
2·24	·96	43	2·08	·94	45	2·18	·64	29

Taking the average of the ratios in the same manner as we did for other countries, we find—

	Copenhagen.		Tarm.		Smidstrup.		Average.
December to May	...	83	...	87	...	89	86
November to April	...	96	...	93	...	86	92

Whence it appears that the drought has scarcely reached so far as Denmark. February, May, and June have been dry, but in the other months the fall has been equal to, or greater than, the average.

To the Editor of the Meteorological Magazine.

SIR,—I have read with much interest the article in the July number of your magazine on the water supply of N.W. Europe, &c. This strengthens the conclusion at which I have long since arrived, that there is not only much to learn, but that the steps taken to ascertain the real state of things are quite insufficient. I believe that I have as much information as anyone on the question. 1st. I have notes of the height of water in a line of wells in the chalk near Watford since 1851, and the records of a well near here for the last seven years, as compared with the rainfall. Now one of the mistakes in the French calculation is not taking in the month of October, because though on the average of years, the rainfall does not tell on the height of the water level in the chalk in October; the rains of that month

very often replace the summer evaporation, and put the stratum so saturated into a condition to (so to speak) transmit the November rains to the water level; indeed I think October is the ruling month rather more than any other, except it be a very wet January. There is another point to be noted, the conditions of the rainfall; and here we find the necessity of diurnal registration. This season, *i.e.*, from October to April. October with me, 2·400 in., of this 1·145 in. fell in three days, 12th to 14th, and ·835 in. in three days, 22nd to 24th. Then November total, 2·105; of this 1·530 in. in six days, from 4th to 9th. Had more rain, of any amount, fallen after this, or had the remainder formed part of a continuous rain, the water level would have been affected. Then a cessation; no rain from the 10th to 23rd, and from 24th to 26th, ·370, and in December only ·517, quite sufficient to account for none percolating to the water level. Then in January, 2·280; of this ·720 on 24th and 25th, the first that touched the water level; this, assisted by February, ·520 on 15th, and ·830 on 26th and 27th, gave nearly the whole stock of water to be given out during the rest of the year; the rise of water in the well being 4 ft. 9 in. by the end of February; it has gradually declined ever since, and is now 1 ft. 6 in. above the point whence it rose, and 2 ft. 6 in. above the lowest for seven years; whether it will fall below this minimum must depend on the autumn rainfall—I am, Sir, yours, &c.,

J. C. CLUTTERBUCK.

Long Wittenham, Abingdon, July 17th, 1874.

SUPPLEMENTARY TABLE OF MONTHLY RAINFALL, JULY, 1874.

Div.	County.	Station.	Total Fall. in.
II.	Kent	Margate (Acol)	·63
„	Sussex	Hailsham	·95
„	Hampshire	Strathfield Turgiss	1·06
„	Oxford	Oxford (Magdalen College)	·70
„	Essex	Harlow (Sheering)	1·81
„	Cambridge	Cambridge (Merton Villa).....	·66
IV.	Norfolk	Swaffham.....	1·09
V.	Devon	Teignmouth (Brookbank)	·86
„	„	Torrington (Langtree)	3·38
„	Somerset	Taunton (The Castle).....	1·32
VII.	Lincoln	Horncastle (Bucknall)	·78
VIII.	Lancaster	Liverpool (Walton-on-the-Hill) ...	4·00
IX.	York	Wakefield (Stanley Vicarage)	1·83
X.	Durham.....	Gainford	2·47
„	Westmoreland	Shap	1·82
XVII.	Banff.....	Keith	1·22
XVIII.	West Ross.....	Strathconan.....	3·32
XX.	Cork	Fermoy, (Glenville)	2·59
XXI.	Westmeath	Athlone, (Twyford)	2·97
XXII.	Galway	Ballinasloe	3·35

THE DROUGHT.

To the Editor of the Meteorological Magazine.

SIR,—The dryness of the air here on Sunday afternoon (July 19th) was so remarkable, that I send you the readings of the dry and wet bulb thermometers. During the whole afternoon, from 1 p.m. to 6 p.m., during which time I was able to make observations every few minutes, the difference between the dry and wet bulb was never so small as 20 degrees, frequently from 21 to 24 degrees, and at one time, between 3 and 4 p.m., was as much as 25 degrees; the readings being: dry bulb 87°, wet bulb 62°; a difference which indicates a relative humidity of about 24°, saturation = 100. Such a degree of dryness as this has never come under my observation before, and as Mr. Glaisher, in his “Hygrometrical Tables,” only gives equivalents for a difference of 23 degrees, viz., from 87° to 64°, I assume that it is something quite exceptional. My verified maximum thermometer registered 90° in the shade the same afternoon. This instrument is mounted in a Greenwich Stand, on the plan recommended by Mr. Glaisher, so as to have a free circulation of air around it on all sides. Two other thermometers, somewhat less freely exposed, indicated a temperature of 94°. The weather was brilliantly fine; sky perfectly cloudless; light airs from S.E. Maximum in shade on 16th, 17th, and 18th, 85°, 87°, and 86°.—I am, Sir, yours, &c.,

G. T. RYVES.

Buildwas, Ironbridge, Salop, July 21st, 1874.

P.S.—Our total rainfall for June was only 0·39, and a correspondent at Bishop's Castle, tells me that the fall there was only 0·33 in. In fact we have had no rain worth speaking of since May 23rd, not having come in for any of the thunder showers which appear to have been so prevalent in the S. and S.E. districts, and the extreme North.

NOTES ON THE DROUGHT.

STRATHFIELD TURGISS, HANTS.—Clover shrivelled for want of rain, and cracks in water meadows so wide from drought that young birds fall into them, and cannot get out, but perish in great numbers. River very low.

DISS, NORFOLK.—Drought much felt, and water in the neighbouring villages very scarce. All the crops greatly improved towards the end.

COMPTON BASSET, WILTS.—Pastures burnt up. Water has become so scarce that it has to be carted from a distance for the use of the sheep and cattle.

SANSAW HALL, SALOP.—Almost all trees and shrubs transplanted since September last are dying or dead. Many forest trees are dying likewise, and lilacs and laburnums suffering much. The only exception to the list of killed transplanted trees and shrubs are those which are kept alive by laborious watering. Pits and pools, the

bottoms of which have not been seen within recollection, are now dry. The fearful drought of this year will be apparent by comparison of the falls in the first seven months of the three previous years:—

1871...14·519—110 days.	1872...25·516—130 days.	1873...14·104—97 days.
1874... 8·835— 75 „	1874... 8·835— 75 „	1874... 8·835—75 „
<hr/> 5·684— 35 „	<hr/> 16·681— 55 „	<hr/> 5·269—22 „

COSTON, LEICESTER.—Vegetation much hindered by the drought. Meadows and lawns parched up; springs in some places failing; visible improvement towards the end of the month.

PARTNEY, LINCOLN.—The ground is so parched and dry that I question whether any rain has penetrated to the extreme roots of the grass since February.

STANLEY, WAKEFIELD, YORKS.—In the early part of the month the drought said to be very trying both to cattle and root crops, but towards the end vegetation much improved.

VIOLENT HAILSTORM AT BROMSGROVE.

To the Editor of the Meteorological Magazine.

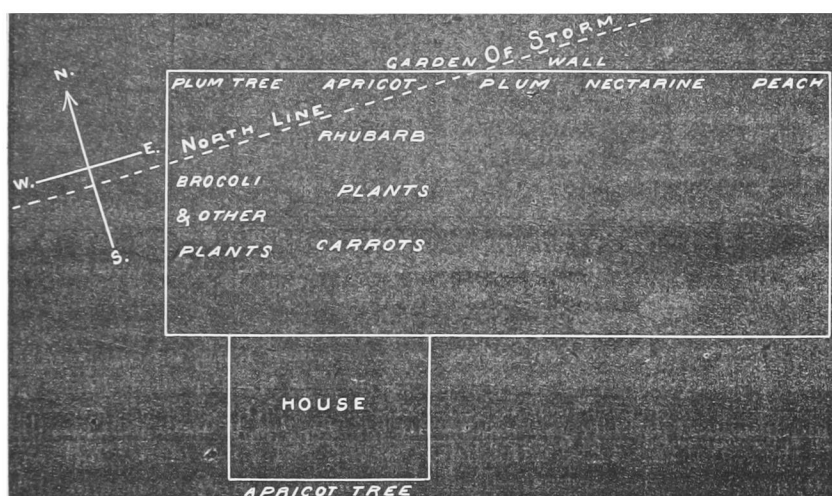
DEAR SIR,—We have had two violent storms this week; on Thursday, about 11 a.m., a very heavy down-pour of rain suddenly came on which lasted for about ten minutes, when '13 was registered by my rain gauge. I was out for a drive with my family at the time, all being drenched to the skin, and all that could not get immediate shelter were the same. A somewhat singular matter attracted my attention just previous, on passing the reformatory—all the prisoners were out with buckets carrying water from an adjacent stream on to an extensive field of kidney beans, which were suffering from the long drought; by the time we had gone half a mile we were in the midst of the deluge.

On Friday morning, the most violent hail storm occurred that was ever remembered, it caused sad havoc to the growing crops, whole fields of swedes and mangolds being destroyed; garden produce cut to pieces; trees and hedgerows denuded of their foliage or pierced as if shot (I enclose you a few croppings from my own garden, not by any means, although severe, the worst part); much of the fruit is past recovery; the quantity of glass broken by the hail is immense, in the lower part, on the East side, of Worcester Street scarcely a whole window is to be seen, many are completely broken up; green-houses demolished to a large extent, indeed the damage altogether is excessive.

About 10.30 a.m. the clouds looked very ominous, on examining the gold leaf electrometer it was apparent that the atmosphere was overcharged with electricity, in a short time loud thunder was heard, and vivid lightning seen; at 11.15 the hail storm commenced, accompanied by a little rain, such was its violence that by 11.30 when

the storm ceased, the ground in the open was covered six or eight inches deep, where obstructed it was, in some places, three feet and upwards, with stones of unusual size, some being full an inch in diameter, whilst most of the remainder varied from that size to half an inch, comparatively few were under that size.

The stones fell very obliquely, which saved many of the lower windows where houses stood opposite. The storm was singular, it being confined to a space of about one mile square, taking the lower part of the town as its centre; its direction was from West to East, the northern edge of the storm is traceable to an inch by following the destruction of the crops, the foliage of the trees, hedgerows, &c., &c.; this line passed nothing is injured. My rain gauge noted '96 for the storm, much of the hail of course would bound over the funnel and be unmeasured. I send you a rough sketch of my garden, by which you



will see how defined the line was, passing between an apricot and plum tree, the former not a leaf injured, whilst the latter was torn from the wall, almost every leaf cut off, and all the fruit destroyed. A portion of the skin of a plum I enclose, also part of an apricot growing against the south wall of house.—Yours, &c.,

G. DIPPLE

The Ford House, Bromsgrove, July 25th, 1874.

REVIEWS.

Repertorium für Meteorologie herausgegeben von der Kaiserlichen Akademie der Wissenschaften, redigirt von Dr. H. WILD, &c.
Band III. 4to. St. Petersburg, 1874. 427 pages.

THE present volume of the *Repertorium* sustains, if it does not raise, its high—perhaps unequalled—reputation. Dr. Wild leads off with two papers. The first (one of a series entitled “Studies on Meteorology

logical Instruments and Methods of Observation") is "On the determination of atmospheric pressure." Although confined to the consideration and description of modern patterns of barometer and to kinds actually in use, it is one of the longest, and on the whole, one of the best articles on barometers we have ever read. When we mention that twenty-one quarto pages are devoted to aneroids, and twenty-five to the section treating of the adjustment and verification of standard barometers, our readers will form some idea of the detailed nature of the work, which moreover bristles with references to most of the best papers in all languages, and goes thoroughly into the mathematical formulæ of every branch of the subject, especially into that of barometers of the King's barograph type, which Dr. Wild calls "Wagbarometers," or balance barometers. We think that in one or two cases it would have been better to have arranged some of the barometric comparisons in the order of barometric height, instead of in the sequence of the observations, and we should have been glad had there been more woodcuts of the instruments, but these are mere spots on the sun. The paper itself is so good that we trust that some competent person will write an abridgment of it for the use of the many thousands of English-speaking meteorologists who may not see, or be able to read, the original.

Dr. Wild's second paper is a description of a new universal magnetic instrument, to which we hope and believe the engraving does not do justice, for we are sure that neither the designer (Dr. Wild) nor the maker (Brauer) would make a magnetic instrument other than "as steady as a rock," and this is certainly not the impression conveyed by the engraving.

M. J. Pernet contributes a short paper on the periodic oscillations of atmospheric pressure at St. Petersburg, embodying the results of 50 years' observations. The hourly results for 22 years are:—

	in.		in.		in.
1 a.m.	29·866	9 a.m.	29·865	5 p.m.	29·863
2	·865	10	·868	6	·862
3	·863	11	·870	7	·862
4	·862	Noon	·870	8	·863
5	·861	1 p.m.	·869	9	·865
6	·861	2	·867	10	·866
7	·861	3	·865	11	·866
8	·862	4	·863	12	·867

The pressure averages about 29·80 during June, July and August, and 29·90 during the rest of the year.

Passing a short note on Ozone Observations, and a long one on Magnetic Intensity at Pekin, we come to one by M. Rikatcheff on the daily temperature curve at St. Petersburg on clear and on overcast days, of which it may be well to translate the second paragraph:—

"Before entering on the details of the calculations I must remark upon the insufficiency of the method of determining the daily march of temperature usually adopted. For example, if hourly thermometric readings are taken, and the day is assumed to begin at noon, the means

are usually taken of the temperatures for each hour from noon to 11 a.m. (inclusive) of the following day. By this means we only obtain the daily march during 23 hours, and its amount between 11 and noon remains unknown. It is ordinarily assumed that the mean temperature at noon at the commencement of the day is the same as that of the next day, which is incorrect. The temperature during the 24 hours rises or falls according to the season. It is therefore necessary to take into consideration this change, which represents the annual march of temperature during 24 hours. It may happen for some place, where the annual march is great, that the mean for 11 a.m. may be higher than that for noon of the previous day, but it would be unjust to conclude therefrom that the temperature at that place falls from 11 to noon. From this defect in the mode of reduction, sudden interruptions in the continuity of the curves are always found. These are usually corrected in an altogether illegitimate manner by Bessel's formula, which does not apply to the case."

M. Rikatcheff then proceeds to point out other difficulties arising from the same cause, and to show that the difference between the noon readings may be regarded as a measure of the daily heating or cooling of the air. Thence he shows that the daily march of the temperature may be regarded as consisting of two elements (1) the true daily march (2) a portion of the annual march, whence it follows that if extreme accuracy is desired it is necessary first to determine the amount of the annual march due to each 24 hours, and then to apply to the daily range corrections proportional parts of this fraction of the annual march due to each hour. A modification of Bessel's formula, which includes this correction, is given.

The author then proceeds to explain the system upon which his paper has been compiled, and gives various tables and curves to illustrate his subject. We, however, can only spare space for a few of his results :

- (1). Throughout the year the daily range is much greater on cloudless days than on cloudy ones.
- (2). The greatest average daily range usually occurs in May, and is $12^{\circ}6$; on cloudless days in that month it is $16^{\circ}6$, and on overcast ones $6^{\circ}5$. It is least (in fact almost insensible) in December, the average for the month being only $1^{\circ}6$, and that for cloudy days in that month less than 1° .
- (3). The maximum temperature occurs earlier on cloudy than on clear days, especially in summer, when on overcast days it occurs at 2.30 p.m., and on cloudless days not until 5.30 p.m.
- (4). In autumn and in December during overcast days we note that towards evening the temperature ceases to fall, and even from 8 p.m. to 2 a.m. seems to rise a little.
- (5). When the sky is cloudless the portion of the annual curve, whether it be on its ascending or descending branch, due to each day, is greater than when it is overcast ; and this daily portion is at its maximum ($3^{\circ}4$) in May (increasing) and December (decreasing) respectively.

- (6.) When it is overcast this value varies irregularly, and the following facts often occur (a) the temperature in summer not only does not increase but actually falls, and the reverse in winter; (b) the greatest daily increase occurs in December, and the greatest decrease in June.
- (7.) When the sky is clear, the effect of the sun, which is at its maximum in the long summer days, explains the great increase at that season. In the same way a cloudless sky during the long winter nights gives rise to an amount of terrestrial radiation which fully explains the cooling at that season.

(To be continued.)

Tafeln zur Berechnung der Beobachtungen an den Küsten-Stationen und zur Verwandlung der angewendeten Maasse in metrisches Maas.

[Tables for the Reduction of Observations at coast stations, and for their conversion into Metric Measures.] By G. KARSTEN. 8vo. 25pp. Paul Toeche: Universitäts-Buchhandlung, Kiel.

A VERY useful collection of tables, and noteworthy in several respects, viz., for accuracy, for fulness, for clearness of printing, and for being printed on one side of the paper only. As regards fulness we may take the table No. X. for the conversion of barometric readings made in Paris lines into their equivalents on the metric system; this table gives every hundredth of a line from 318''' (28.24 Eng. in.) to 349''' (31 Eng. in.) One hundredth of a Paris line is very nearly one thousandth of an inch (accurately $0''\cdot01 = 0\cdot00088814$ in.), the fulness of this table may therefore be realized by anyone by remembering that it is almost the same as one for English measures giving the equivalent of every thousandth of an inch from $28\frac{1}{4}$ to 31 in.

NEWSPAPER CUTTINGS.

§ At a recent meeting of the Berlin Academy, a paper was read by Professor Dove on "The General Character of Mild Winters." One fact which appears from his figures is, that several such winters often follow one another in close succession, or with little interruption. It also appears (1) that sudden exceptional moderating of the temperature in the last third of December is very frequent; but does not always betoken a continued mild January of the following year; (2) that a cool November and a cold first half of December generally point to a mild January following; and, conversely, a mildness in the former period points to a severe midwinter. The phenomena, lastly, show that the earth's surface at a determinate time falls into determinate weather systems; and the rules found for one of these are without significance for another. As these systems depend on air currents, they can have no universal application.—*English Mechanic*.

The influence of forests in drawing moisture from the heavens, says the *Californian Horticulturist*, may be seen from the experience of San Diego, California. Previous to the year 1873 there was yearly a rainy season, which made the soil nourishing and productive. In 1863, a destructive fire swept over the greater part of the country, destroying the forest, and blackening the hills. Since then there has been no rainy season at San Diego.—*Journal of Horticulture*.

JULY, 1874.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which ≥1 or more fell.	TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.			Max.		Min.			
				Dpth	Date.		Deg.	Date.	Deg.	Date.		
I.	Camden Town	.82	— .97	.22	27	11	90.8	20	47.3	25	0	0
II.	Maidstone (Linton Park)	.72	— 1.26	.24	27	8	94.0	19	44.0	25	0	0
III.	Selborne (The Wakes)	1.03	— 1.17	.48	27	8	82.0	10†	44.0	6	0	0
IV.	Hitchin	2.05	+ .15	1.62	10	11	83.0	9	44.0	24	0	...
V.	Banbury	2.14	+ .08	1.18	10	12	84.0	9	41.0	6	0	...
VI.	Bury St. Edmunds (Culford)	.76	— 1.23	.39	28	7	89.0	20	43.0	29	0	0
VII.	Bridport	1.59	— .52	.48	25	6	80.0	10†	42.0	6	0	...
VIII.	Barnstaple	2.77	— .09	.61	25	13	86.0	19	48.5	7	0	...
IX.	Bodmin	2.15	— .96	.47	28	15	76.0	16	47.0	7	0	0
X.	Cirencester	1.09	— 1.35	.46	25	12	...	...	...	...	...	...
XI.	Shifnal (Haughton Hall)	1.17	— 1.00	.30	4	12	80.0	10	47.0	27	0	0
XII.	Tenbury (Orleton)	.80	— 1.58	.35	25	10	87.7	19	42.6	6	0	0
XIII.	Leicester (Wigston)	.61	— 1.49	.28	27	11	92.0	19	42.0	5	0	...
XIV.	Boston	1.86	— .44	.74	29	10	92.0	9	45.0	6	0	0
XV.	Grimsby (Killingholme)	1.55	...	.58	28	12	81.0	2.9	47.0	6	0	...
XVI.	Derby	1.28	— .91	.24	26	14	86.0	6, 25	47.0	19	0	0
XVII.	Manchester	1.77	— .92	.69	13	14	89.5	19	48.0	6, 7, 8	0	0
XVIII.	York	1.18	— .76	.31	23	10	78.5	10	41.0	6	0	...
XIX.	Skipton (Arncliffe)	3.92	+ .69	.84	31	18	86.0	10	38.0	5	0	...
XX.	North Shields	1.47	— .34	.40	13*	11	75.2	2	45.0	7	0	0
XXI.	Borrowdale (Seathwaite)	7.20	— .94	1.60	31	15	...	...	...	...	...	...
XXII.	Cardiff (Ely)	...	...	...	...	...	...	...	...	...	...	...
XXIII.	Haverfordwest	2.55	— .75	.54	1	11	81.7	18	43.5	24	0	...
XXIV.	Rhayader (Cefnfaes)	3.41	+ .56	1.00	2	19	82.0	...	43.0	...	...	...
XXV.	Llandudno	1.97	— .32	.48	12	11	81.3	19	46.0	9	0	...
XXVI.	Dumfries	2.68	+ .43	.64	13	17	82.0	18	46.5	6	0	0
XXVII.	Hawick (Silverbut Hall)	2.20	...	.75	13	13	...	...	...	...	...	...
XXVIII.	Kilmarnock (Annanhill)	2.68	...	.44	28	16	76.4	20	42.6	11	0	...
XXIX.	Castle Toward	2.76	— .38	.48	2	14	76.0	18	...	...	0	0
XXX.	Leven (Nookton)	1.99	— .28	.47	26	15	81.0	18	40.0	7	0	0
XXXI.	Stirling (Deanston)	...	...	...	...	...	...	...	...	...	...	...
XXXII.	Logierait	3.58	...	.87	21	14	84.0	18	37.0	25	0	...
XXXIII.	Braemar	4.41	+ 2.13	.77	21	15	76.3	18	40.0	29	0	1
XXXIV.	Aberdeen	2.67	...	.87	14	18	77.2	18	44.5	7	0	0
XXXV.	Loch Broom	2.90	...	.66	18	14	...	...	...	...	...	...
XXXVI.	Portree	5.40	— .67	1.27	1	20	...	...	...	...	...	...
XXXVII.	Inverness (Culloden)	1.92	— .75	.36	3	15	83.2	19	44.4	28	0	0
XXXVIII.	Helmsdale	2.85	...	1.05	22	12	...	...	...	...	...	...
XXXIX.	Sandwick	2.75	+ .86	.63	14	16	72.5	18	41.9	13	0	0
XL.	Caherciveen Darrynane Abbey	4.13	...	.58	25	17	...	...	...	...	...	...
XLI.	Cork	1.27	...	.36	1	10	...	...	...	...	...	...
XLII.	Waterford	2.38	— .94	.47	23	15	...	...	...	...	...	...
XLIII.	Killaloe	3.47	+ .28	.53	25	21	85.0	16¶	47.0	6	0	...
XLIV.	Portarlington	2.73	— .81	.48	14	23	78.0	16	46.0	28	0	...
XLV.	Monkstown, Dublin	2.38	— .05	.65	22	16	...	...	...	...	...	...
XLVI.	Galway	4.98	...	.61	21	25	73.0	15	48.0	11	0	...
XLVII.	Ballyshannon	3.52	...	.71	25	26	...	...	...	...	...	...
XLVIII.	Waringstown	2.46	...	.48	23	16	85.0	17	43.0	12	0	0
XLIX.	Edenfell (Omagh)	2.86	...	.55	27	19	76.0	18	39.0	28	0	...

* And 23. † 20. ‡ 19 & 20. § And 25. || 28. ¶ 17.

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

METEOROLOGICAL NOTES ON JULY.

ENGLAND.

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.

LINTON.—A very dry hot month, the days being very hot all the middle part of it, but the nights not particularly so, that of the 24th being quite cool. T only on the 11th, when we had nearly four hours of it, the rain, however, not being heavy. The hottest days were the 8th, 9th, 10th, 19th, and 20th. Vegetation suffering from drought, but not more than might be expected, but water for domestic use is becoming scarce in many places, as, with the exception of July 1864, 1868, and 1869, it is the driest I have on record for twenty years.

SELBORNE.—Very hot and excessively dry month. Harvest begun on the 31st with fine crop of wheat. Great deficiency of root crops and hay; the hops as yet extremely bad. TS on 9th, and T on 10th, 11th, and on 24th. Fog on 17th and 19th. Misty morning and very hot day on the 20th. Max. bar. 30·28 on 10th; Min. 29·65 on 20th; and Mean of month 29·97.

HITCHIN.—Tremendous TS on 10th, the heaviest fall of rain on record in such a short time.

BANBURY.—TS 7.45 to 9.15 p.m. on 10th, 1·18 of rain fell. R and H on 23rd, TS on 27th, when ·50 fell in ten minutes. A little H.

CULFORD.—A month of dry hot weather. Mean. temp. of month, 64°. T was heard on 21st, 22nd, 23rd, 24th, 28th, and 29th; but R only accompanied it on 23rd, 28th, and 29th, and that to only a trifling extent. Notwithstanding the excessive drought, crops are much better than might have been expected. The wind was from easterly points on fourteen days, and from westerly the remaining seventeen days.

BRIDPORT.—A continuance of fine and hot weather to the 22nd. Wheat reaped on the 20th. On the 24th, at 2 p.m., a TS; at 3 p.m. it was very heavy. L vivid and T loud, with R and H. ·36 fell in one hour.

BODMIN.—Average temp. of month, 65°·1, being 3° above the average.

HAUGHTON HALL.—1st, Very few swallows and martins, swifts and sand martins as usual; partridges hatched in great numbers, and some able to fly. Although R fell on twelve days, it was in such small quantities and so soon evaporated by the powerful sun and drying winds, that vegetation benefited little thereby. With the exception of a fall of ·30 on the 4th, there were only a few slight showers till the 23rd. Almost a complete failure of swedes and root crops. The wind from S.W. till 6th, when it changed to W. and N.W., and so continued, with a few exceptions, till the close. Harvest began on 24th.

ORLETON.—Another very dry, hot, and brilliant month, with a mean. temp. of nearly 4° above the average, and only exceeded in July 1859 and 1868. The earth very dry, the brooks and rivers very low, the grass burning up, and all the crops except the wheat suffering severely from the drought. The falls of R have been very trifling, and have made scarcely any impression upon vegetation, and none on the land. Wheat cutting commenced on the 27th. Distant T was heard on the 10th, 24th, 27th, and 28th. On the latter day a storm passed nearly over us from S to N, about 3.45 p.m., with L and loud T, but no rain. A tree was struck in the valley within half a mile of this place.

BOSTON.—A very fine month, with almost constant sunshine during the day. Several showers towards the end of the month. On the 29th there was a very severe TS, accompanied by a heavy fall of R, ·73 falling in about half an hour. Two of the peals of T were the loudest I ever heard, and the atmosphere was so darkened that, for a short time, it was too dark to read indoors. Corn crops in very good condition; cutting commenced on the 30th, in a few places, but not generally till four days later.

GRIMSBY (KILLINGHOLME).—The air at times very dry, water scarce. The wheat crops very good, root crops on heavy land bad. More T and L than usual. More rain fell in the neighbourhood than here. 2nd, 8.30 p.m., very wild sky, a wind dog, and a cloud resembling the pocky cloud. 3rd, 2.45 p.m., dry bulb,

73°; wet, 42°. 4th, 4.30 p.m., distant T. 11th, TL and R at noon. TS on 21st, 24th, 28th. 28th, a meteor in S at 8.40 p.m.

ARNCLIFFE.—Ther. at 122° in sun on 10th.

NORTH SHIELDS.—TS on 23rd and 29th.

SEATHWAITE.—T on 20th, 21st, and 28th.

WALES.

HAVERFORDWEST.—A most fine month. The rainfall opportunely came to save the green crops, and it is said that the cereal crops, though light, will be of good average yield; the wheat will be first rate in quality and quantity. The warmest July since 1870, temp. exceeding 80° on three days; the nights very warm, some over 60°.

CEFNFAES.—The month in this district has been fine and genial. Hay crop very light, but well got in. Rains gentle. Brooks and small springs dried up; great want of water. Winds, S.W. and N.W.

LLANDUDNO.—10th, a thick sea fog passed over the lower part of the town from 1 p.m. to 3 p.m. Altogether a splendid month.

SCOTLAND.

DUMFRIES.—Copious showers and genial heat have been the characteristics of the month, and a great impulse has been given to vegetation and pastures, which were brown and bare, and are again fresh and green. Cereal crops were much benefited, but potatoes and turnips were more so. Harvest commenced on the 27th. Wheat a splendid crop. Oats are rather deficient in straw, but an average of grain. Potatoes fully an average. Turnips, with some exceptions, very good. Fruit, a good crop. Rainfall, rather above the average.

HAWICK.—Hurricane on 3rd; T and T showers on 13th and 22nd. Hay crop light, but well secured. Turnips have suffered from drought, and have not come up regular. Potatoes lift small, but clear as yet from disease. Pastures look as brown as if it was October.

ANNANHILL.—Winds principally S.W., light to fresh. S.S.W. gale on 2nd. 28th. TS, vivid L, both sheet and forked, with heavy R. Month generally fine. The R, though light, has improved pastures and brought on the wheat. Oats and hay still light, but looking better than was anticipated earlier in the season. Fruit very scarce; ozone well developed during the month.

CASTLE TOWARD.—A rather dry month, but the occasional showers have refreshed the crops, which look well in this locality. Hay crop pretty fair, and well secured. Potato disease has appeared, otherwise they, turnips, and corn look well. Grass is now abundant. Currants, above the average; gooseberries, fair; strawberries, excellent; apples, pears, plums, and cherries, scarce, considering the show of blossom. Running streams small, and water scarce.

BRAEMAR.—TS on 19th and 28th. A most excellent growing month. Crops looking remarkably well.

ABERDEEN.—Bar. pressure below the average; temp. 2°·5 above it. Winds from S. and S.W. more frequent than usual; rainfall slightly above the average. A month of warm, genial weather, but somewhat variable. TS from 11 to 12 a.m., and 4 to 5 p.m. on 14th. T also on 11th, 20th, 22nd, and 23rd.

PORTREE.—A fine growing month. Crops of all kinds looking well; cattle and sheep thriving well; pasture grass abundant.

LOCHBROOM.—A most beautiful month. The crops are luxuriant.

CULLODEN.—Distant T on evening of 2nd; T and one flash of L between 5.10 and 6.45 p.m. on 27th; a very heavy storm of T and L between 2 and 3 p.m., on 28th, with a heavy fall of R and H. Three trees (two oaks and one elm) struck between Culloden and Inverness, not all in one locality, but in same line from this place. Total fall 72 below the average of 32 years.

SANDWICK.—Distant T on 8th in evening, and on the mornings of the 9th and 11th. July has been wetter and warmer than the mean, the temperature having been 100° or more in the sun on 11 days, and even in the shade it was as high as 72°·5. The rains and heat together caused very rapid vegetation.

IRELAND.

MONKSTOWN.—22nd, TS with very heavy hail and rain at 5 p.m., '44 in 1½ hour.

BALLYSHANNON.—Although a much larger quantity of R fell during the month than in the preceding one, there has been much heat which, coupled with the moisture, has well assisted the growth of green crops, all of which are looking very promising.

EDENFELL (OMAGH).—First three days unsettled and squally, but from 4th to 19th the weather was very fine, culminating in higher temp. on 16th, 17th, and 18th, than has been here recorded for three years. From 19th showery, but not sufficient to seriously stop the hay harvest, which has been an abundant and favourable one. It is many years since crops of all kinds in this county have looked so promising.

DRYNESS OF THE AIR IN NORTHERN INDIA.

To the Editor of the Meteorological Magazine.

SIR,—In your remarks, in your February number, on M. Bulard's "Climate of Algeria," I observe that the degree of dryness noted by him is so extreme as almost to excite incredulity. Allow me to forward you a few observations to illustrate the hygrometric conditions of sub-tropical climates at certain seasons of the year.

Date.	Place.	Dry Bulb.	Wet Bulb.	Difference.
4th June, 1869	Gwalior, Central India	110°·3	69°·7	40°·6
16th Feb., 1870	do.	69°·2	50°·5	18°·7
11th May, 1870	Jutog, near Simla, } 6,500 ft. above the sea }	70°·6	49°·0	21°·6
18th Nov., 1870	do.	58°·2	37°·9	20°·3
19th June, 1873	Meean Meer, Punjab	112°·2	70°·2	42°·0
17th May, 1874	Meerut, North West Provinces	103°·2	66°·4	36°·8

I have selected the above observations as some of the most remarkable on my record, but I could fill a page with others very nearly approaching them. During the months of April and May, and the first week of June, 1869, at Gwalior, the difference between the dry and wet bulb, at 9 a.m., exceeded 30° no less than 16 times. In fact, the extreme dryness of the Algerian sirocco is reproduced day after day in the plains of Northern India, during the months of April and May.

Yours faithfully,

W. STRAHAN.

Meerut, East Indies, May 31st, 1874.

BOOKS RECEIVED.

CANADA.

Kingston, Prof. G. T.—General Meteorological Register for 1873. Toronto, 8vo.
Kingston, Prof. G. T.—General Monthly Meteorological Register for 1873. Toronto, 4to.

CEYLON.

Fyers, A. B., Lieut.-Col., R.E.—Results of Meteorological Observations at Ceylon, from 1870 to 1873.
Fyers, A. B., Lieut.-Col., R.E.—Results of Meteorological Observations at Ceylon, Feb. and March, 1874.