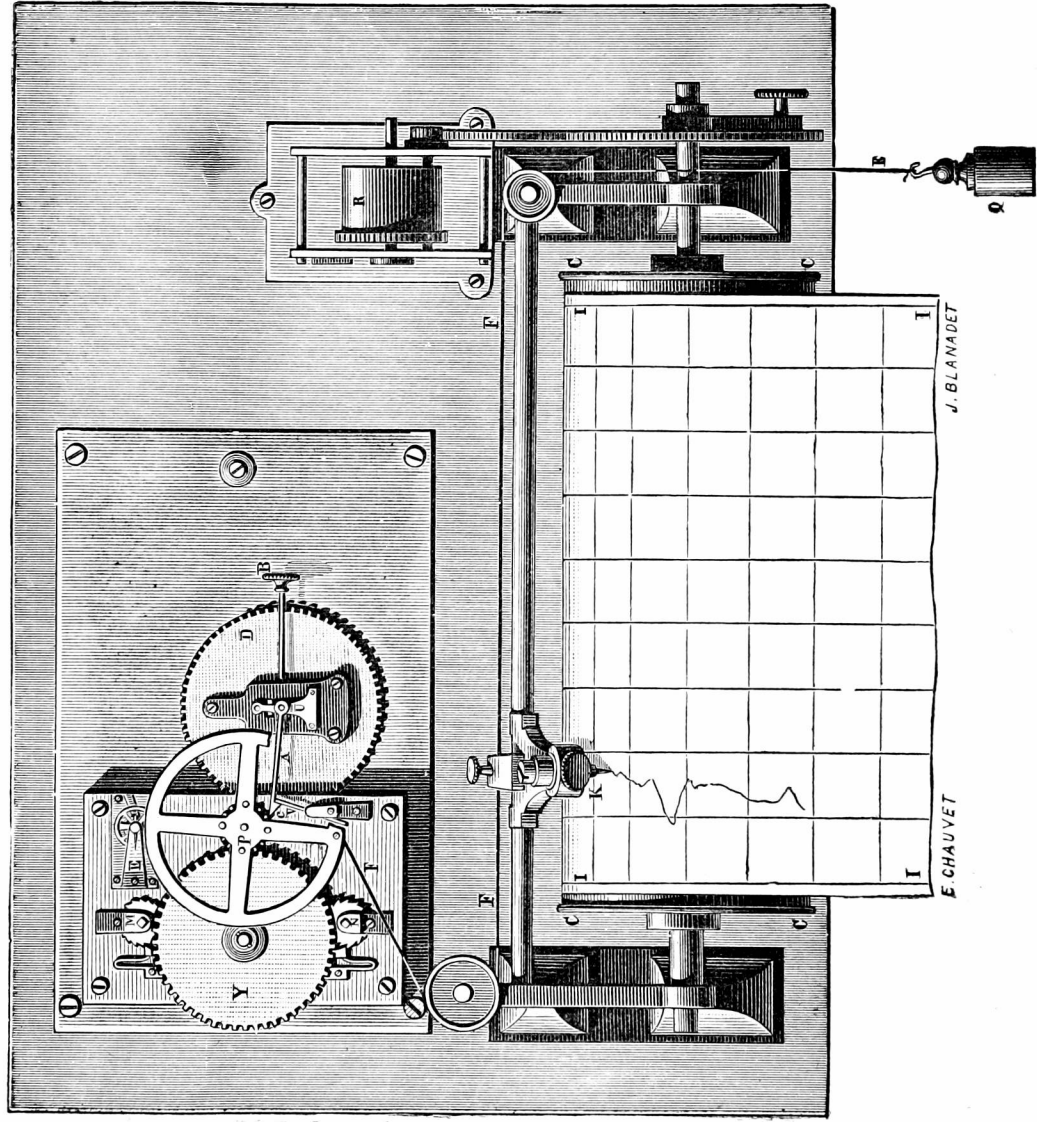


REDIER'S THERMOGRAPH.



# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CLIV.]

NOVEMBER, 1878.

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

### WHIRLWIND AT WALMER, KENT, OCTOBER 24TH.

To the readers of this Magazine, records of terrible destruction by whirlwinds, even in England, are by no means unfamiliar. It will be convenient to give references to some of the most important ones—

Bruce Castle, Tottenham.....	Vol. III., p. 87.
Wantage.....	„ VII., p. 128.
Newbottle, Banbury .....	„ VIII., p. 149, 167.
Baldock .....	„ X., p. 83.
Cowes .....	„ XI., p. 121.
Ware .....	„ XII., p. 43.
Guildford .....	„ XII., p. 122.
Bodenham, Herefordshire .....	<i>British Rainfall</i> , 1872, p. 63.

Another must now be added to the list, and a very costly one too, for its path ended over a thickly built locality, and the ruin of house property has been excessive. We have neither time nor space to write the full record of the disaster, and must, therefore, content ourselves with reprinting the best general description which we have seen, and giving a short abstract of the results of our own personal examination and measurements of the damage.

We may also mention, as a preliminary, that a dozen or more extremely good photographs of the damage have been taken by Mr. Franklin, of Deal, and that copies may be procured of him.

Now for the epitome of the facts. It is reported that a few trees were damaged at the village of Whitfield, which is five miles S.W. of Deal, but although there is little doubt that this is true, we have not seen them, and, therefore, cannot place it among the facts. Its importance lies in this, that the village of Whitfield is exactly on the line of the path of the storm, and if damage occurred there it prolongs the track. This will be evident if we print the places passed over in their proper order.

S.W.	Whitfield.	Ripple.	Coldblow.	Walmer	Lower	Sea.	N.E.
Miles from				Court.	Walmer.		
Sea.	5·4	2·0	1·4	0·9	0·1	0	

We have spoken of the track as S.W. to N.E. ; its precise bearing was rather more westerly, or from S. 54° W. to N. 54° E.

The breadth of the track was in no place less than 450 feet, and in none greater than 700 feet ; its least breadth, and perhaps the greatest

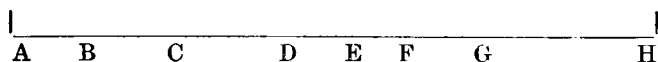
mechanical force, occurred at Walmer Court, which was the highest ground over which it passed, and near the middle of its observed path.

The central path is very nearly a straight line. From Coldblow to Atholl Lodge, Lower Walmer, is nearly one and half miles, and the central line is in no case 100 feet away from an absolutely straight line joining those two places.

The duration assigned to the phenomenon by the editor of the *Deal Telegram*, "one or two minutes," is singularly confirmed by a rather droll calculation. A coach leaves Deal for Dover about 1.5 p.m.; on the day in question a fly followed the coach, and the proprietor of both noticed that when the coach passed Ely House (which was then intact) the fly was a quarter of a mile behind; before the fly reached the spot, the whirlwind had swept across, and all the damage was done. If we assume that the vehicles were going six miles an hour, it is evident that the interval between the passage of the vehicles was  $\frac{1}{4}$ th of an hour, or  $2\frac{1}{2}$  minutes, but this must be much in excess of the duration, for had either the coach or the fly been in the track, it would certainly have been carried up into the air. Our own impression, which must be taken *quantum valeat*, is that the duration was less than one minute, because usually these whirlwinds travel about 20 miles an hour, and with an extreme diameter, as we have shown, of 700 feet, it would only last 24 seconds. Since working this out we have noticed the last statement in the *Deal Telegram*. "We have heard several persons state that the whole mischief was done in less than a minute." Probably our calculation is not far wrong after all.

The newspaper report, though evidently hurriedly written, is extremely accurate; we have, therefore, reprinted it verbatim, taking, however, one liberty with it, viz., that of re-arranging the paragraphs so that they may follow as nearly as possible the path of the whirlwind. There is one expression to which we cannot quite assent, viz., that in which it is said "a portion of the cyclone appears, &c.," but as we are ourselves rather puzzled by the small damage done to the buildings at the S.E. corner of the barracks, the editor may, perhaps, be complimented upon having started the hypothesis of bifurcation.

We cannot hope fully to explain to our readers without engravings and a map this solitary point upon which we are at issue. But roughly the facts are represented by the following words and lines expressing the damage done on a line crossing the track of the storm S.W. of Lower Walmer.



A—N.W. boundary of injury.

A to D—A brick wall 7 ft. high, 14 in. thick.

B to C—86 ft. of this wall blown down.

D to E—Cells belonging to the Barracks, not much injured.

E to F—Turnpike road.

F—Ely House, terribly damaged, roof off, &c.

F to G—Houses much damaged.

G to H—Houses slightly damaged.

H—S.E. boundary of injury.

As the spaces B C and F G are those where injury is most manifest, it is not surprising that the hypothesis of bifurcation should have been started. As, however, the damage behind C F is at least equal to that behind B C, F G, we think that some other explanation of the partial immunity of the small building at D E must be sought. It is just possible that it was too strongly built to yield readily even to the force brought to bear upon it. We hope to have some information respecting its structure, so that we may have arrived at the solution before our next issue.

The report says nothing of what occurred at Coldblow—we, therefore, epitomize it. An ornamental clump of young oaks, about 200 ft. S. of the house, was completely spoiled; some have been wrenched round, others pulled up, and others broken off. A tub, about 3 ft. in diameter, and 2 ft. deep, which was about two-thirds full of water, was lifted up, and carried about 100 ft. N.E. The clothes lines of iron wire were broken from the posts and the loose ends twisted round the posts, and one of the iron stays to the post disappeared altogether. Many trees were broken, and the roofs much shaken. Slates from Walmer Court were blown 3,400 feet, and the rigging of some vessels in the Downs, about  $1\frac{1}{2}$  miles from the shore, was encumbered with hay and straw, and we believe, in one case, a branch of a tree fell on the deck.

#### SEVERE GALE AT DEAL AND ALARMING CYCLONE AT WALMER.

Soon after daylight on Thursday, October 24th, a strong southerly breeze commenced, which had been preceded by a moderate "south-wester" during the previous day and night, and had caused a considerable number of vessels to take shelter in the Downs, which a few hours, before were nearly deserted. By ten o'clock the sea assumed a very boisterous appearance, and the wind increased to a gale from the south. From noon till one o'clock the gale increased almost to a hurricane, with torrents of rain. About five minutes after one the gale increased to what we think it no exaggeration to designate a cyclone, the force of which fell upon and inflicted most serious damage to property at Walmer. The destruction that has taken place in the short space of about one or two minutes (which was the utmost length of time it lasted) is almost incredible. Houses were unroofed, chimneys blown down, windows and window frames blown in, trees torn up, and in some instances the gable ends of the houses blown out.

The cyclone approached from a south-westerly direction; the first visible effects of its destructive character were felt at Walmer Court, the residence of Mr. Page, where the havoc it has made must be seen to be comprehended. The farm buildings are many of them completely destroyed and others mere wrecks. The destruction among the trees is of a most extensive character, some uprooted entirely, others of considerable size snapped off short, branches of immense dimensions are scattered all over the premises. The dwelling-house has happily escaped with comparatively slight injury, the lead of the roof being turned up, a chimney or two at the back blown down, and partially stripped of the slates. The destruction among the stacks and farm buildings is of considerable extent and value. As far as we were able to glean the particulars the following will be found pretty correct. The implement-shed, which stood at the south-west corner of the farm, had a boarded and felt roof. The latter was blown over a wall and across the bullock-yard, with a great deal of the *debris* of the building. The bullocks appear to have escaped unhurt. One sheep was killed, and two received such injuries that they were

immediately slaughtered. Three Christmas lambs were also slaughtered from a similar cause, and some of the Christmas sheep were buried in the ruins. All the bullock-lodges in the back-yard are destroyed, also the cart and waggon lodges. One most extraordinary circumstance we observed was eleven elm trees in one hedge row, all nearly together within the space of about forty yards, some on the top of each other in the wildest confusion. The fir trees are thrown in different directions, as much as fifty yards from the stumps, and one tree of large dimensions was blown completely over a wall, one portion resting on the wall, the stump being left in the ground. The lead is blown from the ridges of the roof of the out-buildings and stalls. A pea and wheat stack completely destroyed; the contents were scattered and blown with the force of the gale down as far as the South Barracks. The thatching of other stacks are nearly all more or less damaged, some completely torn off. A large lodge about the middle of the premises, in which were bullocks and colts, the thatch was stripped off and the building otherwise damaged. The carpenter's saw-lodge was blown down and the roof taken off the riding-horse stable. The groom and one of the farm servants sustained some serious injuries from the broken slates, tiles, and glass that flew about in all directions like feathers. It was a fortunate circumstance the storm was preceded by a heavy shower, so that many of the men employed on the farm had taken shelter in some of the buildings, or had they been exposed to the fury of the storm it would have been almost impossible to have avoided being injured by the falling *debris* from the trees and buildings. The front carriage-way to the Court was completely blocked with fallen trees and broken timber, which men were engaged clearing away during our inspection.

The cyclone appears to have passed Walmer Court across the field on the west side of Walmer Hill towards the South Barracks, where it threw down between thirty and forty yards of the strongly-built barrack wall facing the south, and then crossed the turnpike road towards Palmerston Villas, taking off the roof of Ely House, carrying away the stacks of chimneys off and sending them through the roof of No. 4, in the occupation of Mrs. Somerville, who it appears was fortunately absent, but the servants remained in the house, and it appears almost miraculous how they escaped with their lives, every floor being crushed and carried through to the lower apartments, carrying the furniture together with a valuable grand pianoforte, right through the building into the kitchen. The whole of the front windows in both houses were blown in, and some cottages at the back were also greatly damaged from falling chimneys and the force of the wind, and were so much shaken as will to all appearance necessitate their being rebuilt. All of the Palmerston and Clarence Villas have suffered either from loss of chimneys, broken windows, lead and slates blown from the roofs, &c. Some idea may be formed of the force of the wind from the fact that a chimney-pot was found among the shrubs in the Archery Ground on the opposite side of the road. The house of Capt. Royse, R.N., on the same terrace, has nearly all the glass of the front windows blown in. It appears that Capt. Royse was sitting reading his newspaper in one of the front rooms, when the panes were dashed in in a moment, and the far end of the room strewn with the fragments of glass, slates, &c.

After making its way through the barrack wall, a portion of the cyclone appears to have passed through the gateway of the principal entrance, and crossing the turnpike road up Cambridge-place towards the sea, where, as well as Palmerston-villas, the principal force appears to have culminated. In passing through the barrack gate it overturned the sentry-box with the sentry in it, who lay there till some one came to his relief. He escaped with a few bruises and a crushed helmet.

Mr. Barnes, "Cambridge Arms," had some of his front panes broken and a small shop-front at the side completely wrecked. This house is directly opposite to the Barrack entrance, through which the cyclone made its exit to the sea.

The south door of the "Cambridge Arms," which was shut and latched, was

blown in with such force that it drew the screws of the box staple of the latch and wrenched them off, and forced open an inner door which was also latched, twisting the lock as if it had been forced by a burglar's "jemmy"; bolts, latches, and locks afforded no security where the premises were exposed to the full force of the gale.

Richborough-villas and Alexandra-terrace, although not to so great an extent as Palmerston-villas, have received considerable damage from windows being blown in, lead curled up and taken from the roofs, chimney pots blown down and panes of the back windows of most of the houses demolished facing the south.

The most serious and alarming case in this neighbourhood has still, however, to be narrated. The two houses in Cambridge-terrace, which have been erected but a few years (four or five stories high) one the property of Mrs. Spickernell, the other of Mr. Knight. The gable end of Mrs. Spickernell's faces the east and the other the west, but they are both forced out, although at opposite points of the compass, laying open to view the staircases and bedrooms, leaving the houses in such a dangerous condition that they cannot be occupied; the furniture and contents are being removed as we write. The Granville Arms has been partially unroofed, chimney-pots destroyed, and other damage done. The whole side of one of the Douro Cottages has also been forced out (although in a sheltered position) and the panes are also shattered in most of these cottages. Several cottages at the back of Grove-lane have come in for a heavy share of loss, all being dreadfully shaken and partially unroofed. But the heaviest sufferer in this portion of the wreck is Mr. Trollope, a builder, who has a dwelling-house and extensive work-shops adjoining, all newly erected at the back of the terrace; these have come in for a double share of the destruction that has been dealt all round. It is only remarkable that so little personal injury has been inflicted from so serious a calamity, which is attributable no doubt in a great measure to several of the inmates of the houses being out, and it having occurred in the daytime. Had it been a night visitation, the consequences must have been most serious. Some estimate of the force of the wind may be formed by the fact that a large piece of timber, nearly 40 ft. long, was blown from Ely House into the sea. Mr. Woodcock's workshop and stables at the back of Cambridge-terrace were left a perfect wreck.

On the terrace fronting the sea scarcely a house has escaped except Mr. Fleet's terrace house, facing Walmer Road, which appears to have sustained no damage whatever, whilst the next house has sustained somewhat serious damage to the roof and some panes of glass blown in at the back, from which it appears that the cyclone terminated at that point and passed off over the sea, which for a few minutes obscured the shipping in the Downs from the spray it raised. In its passage from the land to the sea it took up a considerable sized boat from the beach into the air and carried it some distance out to sea, but we have heard that it has been since recovered.

The damage to the Terrace Houses has been confined principally to the back premises. The houses of Col. Green, Mr. Fleet, Mr. Roget, Mrs. Northcote, Capt. Douglass, Miss Blackburn, Mrs. Hassall, Mr. Kelly, and the Belle Vue Houses have all suffered more or less from the effects of the storm, either from chimneys blown down, being partially unroofed, broken windows, trees torn up, gates and fences blown in, or other casualties.

The destruction was all accomplished within two or three minutes. One of the residents of Walmer Beach told us it was more like a bombardment than a gale. The roads all round the parts we have described were covered with the broken fragments of slates, tiles, window glasses, &c.

The spot has been visited by hundreds of the inhabitants, many of whom are struck with amazement at the destruction effected in such a short space of time. We have heard several persons state that the whole mischief was done in less than a minute.—*Deal Telegram*

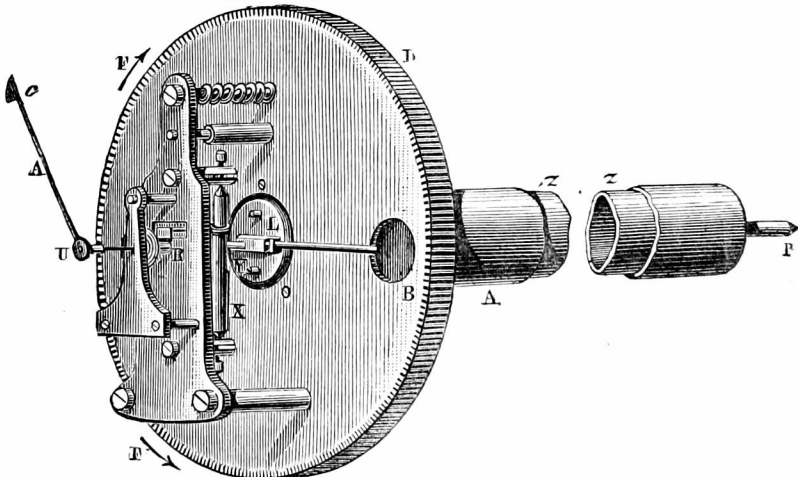
## METEOROLOGY AT THE PARIS EXHIBITION.

*(Continued from page 68.)*

THE continued pressure on our space sufficiently explains the late period at which we are able to finish our notes.

In addition to the temporary **Montsouris Observatory** already mentioned, there was the **Meteorological Pavilion** on the north side of the river, which contained instruments, charts and books. The chief display of instruments was by **Redier**, and we think that they thoroughly deserved the reward they obtained, viz., the highest or *Grand-prix*. Nearly, if not quite, all the instruments exhibited by them were self-recording ones, on what may well be called the Redier system, viz., that of giving the instrument no work to do except to lift a trigger weighing at the most *two grains*. They exhibited a **barograph** on this system, already engraved by us\*, and which we need not therefore explain; also a specimen of their **large dial barometers** (5 or 6 ft. in diameter), such as are erected at the Bourse, at the Church of Saint Eustache (opposite the Halles-centrales), also at the Westminster Aquarium, and of which a specimen was exhibited at the Loan Exhibition of Scientific Instruments.

We must, however, pass to new things—first, to the **thermograph**. This is utterly different from any hitherto made, but will be easily understood by anyone who has mastered the arrangement of differential clock movement invented by Redier for his barograph, and fully described in the number of this magazine to which we have already referred. Englishmen have become so accustomed to regard glass tubes containing mercury or alcohol as the only form of thermometer,



that they will be slow to recognize the undeniable fact that these forms owe much of their popularity to fashion and facility of construction. However, be that as it may, Messrs. Redier have adopted for

\* *Met. Mag.*, Vol. x. (1875), p. 33.

The engravings do not need much explanation. In *fig. 1*, A is the exterior steel tube (not  $\frac{1}{16}$ th of an inch thick), Z is the interior zinc tube; the changes in the length of these tubes are by the multiplying mechanism Y X conveyed to the axis U and cause the thermometric needle A to rise or fall; B is a regulating screw to bring the indications into perfect agreement with an ordinary thermometer. Turning now to the *frontispiece*, and following the order of the alphabet, we have—

- A, the thermometric needle which, according to the temperature, does or does not hold upon the escapement V by the hook c.
- B, regulating screw for adjustment of scale readings.
- C, cylinder, carrying the paper on which the temperature is recorded.
- D, toothed wheel, turned by the differential clock movement so as to keep the thermometric needle A always in nearly the same position.
- E, the escapement, which is always going, and which tends to turn the wheel D in the direction of the hands of a clock.
- F, the cord which, starting from the wheel P and therefore wound or unwound according as the temperature rises or falls, and draws the recording pencil to the left or allows it to be drawn to the right by the weight Q.
- I, the recording paper.
- K, the recording pencil, an ordinary lead pencil on ordinary paper.
- M, key shank, for winding the clock of which E is the escapement.
- N, " " " " V " "
- P, wheel, turned by the differential clock movement.
- Q, counterpoise, keeping the cord F taut.
- R, clock, driving the recording cylinder.
- U, axis of the needle A.
- V, quick fan escapement, going only when released by A.
- Y, terminal wheel of the differential movement, and driving P.

It is obvious that this mode of registration is applicable to all kinds of variation. And two others were exhibited, one a **recording weighing machine**, intended for experiments upon evaporation, and so delicate that when loaded with a quarter of a ton it is said to register to the 50th of an ounce, or one-half-millionth of the total



weight ; a burning candle will record its own consumption in a smooth continuous line. Another ingenious application was that of recording the readings of an electrometer constructed on the model of Sir W. Thomson's.

### THE FENLAND.

*To the Editor of the Meteorological Magazine.*

SIR,—Will you allow me to make a few remarks on your review of "The Fenland, Past and Present" ? (*Met. Mag.*, Oct. 1878, p. 135).

In corroboration of what is recorded in the book, I beg to say that a day's fog in the Fens is a rare phenomenon. But you quote only the averages. The table to which you refer shows that in Oct., 1863, 7 fogs were recorded ; in Nov., 1870, there were 8 ; and in Jan., 1864, there were 5. I may add that records of the prevalence of fogs are being made at different places in the Fens, and that we shall have further details in the future.

I would suggest that the Meteorological Society should take up the subject of *elastic force of aqueous vapour*, as the present definitions of this branch of meteorology are anything but satisfactory.

As regards the word "vaporization," I see nothing "fine" in it. The matter is made clear by what follows, thus : "By the action of heat, water on the surface of the earth is vaporized." I find the following definitions in "Webster's Complete Dictionary" :—"VAPORIZE, to convert into vapor by the application of heat, whether naturally or artificially." "VAPORIZATION, being converted into vapor."

If there is a distinction to be made between *evaporation* and *vaporization*, it is that the former applies more particularly to quantity, the latter to the active principle.—Yours truly,

HORACE E. MILLER.

*Belle-Vue Park, Lowestoft,  
October 29th, 1878.*

N.B.—Thus far in October (29th) fog has occurred at Lowestoft on two occasions, viz., on the 21st, from 5 a.m. to 9 a.m., and on the 27th, from 8 a.m. to 8.30 a.m. The fog bell at the Lowestoft Ness Lighthouse has not been sounded at all during October.

[We fail to see the utility of the above letter, but do not like shutting out replies to reviews. Here is the Reviewer's answer.—ED.]

The second paragraph only so far contradicts what I said as it contradicts its own opening statement. Mr. Horace Miller, throwing aside the averages, picks out the most foggy months ; he might have added that, according to the table, there was not a single record of fog in October, 1862, 1870 or 1872 ; none in November, 1863, 1865, 1873 or 1875 ; none in December, 1863 or 1875 ; none in January, 1866, 1870 or 1873. Out of 60 winter months 12 are absolutely without one record of fog, and in 20 it does not exceed one entry per month.

The third paragraph confirms what I said, and the fourth shows that which is well known, viz., that dictionaries differ.—THE REVIEWER.

## LIGHTNING CONDUCTORS IN CORNWALL.

*To the Editor of the Meteorological Magazine.*

SIR,—I have read with deepest interest Mr. Anderson's papers on Lightning Conductors and Accidents by Lightning, and I fully endorse all he says touching the singular neglect in allowing buildings to remain unprotected from the destructive effects of the electric fluid. For nearly 40 years I have been striving to induce my friends to fix conductors to their houses, and not, I am glad to say, without some success. But my great object has been to get the beautiful towers of this country protected, and those who pass through Cornwall will see that my efforts have not been in vain.

The expense of an efficient copper conductor is so trifling, and the fatal effects of lightning so frequent, that we may well wonder at the gross negligence so well stated by your correspondent.

The Brigade Depot buildings have lately been erected here on a high, exposed spot, at a cost of nearly £50,000, and not a single lightning conductor has been fixed, though the attention of the Government was called to the subject!

I do not concur with your correspondent in his alleged necessity of frequently testing by a galvanometer the efficiency of lightning conductors, believing that when a copper rod is properly fixed it will need no looking after for a *century or more*.

I am, Sir, yours faithfully

JAMES LIDDELL.

*Bodmin, October 18th, 1878.*

[Remarkable confirmation of Captain Liddell's argument is afforded by the following paragraph. How long will people prefer risking their lives and large sums of money to paying £5 or £10 for a good conductor.—Ed.]

"For the third time within thirty years the tower of the parish church of Week St. Mary, North Cornwall, was on Saturday night struck by lightning and destroyed. A massive basement stone was thrown twenty yards from the tower, and all the corner stones were dislodged. It is stated that about £2,000 will be needed for the restoration of the church."—*Daily News*, Nov. 12, 1878.

## SQUALL AT BRIGHTON.

*To the Editor of the Meteorological Magazine.*

SIR,—For the second time this year we have been visited with a singular squall. On the afternoon of September 12th I observed the sky becoming very dark in the N., and at 2.35 p.m. there was a violent squall. All the doors in the house were suddenly banged to and the windows rattled. In the street dust was whirled round in clouds. Temperature, which at 2 p.m. was 67°·3, fell by 2.50 to 57°·8, and at 3.15 to 56°·5.

This squall was very similar to the Eurydice squall on March 24th last. On that day, at 4.40 p.m., I observed the dust flying in clouds in the N. along the Ditcheling-road here. The sky in the N. suddenly became dense, and at 4.45 p.m. snow commenced and continued to fall until 6.5; from 4.55 to 6.0 the fall was very heavy. By 6.25 the sky had become cloudless. Temperature, which at 4.42 was  $39^{\circ}2$ , had fallen to  $30^{\circ}5$  by 5.7, and to  $27^{\circ}5$  by 5.25, making a total fall of  $11^{\circ}7$  in 43 minutes.

During the 11 years I have kept a meteorological register I have never observed such singular squalls as the two before-mentioned, and it is particularly noticeable that both were characterized by sudden falls of temperature.—I am, Sir, yours faithfully,

FREDERICK E. SAWYER, F.M.S.

55, Buckingham Place, Brighton, 14th Oct., 1878.

## HEAVY SNOWSTORM.

*To the Editor of the Meteorological Magazine.*

SIR,—In the closing hours of October and the first hours of November a remarkable snow-storm visited these parts.

At 10 p.m. on October 31st, after two hours of heavy rain, snow commenced falling. At 11 p.m. the air was thick with flakes of enormous size, and the gardens were already becoming white. By daylight on November 1st, when the fall had ceased, snow lay on the ground to an average depth of 4 inches. The effect upon the trees and shrubs was disastrous. Many of the evergreens were torn to pieces by the weight of the superincumbent mass, tall conifers (as the arbor vitæ) were bowed to the earth or broken off in the middle, and large trees (as the oak, elm and birch) lost many branches.

The total downfall of water, including the two or three hours' rain which preceded the snow and some slight showers earlier in the day, was 1.698 in. Of this about 0.9 in. was in the form of snow at the time of observation, but it is probable that about 1.4 in. actually fell as snow. Had none melted, therefore, and had the snow fallen and remained in a dry state, the depth should have been about 17 inches. But the ground was comparatively warm, and the air was above the freezing point, the minimum of the night being  $32^{\circ}7$ . Much therefore melted, and the rest lay close and heavy. On the trees less would melt than on the ground, and it seems likely that the mass which rested upon many of the branches was equivalent to some 12 inches of dry snow. Hence the destructive effects.

From what little information I have gathered I infer that the fall was very local. The general distribution of barometric pressure, as indicated by the published charts, gave scarcely a suggestion of such an occurrence. A centre of depression lay to the eastward of the North Sea, and northerly winds with a moderately high and rising barometer prevailed over the western parts of England. There may have

been a secondary depression central to this neighbourhood and too small to be figured in the charts, but no distinct evidence of such appeared either in the movements of the barometer, the rise of which was scarcely if at all interrupted, or in the direction of the wind, which (as far as could be noted) was light from north-west and north.

GEORGE F. BURDER, M.D.

*Clifton, 8th November, 1878.*

## GREAT RAIN IN THE SOUTH-WEST OF IRELAND.

*To the Editor of the Meteorological Magazine.*

SIR,—My return for October is startling—4 in. of rain on the 7th. All the streams from Darrynane Abbey to West Cove, on the east, and to Waterville on the north, were tremendously flooded; beyond those points there does not seem, judging by report, to have been much flooding, nor, I conclude, any remarkable rainfall.

The river Finneglass, close to Waterville, was flooded to an extent no one remembers before; but the Currane or Waterville river, running from Lough Currane to the sea, was hardly flooded at all! The Finneglass joins the Currane just above its mouth, and a salmon weir crosses the latter *immediately above* the confluence. Though the Currane is fully three times the size of the Finneglass, yet the latter not only rose over the weir but overpowered the Currane, and the water was flowing back into the Lake!

The Coomnahorna river, and two small streams between it and this place, were tremendously swollen. Man and boy, I have spent, since I can remember, about 25 years here, but never saw any flood at all approaching to this.

Mr. Mahony tells me his fall at Dromore Castle, 18 miles E.N.E. (true) from this, was 0·78 in. on 7th; at a second gauge, three miles from Dromore among the mountains, it was 1·17 in.

Yours very truly,

D. O'CONNELL.

*Darrynane Abbey, Caherdaniel, Killarney, Nov. 3, 1878.*

## LUNAR RAINBOW.

*To the Editor of the Meteorological Magazine.*

SIR,—A very perfect lunar rainbow was seen here at about 5.45 p.m. yesterday, the 10th. As I believe such phenomena are of comparatively rare occurrence, perhaps you may care to insert this note in your magazine. The weather yesterday (and to-day) is very showery and unsettled, barometer oscillating frequently, and temp. below the average. Rainfall in last 48 hours, to 9 a.m. 11th, 0·88 in.

Yours faithfully,

B. T. GRIFFITH-BOSCAWEN.

*Trevalyn Hall, Wrexham, Nov. 11th, 1878.*

## ESTIMATION OF OZONE.

*To the Editor of the Meteorological Magazine.*

SIR,—In the paragraph you give in the *Meteorological Magazine* from Dr. Fox's "Handbook for the Medical Officer of Health," it is stated—"It was formerly the practice to employ starch tests, which are composed of a mixture of iodide of potassium and boiled starch," &c., &c., &c. Would you oblige by stating what is *now* the practice employed for estimating ozone?—I am, &c.,

T. MOFFAT.

*Hawarden, Oct. 27th, 1878.*

## SUPPLEMENTARY TABLE OF RAINFALL IN OCT., 1878.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. X., p. 28., but the list is under revision.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol .....	3·17	XI.	Castle Malgwyn .....	8·10
"	Littlehampton .....	3·93	"	Nantgwillt, Rhayader ...	9·17
"	Hailsham .....	4·50	"	Carno .....	7·01
"	St. Lawrence, I. of W....	3·42	"	Rhug, Corwen .....	5·85
"	Strathfield Turgiss .....	2·83	"	Port Madoc .....	5·56
III.	Addington Manor .....	2·14	XII.	Carsphairn .....	9·22
"	Oxford .....	3·20	"	Melrose .....	1·86
"	Northampton .....	2·26	XV.	Gruinart .....	6·21
"	Cambridge.....	2·02	XVI.	Grandtully .....	...
IV.	Sheering .....	2·60	XVII.	Tomintoul... ..	3·19
"	Diss .....	2·05	"	Keith .....	5·37
"	Swaffham .....	2·78	XVIII.	Dalwhinnie .....	6·35
V.	Alderbury, Salisbury ...	3·53	"	Auchnasheen .....	6·32
"	Compton Bassett .....	4·30	"	Springfield, Tain .....	2·38
"	Dartmoor .....	9·79	"	Glenfinnan .....	...
"	Langtree, Torrington ..	6·49	XIX.	Watten .....	2·27
"	Cosgarne, St. Austell ...	7·52	XX.	Glenville, Fermoy .....	4·44
"	Taunton.....	4·85	"	Tralee.....	6·98
VI.	Bristol .....	6·14	"	Tipperary .....	4·99
"	Sansaw .....	5·06	"	Newcastle W., Limerick	5·78
"	Cheadle .....	3·35	"	Kilrush .....	4·35
"	Bickenhill Vicarage.....	3·07	XXI.	Kilkenny .....	3·19
VII.	Coston, Melton Mowbray	2·36	"	Kilsallaghan .....	1·76
"	Bucknall .....	2·27	"	Twyford, Athlone .....	4·06
VIII.	Walton, Liverpool .....	3·03	"	Belvedere, Mullingar ...	2·97
"	Broughton-in-Furness ..	6·29	XXII.	Ballinasloe.....	3·31
IX.	Stanley, Wakefield .....	1·79	"	Kylemore .....	8·41
"	Mickley, Ripon .....	2·33	"	Carrick on Shannon.....	2·76
X.	Gainford .....	1·48	XXIII.	Rockcorry .....	3·00
"	Unthank Hall .....	3·01	"	Warrenpoint .....	2·75
"	Shap .....	6·62	"	Newtownards ... ..	3·42
XI.	Llanfrechfa .....	6·35	"	Bushmills .....	3·61
"	Solva .....	4·31	"	Buncrana .....	6·69

OCTOBER, 1878.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which "1 or more fall.	TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.		Deg.		Date.	Deg.	Date.	In shade.	On grass.	
				Dpth	Date.								
inches	inches.	in.											
I.	Camden Town .....	1.99	— .60	.50	24	13	73.3	5	31.6	31	2	2	
II.	Maidstone (Hunton Court)...	2.59	— .40	.88	25	13	...	...	...	...	...	...	
III.	Selborne (The Wakes).....	3.97	— .24	1.27	10	14	65.0	5, 6	29.5	30	3	9	
III.	Hitchen .....	1.83	— .72	.37	24	17	64.0	5	30.0	29	3	...	
IV.	Banbury .....	2.61	+ .18	.45	23	18	68.5	5	31.0	30*	3	...	
IV.	Bury St. Edmunds (Culford).	1.92	— .79	.37	21	14	67.0	5	26.0	29	4	5	
V.	Norwich (Sprowston).....	2.04	...	.38	24	15	...	...	...	...	...	...	
V.	Bridport .....	3.43	— .60	.72	9	14	...	...	...	...	...	...	
V.	Barnstaple.....	7.21	+ 3.09	1.08	25	20	72.0	6	37.0	30	0	...	
V.	Bodmin .....	6.89	+ 1.57	1.04	25	20	70.0	5	37.0	30	0	2	
VI.	Cirencester .....	4.30	+ .81	.77	19	16	...	...	...	...	...	...	
VI.	Shifnal (Haughton Hall) ...	3.70	+ 1.46	.59	9	17	65.0	5, 6	30.0	31	2	3	
VI.	Tenbury (Orleton) .....	4.26	+ 1.03	.70	9	22	71.2	5	30.5	31	1	4	
VII.	Leicester (Town Museum) ...	2.57	...	.40	24	20	71.9	5	31.2	27+	2	9	
VII.	Boston .....	1.94	— .18	.52	24	18	70.0	5	29.0	30	2	...	
VII.	Grimsby (Killingholme).....	2.16	...	.72	24	18	65.0	6	31.0	30	1	...	
VII.	Mansfield .....	2.93	...	.63	24	20	76.8	5	30.0	30	4	4	
VIII.	Manchester (Ardwick).....	3.93	+ .40	.66	25	16	61.0	3**	32.0	30	1	...	
IX.	York .....	1.66	— .86	.45	21	15	70.0	7	29.0	30	1	4	
IX.	Skipton (Arncliffe) .....	6.76	+ .10	1.06	25	23	68.0	6	28.0	29	3	...	
X.	North Shields .....	1.50	— 1.78	.59	30	17	64.0	5, 7	29.3	30	1	1	
X.	Borrowdale (Seathwaite).....	16.16	— .16	3.00	20	20	...	...	...	...	...	...	
XI.	Cardiff (Crockherbtown).....	5.76	...	1.09	23	18	69.4	6	32.0	30	1	...	
XI.	Haverfordwest .....	6.72	+ 1.53	1.15	21	18	66.5	5	31.5	31	1	2	
XI.	Aberdovey.....	4.70	...	.87	23	20	74.0	5	32.0	30	1	...	
XI.	Llandudno.....	3.62	— .34	.58	9	17	73.0	5	37.0	29	0	...	
XII.	Dumfries (Crichton Asylum)	3.47	— 1.70	.99	22	19	66.5	5	29.5	30	2	2	
XII.	Hawick (Silverbut Hall).....	2.32	...	.55	21	15	...	...	...	...	...	...	
XIV.	Glasgow (Cessnock Park) ...	3.95	— .41	1.01	23	19	...	...	...	...	...	...	
XVI.	Mull (Quinish) .....	7.72	...	1.56	10	22	...	...	...	...	...	...	
XVI.	Loch Leven .....	4.60	— .38	.90	22	12	...	...	...	...	...	...	
XVI.	Tyndrum (Ewick) .....	...	...	...	...	...	...	...	...	...	...	...	
XVII.	Arbroath .....	2.06	— 1.63	.51	21	11	65.0	3	33.0	2+	0	...	
XVII.	Braemar .....	5.01	+ 2.26	1.55	30	18	63.8	6	26.0	2	5	15	
XVII.	Aberdeen .....	2.73	...	.49	30	20	64.5	3	33.4	30	0	8	
XVIII.	Gairloch .....	7.05	...	1.06	31	19	...	...	...	...	...	...	
XVIII.	Portree .....	10.39	— .39	1.19	20	24	...	...	...	...	...	...	
XVIII.	Inverness (Culloden) .....	2.11	— .55	.37	30	21	64.9	8	33.6	1	0	8	
XIX.	Dunrobin .....	3.05	— .18	.70	29	19	62.0	3, 6	32.0	28§	2	...	
XIX.	Sandwick .....	4.87	— .05	.74	31	22	59.0	9	33.6	29	0	1	
XX.	Caherciveen Darrynane Abbey	...	...	...	...	...	...	...	...	...	...	...	
XX.	Cork .....	3.49	...	1.25	7	16	...	...	...	...	...	...	
XX.	Waterford .....	3.02	— 1.38	.88	7	13	66.0	5	34.0	12	0	...	
XX.	Killaloe .....	5.39	+ .37	.87	7	17	70.0	2, 3	32.0	31	1	...	
XXI.	Portarlington .....	2.45	— 2.68	.53	7	25	65.0	5	32.0	29	1	...	
XXI.	Monkstown, Dublin .....	1.90	— 2.02	.77	7	14	...	...	...	...	...	...	
XXII.	Galway .....	3.40	...	1.04	20	21	65.0	4**	35.0	31	0	...	
XXIII.	Waringstown .....	3.47	...	.80	9	21	68.0	4, 5	28.0	31	2	5	
XXIII.	Edenfel (Omagh) .....	4.91	...	.68	20	20	66.0	6	32.0	1¶	3	...	
XXIII.	Ballyshannon .....	6.20	...	.80	31	19	...	...	...	...	...	...	

\* And 31. † And 30. ‡ And 30. § And 29. || And 30. ¶ And 30, 31. \*\* And 5, 6.  
+ 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.

SELBORNE.—Month on the whole favourable for field and garden. Prevailing wind early in the month S. and W., then N. and E., and last ten days N.W.

CULFORD.—The weather up to the 29th was mild for the season, and tender plants in the flower garden continued in bloom up to that date. S fell on the morning of the 30th, yielding 12 in. Swallows and martins seen on the 11th. Mean temp. 50°; easterly winds prevailed during 13 days; high wind on 9th and 10th; T on 24th.

SPROWSTON.—First half of month very fine; from 21st to 28th stormy; sharp frosts on mornings of 30th and 31st; rainfall more than half an inch below the average.

SHIPNALL.—An unusually mild October. Fog on 2nd, 17th, 18th, and 20th. High wind from N.W. on 28th, and bitterly cold afterwards. Dahlias and other tender plants untouched by frost; red admiral and tortoiseshell butterflies out till 19th, on which day a large green dragonfly was seen hawking for flies as in summer.

ORLETON.—Temp. high, and weather generally fine during the first half of the month. After the 18th the weather became cold and cloudy, with R every day except one, and heavy falls on the 19th, 21st, and 23rd. The high hills were covered with S on the morning of the 29th, and there was a little on the lowland on the 30th. Mean temp. of the month about 0.75 above the average; bar. generally low and unsteady; L was seen on the nights of the 9th and 22nd, and the wind was frequently rough, especially on the 7th, 9th and 10th.

KILLINGHOLME.—Up to the 20th warm and fine, and R wanted on strong soils for growing wheat; the latter part of the month cold and wet; L on nights of 28th and 29th. [*Erratum* in last month's remarks:—for horse flies, read house flies.]

MANSFIELD.—The month was remarkable for a low barometer, the mercury having fallen to 29.06 and 29.02 on the 10th and 26th respectively. Mean of the month 29.740 in., .197 in. below the average 1872-78. T on 11th, 25th, and 28th.

YORK.—Several instances of spring flowers in blossom, specially of the primrose tribe. S on 24th, 29th and 30th.

SEATHWAITE.—Seven days on which the fall of R exceeded one inch. S on hill tops at end of month.

## WALES.

HAVERFORDWEST.—More wind than usual during the month; two very stormy periods of long duration from the 4th to the 10th, and from the 19th to the end; weather between delightful, bright sunshine with unusual heat.

ABERDOVEY.—Unsettled weather till the 10th; fine, calm and clear up to the 18th; stormy and wet to the close, with N. and N.W. winds prevalent; T with H on 28th and 30th.

## SCOTLAND.

HAWICK.—A very fine month; sharp frosts on the night of the 1st and 31st. Potato crop very plentiful and fine in quality; many garden annuals in full bloom at the end of the month.

QUINISH.—Very high temp. from 1st to 20th. Weather broken and stormy throughout the month, except from 13th to 20th; from 20th to end of month very cold.

BRAEMAR.—A fine month; hills covered with S for the first time this season on 22nd, an unusually late date.

PORTREE.—A very cold stormy month; a continuous gale on 28th and 29th from N. to N.W., with heavy S showers; T and L on 28th.

**DUNROBIN.**—Month on the whole seasonable. Vegetation better ripened this autumn than for many years.

**SANDWICK.**—Generally a pleasant month till 21st, mild and dry; but then the bar. fell and continued below 29 in. for 5 days, and R fell daily. During the last six days the wind was N. with cold weather; sleet showers and a gale of 55 miles an hour on the 30th. There has been no aurora this autumn, and distant L reported by a neighbour on 28th, but not seen at this house, is the only L noticed this year.

#### IRELAND.

**KILLALOE.**—After some heavy falls of R, the month closed with fine, dry, but cold weather, and N.W. wind.

**WARINGSTOWN.**—Rather wet, but the ten days fine weather in the middle of the month allowed the farmers to get out the potato crop in good condition.

**EDENFEL.**—With the exception of the third week, which was fine and clear, the month was cold, inclement, and stormy.

**BALLYSHANNON.**—The month was wet and severe throughout. "The Donegal Summer," which is generally expected here about this time, has not favoured us, and winter seems fairly to have set in. Many showers of H during the month, and the River Erne swollen to winter height.

---

### THE WEATHER IN OCTOBER.

ON the 30th September a sudden and brisk fall of the barometer occurred over these Islands, and a well-marked depression—which had apparently come in from the westward—lay over the north of England. This disturbance subsequently passed away eastward, the mercury rose, and high uniform readings, with light breezes, were reported until the evening of the 2nd. At this time the anticyclone retreated in a south-easterly direction to Scandinavia, but was quickly succeeded by others, which travelled from our S.W. coasts northwards to Scotland, making pressure very unsteady in the W. and N. From the 6th to the 12th the changes in pressure were large and important, but at the same time gradual and regular. On the 6th a uniform decrease of about 0·3 in. was shown over these Islands, but the disturbance which caused it passed outside our coasts, and only strong southerly winds or moderate gales were experienced. On the following day, however, the barometer fell very quickly in the S.W., a deep depression (28·8 in.) advanced to these coasts, and a hard southerly gale sprang up, extending to our other coasts, though with less force. On the 7th a brisk recovery took place, accompanied by south-westerly breezes, but the barometer again began to fall, the wind backed, and a strong gale was reported from Scilly. This fresh disturbance proved to be as serious as the one just noticed, and as it advanced slowly in a north-north-easterly direction, hard westerly to southerly gales were experienced on nearly all coasts. In the rear of this disturbance a brisk recovery took place, but gradients remained steep, and the winds strong, until the 12th, when a large anticyclone was shown over England and France, and light variable breezes prevailed. For the first day or two the weather was dull, with a good deal of rain in many places, and on the 10th dull, squally, and unsettled weather was reported from all Western Europe, with an inch and a half of rain at Ardrossan, and smaller amounts elsewhere.

During the next week (13th–19th) the distribution of pressure underwent little change. At first a large area of high pressure lay over the north of France, North Germany, and the S.E. of England, while low readings were reported from our western coasts. Throughout the week depressions moved from S. or S.W. to N. or N.E. over or near to our western coasts. On the 13th the temperature stood at about 55° over these Islands, and in the north of Sweden it was as high as 44°. On the same day the lowest minimum was reported from Nottingham and London, the readings being 37° and 35° respectively. The weather during this week was cloudy, but exceptionally dry.



For the remainder of the month the weather was for the most part exceedingly unsettled, and several depressions of considerable importance passed across Western Europe. The main depressions, which were large and deep, have passed over our northern coasts in an easterly or north-easterly direction towards Norway, but on the 22nd, 24th, and 26th, smaller and subsidiary disturbances travelled from W. to E. over Southern England.

On the 27th pressure had increased quickly over the whole of N.W. Europe, the change varying from nearly 0.6 in. over Ireland, to about 0.3 in. on our east coast, while in Denmark and the south of France the barometer fell slightly. This rapid and very general rise of the barometer was followed on the 28th by a rather sudden fall on our N. and N.E. coasts. A depression lay between the Shetlands and the south of Norway. This depression on the day following lay near the mouth of the Skager Rack, remaining there till the 31st, when it appeared to be filling up.

Temperature oscillated considerably during the last ten days of October, and was low for the time of year. Thunderstorms occurred at some places in England, mock suns were seen at Nottingham on the 30th, and a solar halo in London. Rain was frequent, and in some instances heavy, and snow fell on our eastern and southern coasts on the 31st.

H. E. M.

### SEVERE SNOWSTORMS ON NOVEMBER 12TH.

The gales which have now been prevalent in some districts for several days, and the snowstorms, particularly in the North of England and in Scotland, seem to have been of exceptional severity, for so early a period of the winter.

Snow fell heavily in the morning of the 12th, in the Durham, North Yorkshire, Cleveland, and Westmoreland districts, to the extraordinary depth of fifteen or eighteen inches. There being a strong wind it was considerably drifted, rendering locomotion either by foot or vehicle difficult. The through Scotch express to London was greatly detained between Newcastle and Darlington, being more than four hours late.

An accident, resulting in the total destruction of a plate mill, took place at the ironworks at Consett. A terrific snow storm, accompanied by lightning had raged all night, and between five and six o'clock in the morning, when the storm was at its worst, the roof of No. 4 plate mill fell and buried the workmen. A portion of the roof fell on the furnaces and the hot iron. In a few minutes the fallen *debris* was in flames. The steam pipes were smashed, and the escaping steam added to the confusion. A considerable time elapsed before all the men were got out. Those most severely injured were carried on stretchers to the iron company's infirmary, where they were attended to by Dr. Renton, and other Surgeons.

The blinding snow storm at Braemar on Monday night, the 11th, gave place to keen frost, but the violence of the gale did not abate anything. Snow wreaths were packed as high as the fences in sheltered parts of the road, trees were blown down, stacks of timber levelled, palings broken, and much damage was caused by the fury of the gale. Shortly after ten a.m. on the 12th, the storm burst again with terrible severity, the gale, if possible, louder and stronger than before, but instead of snow, sleet accompanied it. The storm continued to rage till a late hour without any palpable variation in its fury.

Early on the 12th there was a heavy fall of snow in the West of England, and the fall was succeeded by a severe frost. About eight o'clock a policeman on duty at Bristol Bridge saw a market woman fall from her seat into her cart. He drove her to the infirmary, where life was found to be extinct. Deceased was a married woman, named Perry, who had started from Yatton, a dozen miles distant, early in the morning in good health, but died from exhaustion, consequent upon exposure to the severe cold.

THE CLIMATE OF HASTINGS.

On Tuesday evening, at the Wellington Square Lecture Hall, A. E. Murray, Esq., Fellow of the Meteorological Society, read a paper, " Local Meteorological Report for 1877," with remarks on cyclones, influence of the moon, &c. J. G. Thompson, Esq., president of the Philosophical and Historical Society, was in the chair, and there were also present Mr. T. H. Cole, M.A., Dr. Bagshawe, Mr. Colborne, Mr. Henry, Mr. W. Andrews, Mr. A. L. Ward, Mr. P. H. Cole, &c. The diagrams referred to in the lecture were thrown on a screen by oxy-hydrogen light. Murray's paper was as follows:

Mr. President, Ladies, and Gentlemen,—In continuation of my previous papers I have now the honour of presenting to you my Meteorological Report for the year ending December 31, 1877. The instruments, hours of observation, and manner of exposure, remained the same as in the preceding year. From January 1, however, the maximum temperature in the sun was also observed by a black bulb thermometer *in vacuo*, placed four feet above the surface. The station was inspected on April 13 by R. H. Scott, Esq., Secretary of the Meteorological Office, and everything was found satisfactory. I think I may honestly say, as a guarantee for the correctness of the observations, that I believe everything possible has been done to insure their accuracy. Although I have before made the same remark, I would iterate and reiterate the opinion of everyone who has properly attended to the subject, that it is far better to abstain from observations altogether, than to take them with uncertified instruments, badly exposed, at varying hours.

Before commencing the report, however, I must say a few words on a personal matter. In March last I sent a letter to the local papers, saying, that, in consequence of the amount of writing and calculation the observations entailed, I felt compelled, most reluctantly, to give them up. It was long before I could arrive at this decision, but I acted on my own maxim, that observations are useless unless properly corrected and reduced to a manageable form; and to do this I had no longer the time. I offered to hand over all my instruments to anyone who would continue the work properly, simply requiring them to obtain certificates from the Meteorological Office at intervals, that the returns had been duly filled up. A week or so after this I unexpectedly received a letter from the Town Clerk, kindly offering me a certain sum yearly to continue the work. This offer I declined, explaining that it was only want of time that decided me to discontinue the work, but also added, that if the Council would remunerate someone to work out the calculations and fill up the forms for me, I would willingly continue the observations at 9 a.m. and 9 p.m., as heretofore; everything on my part, of course, being gratuitous. I am glad to say they have agreed to this proposal, and for the last few months Mr. D. Bennett, of Quarry Hill School, has very carefully and satisfactorily fulfilled the office of computer. I think it is greatly to the credit of the Town Council that they have thus come to the assistance of meteorology, and I am quite sure the town will gain by the act, for I know of no place where the observations prove more clearly the excellence of the climate.

Mon.	Mean Pressure.	Air Temperature.			Means of Absolute.		Relative Humidity.			
		9 a.m.	9 p.m.	°m	°m	M'x		M'x		
Jan...	29.877	29.893	44.1	44.4	39.7	48.5	31.1	54.8	91.2	89.5
Feb...	29.941	29.980	43.5	42.9	39.1	48.2	24.0	54.0	88.8	85.5
Mar...	29.764	29.776	47.1	40.1	35.6	46.1	25.1	53.8	82.3	86.7
April...	29.774	29.773	47.4	45.1	44.3	51.6	35.1	58.5	79.9	86.3
May...	29.806	29.860	50.7	46.9	43.7	54.8	31.2	61.5	76.9	84.5
June...	30.033	29.037	62.2	57.7	52.7	67.6	44.9	76.5	72.6	81.6
July...	29.027	29.047	61.9	58.3	53.7	65.8	45.3	75.5	76.5	88.1
Aug...	29.002	29.011	62.6	60.0	55.7	67.6	46.4	75.7	79.6	86.3
Sept...	29.066	29.071	55.6	52.8	48.7	61.9	39.3	68.7	80.5	84.6
Oct...	29.062	29.050	51.9	50.4	44.6	57.9	32.9	63.3	82.7	83.5
Nov...	29.752	29.768	47.9	48.1	42.8	52.6	32.7	59.1	86.2	85.5
Dec...	29.061	29.081	40.7	40.9	36.9	46.0	28.0	51.5	90.3	90.1
M'ns	29.926	29.926	50.7	48.9	44.5	55.5	—	—	82.6	86.6

In the first place, I will bring to your notice a table containing the most important meteorological facts for the year; but, as there are a great many figures, I fear that you would be asleep before I came to the end of them. We will, therefore, if you approve, take them as read; but, in order to be able to grasp the most salient facts, a slide has been prepared showing them pictorially. The firm black lines represent the barometer, and the dotted lines the thermometer. The topmost line shows the highest reading of the barometer in each month; the next, the mean of all the observations; the third, the lowest reading. The highest rise was in December; the lowest fall and mean also, as is usually the case, in November. The thermometric lines show, in the same manner, the highest, lowest, and mean of 9 a.m. and 9 p.m. readings. The highest point reached was 76.5 in June; the lowest 24.0, in February. You will notice that the mean temperature in January, November, and December was higher at 9 p.m. than at 9 a.m.; and I find, from comparison, this is the rule, not the exception. In May, the temperature fell abnormally to 31.2. From the line at the lower part of the diagram, it will be seen that 7.04 inches of rain fell in January; the fall then remained steadily between two and three inches till August; after which it fell, and then rose again to 3.81 in October, and 7.39 inches in November, and fell again in December.

The next diagram shows the number of times wind was recorded from the different points of compass during the year. By far the greater proportion of our winds is from points near south-west and north-east. We have very little indeed from anywhere between east and south. Perhaps from the appearance, from a meteorological point of view, is to a certain extent illusory, for, as a rule,

the wind remains only a short time in the same direction when it blows from points between east and south, and therefore the chances are that it would not be reported; for the diagram represents the wind at 9 a.m. and 9 p.m. only. This diagram although based on the number of times the wind was observed from each point, more truly represents the length of time it blew from the different quarters. In February no wind blew from any point between north-east and south-west.

Finally, for this part of the subject I have arranged the chief totals for 1875-6, 7 under each other. It will be evident from this table how extraordinarily near the figures remain when each year is considered as a whole. Thus, the mean temperature for 1875, at 9 a.m., was 50.4; for 1876, 50.6; 1877, 50.7; a difference of only three-tenths of a degree. Most of the other figures differ from each other in like proportion. According to all the thermometers, there has been a slight increase in the mean temperature during the last three years. It will be interesting to note whether 1878 also has an increase. If so, perhaps it may be attributed to the great number of new houses which are constantly springing up around us; but my belief is that the increase of the rainfall during each of the past three years accounts for the increase of temperature, either both being the effect of the same cause, or the excess of rain being the cause of the increase of temperature. The rainfall for 1877 was about twelve inches above the average. It is curious to notice that the mean height of the barometer for the three years at 9 a.m. and 9 p.m. is exactly identical, even to the thousandth part of an inch. The averages of the three years are useful as giving a very near approach to the true means for the town, but I must warn you against accepting them as the exact means, for in all probability the addition of the next half-dozen years will alter all the figures slightly. The rain is certainly too high on account of the fall having been so unusually great during the past three years.

Having reviewed the year as a whole I propose to take now the months separately, with the remarkable phenomena. January the 1st will make a very good beginning, for the new year was ushered in by a very severe gale. I have had a weather chart photographed for that day, but before considering it I wish to state, as briefly as possible, the causes of changes of weather, so far as they are at present known. Perhaps I should rather say the secondary causes, for we are almost entirely ignorant of the primary ones. Probably most of my hearers are aware that there are two main divisions of atmospheric disturbances, cyclones and anticyclones, the former are also called "depressions." But, although these may be treated for the sake of simplicity as if they were separate phenomena, there is every reason to believe that they are closely connected with each other. The diagram now before you shows the chief characteristics of each. Cyclones, for practical purposes, but not when they are examined theoretically, may be compared to whirlwinds, with a tendency of the wind to blow towards the centre. Their forward motion in northern latitudes, with hardly an exception, is from westward to eastward and their internal motion or whirl is invariably in the opposite direction to in which the hands of a clock move, namely from east round north to west and south. The front part, in winter especially, is warm with strong wind and heavy rain, the rear cold with often high wind for a short time and clearing weather. In summer, however, owing to the thickly overcast sky during the advance of a depression, the temperature is usually low. These whirlwinds, as mentioned before, advance from westward to eastward, and have two motions, first, their own internal motion, second, their onward movement. It is very important to bear this in mind, for the wind in the whirl itself may be blowing at a rate even of a hundred miles an hour, whereas the movement of the disturbance as a whole may be at the rate of twenty miles an hour, or even less. Thus immediately it reaches our west coast its arrival can be telegraphed to the east coast, and several hours, sometimes twenty-four, elapse before it has travelled across England. It would be quite impossible to do this if the wind blew in a direct line, not in a curve. If a depression passes directly across a place from west to east, the wind is first south with a falling barometer, then comes a calm during which the centre passes, then a rapid change to the north, with a rising barometer. On the diagram, below the sectional view, I have inserted figures showing how the barometer would be affected during the passage of a depression. If, before its arrival, it stood at 30 inches, it would probably rise to perhaps 30.1. Then it would fall to say 29.5, then rise again, and if a satellite were accompanying it, the barometer would again fall and rise very rapidly indeed when it had passed. If the centre passes to the north, as is usually the case with us, the wind is first south-west, and changes through

west to north-west. If the centre passes south, the wind is first south-east, and then changes through east to north-east. The depressions sometimes cross us diagonally, and then these directions are slightly changed.

Anticyclones to a great extent are cyclones reversed. They have a high barometer in the centre, are, as a rule, cold with little wind, which revolves in the contrary direction to that in a cyclone, the weather is often fine but overcast and foggy in winter, but clear and bright, with warm days, in the summer. They remain almost stationary for days together. The drawing of each will be useful for showing the difference between cyclones and anticyclones, but they will not bear theoretic scrutiny, for there are many things about cyclones very difficult to understand. These large depressions often have smaller ones as it were running round them. We, in the South of England, unfortunately are in the path of many of these satellites, and most of our severe storms have been caused by them. I have shown a satellite in the section. You will notice that if one follows a large depression it causes the outside of the main one to become deeper, but reduces the gradient, as it is called, of the inner side. It is a rule that the steeper the sides the stronger is the wind, therefore it depends on the relative position of a certain place with regard to a satellite whether it increases or reduces a gale.

A careful study of the features of a depression will show what are the premonitory signs of its arrival. The following I think the most important. The sky becomes gradually overcast, usually with a sheet of very thin cloud formed in the higher parts of the atmosphere. The clouding generally commences in the west, and the clouds at first often assume the appearance of "streamers," and the motion is usually from the westward, although the wind may be in some other quarter, frequently at this it will be backing towards south-east. These signs may take place before the fall of the barometer, which invariably follows, and is quick or slow according to the nature of the depression. The fall of the barometer is accompanied, especially in the winter, by a rise of the thermometer. The wind now increases and the rain begins to fall. Lunar and solar halos are also forewarnings, and likewise a short rapid rise of the barometer before the fall. Besides these signs I have also noticed that a heavy ground swell frequently precedes a gale. If all these signs are present a depression may almost with certainty be predicted. But my advice is, Do no prophesy publicly. I once, two or three years ago, ventured to put a remark at the end of my weekly weather report that fine weather was likely to take place. Within half a dozen hours of the remarks being in type we were visited by a tremendous gale and heavy rain. My friends did not let me hear the end of it for some time.

Now I think we are ready for the chart of January 1. On the evening of December 31 a large depression was passing across Great Britain. It was still visible on the morning of the 1st to the eastward of us, but by that time another had approached rapidly from the westward. Neither could well be called a satellite of the other, for apparently they were of about equal size, but the second by following so rapidly on the first acted in the same manner as a satellite would have done in deepening the gradient on the southern side of it. The steepest barometric gradients, as will be seen from the isobars being so close together, were over the North of France, the Channel, and the South of England, therefore we had a very heavy gale while there was almost a perfect calm in the centre of England. A great deal of damage was done here and at other places on the south coast during this gale. By next morning both depressions had passed to the eastward of us, and the barometer had risen nearly an inch. From the 1st a period of wet, unsettled weather set in which continued during the whole month. The rainfall was very unusual, being 7.935 inches, against 1.205 in 1876, and 4.010 in 1875. The total fall during December and January was 14.225 inches. The rain fell on twenty-five days, out of thirty-one, the exceptions being the 12, 15, 21, 22, 23, 26. 1.040 inch fell on the 8th, and 1.240 inch on the 10th, the latter being the greatest fall yet recorded in twenty-four hours. The temperature was very high indeed for the time of year, having risen to 54.8 during the storm of the 1st, against 51.3 the previous year. The mean temperature at 9 a.m. was 7.3 above the corresponding figures of 1876, while the mean temperature for the month by Glaisher's tables was 44.5, against 37.4 in 1876. The lowest temperature was 31.1, instead of 20.9 in 1876, and it was below 32 degrees on only two days. The mean of the barometer was very low, it having fallen to 28.820 on the 1st.

As a whole, the month of February was overcast and warm for the time of year, but during the night of the 27th the temperature fell to 24 degrees, and 19 on the grass. The air was also most unusually dry, the dew point being 7.6 at 9 p.m., and 13.4 at 9 a.m. next morning. It is rather curious that a total eclipse of the moon occurred on that night. The extraordinary state of the atmosphere would be considered by those who adopt the theory of lunar influence, as strong evidence in favour of it.

While on the subject, I might mention the result of some calculations I made to see whether the moon had any power to clear the sky or not. I must confess when I first began observations I leaned decidedly to the side of those who say it has, now however, I have gone over to the opposite. I found my calculations on the following fact. If two thermometers are exposed, one close

to the ground not protected in any way, and another four feet above it, protected from radiation, on a cloudy night there will be very little difference between them, but on a clear night that on the ground will always read some degrees, even ten or fifteen lower than the other. By this fact I determined to prove, from instruments alone, whether there was less cloud at full moon than at any other quarter. For the year 1876 I picked out all the days of full moon, new moon, and first and last quarters, and found that the difference between the thermometers was in the following proportion : Full, 24·7 ; last quarter, 39·3 ; new, 41·0 ; first quarter, 46·6, showing that for that year there was most cloud at full moon, instead of least, and least at the first quarter. I then combined one day on each side, and obtained the following figures : Full, 91·9 ; last quarter, 108·0 ; first quarter, 116·3 ; new moon, 151·5 ; giving least at new moon, most as full. I pursued the same course for 1877, with the following result, taking one day : First quarter, 38·9 ; new, 43·1 ; full, 49·9 ; last quarter, 52·5, giving most to the first quarter, least to last quarter. Including one day on each side : First quarter, 130·1 ; new moon, 137·5 ; last quarter, 150·1 ; full moon, 158·3, giving most to first quarter, least to full. I have given the results on the diagram to show plainly how utterly at variance the two years, both separately and combined are, but evidently a much longer period would be required to prove anything. My impression from the figures is that we should find that the different years, would in time neutralise each other, and that then it would be seen that the amount of cloud at all ages of the moon is the same, and that the idea of the moon clearing the sky is an optical delusion, arising from the fact that there is usually less cloud at night than during the day ; but the gradual clearing is not so striking unless the moon is rising at the same time. I hope to add 1878 by-and-by.

The mean temperature of February was 43·6, against 40·4 in 1876 and 36·2 in 1875. The rainfall was about an inch above the average. Out of fifty-six wind observations, forty-nine had west in them. Not a single case of east-north-east, east, east-south-east, south-east, south-east, or south wind was recorded—a very unusual occurrence. A strong gale from the west and north-west took place on the 20th, heavy snow for an hour in the evening of the 22nd, and hail and graupel showers on the 26th and 27th.

March commenced fine, but cold, the temperature on the 1st falling to 25·1 and 18·7 on the grass, but in the evening it rapidly rose, and the next three days were warm, with drizzling rain. I have often noticed that a rise of temperature is preceded by a very cold night. This may be accounted for on the supposition that the warm current has already set in overhead, dispersing the clouds and causing great radiation to take place from the surface of the earth. The following week was much finer, but cold with showers of snow at times. The 11th was unusually fine. Then changeable but pretty fine weather set in, with heavy showers of graupel and rain at times. On the 23rd there was a good deal of snow fell. On the 24th a depression passed across Great Britain, causing heavy rain, but little wind, the barometer falling to 28·944 inches on the morning of the 25th. To the end of the month the weather was pretty fine but changeable. The mean temperature was 4 degs. lower than that of January. In fine, all the temperatures were lower than those for the two preceding months, the max. in the sun alone excepted. The wind was variable.

The month of April was fine for the time of year, with, of course, now and then showers of rain. There was nothing particular to remark with respect to the extremes and means. The chief phenomenon was a severe hail-storm on the 4th. I was in Newgate Wood at the time, and noticed a heavy, black cloud roll up rapidly from the southward, accompanied by heavy thunder, and I believe several persons saw lightning, but I did not. At 3-10 hail-stones of most unusual size, being about half an inch long and three-eighths of an inch broad, fell. They were chiefly conical, with alternate layers of clear and white ice, the point being white. Heavy showers of rain soon followed. Newgate Wood must have been near the western boundary of the storm. Its full force was felt chiefly in the eastern part of the town, where much damage was done, e. g., 200 panes of glass were broken at Gilbert's Nursery. He described the stones as like small walnuts, or the bowl of a pipe. Many windows were broken at Halton Parsonage and other places. The storm passed over Ore, but reached neither Hollington nor St. Leonards. This storm was apparently caused by the passage of a small depression, and it can be traced from one end of England to the other. It reached Durham between half-past seven and eight. During April there were three other storms, but all distant. Eight solar halos were observed.

May commenced cold and dry, with high barometer, and north-east wind, but upper currents chiefly westerly. Pressure gradually diminished, and on the 7th the weather became very much warmer, and remained moderately so to the end of the month. On the 17th, a depression passed over us, when half an inch of rain fell. This was succeeded by an overcast period, with rather heavy rain on the 19th and 21st. It then continued chiefly fine till the 27th, when a severe gale blew, the wind continuing strong during the two following days. The means were much as usual, except that, as a whole, the temperature was rather low. The mean temperature was 48·1, against 47·4 in

1876, and 52·7 in 1875. The number of rainy days was above the average, the total fall of rain below it.

June was undoubtedly fine and warm, rain falling only on eight days. On the 1st there was a heavy gale, after which the weather became fine and continued so to the end of the month, except it was rather unsettled for a few days about the 20th. On the 4th there was a short but severe thunderstorm in the evening. The day had been hot and fine, with wind changeable from east to south, the clouds chiefly cirrus of various kinds from south-west. In the morning two or three claps of thunder were heard. At 8 p. m. heavy clouds came up from between south and south-west, accompanied by a great deal of brilliant lightning. About 8.40 two very heavy, dense, white masses of cloud, tapering at each end, passed quickly overhead, the first being the larger of the two. They appeared to be rapidly revolving. The first vanished almost in a moment, the second nearly as fast. By nine o'clock the storm, which now consisted of almost constant thunder and lightning, came up, and exactly at nine, or perhaps two minutes before, a very heavy shower took place. At this time the lightning was almost overhead, the flashes being almost entirely horizontal. Before the storm the barometer rose, after it, it fell. The temperature remained stationary.

On Monday the 11th the most severe storm that has occurred at Hastings for a very long time took place. It lasted at least from six p. m. till one a. m. of the 12th. The characteristic features were the changing of the wind, the rises and falls of the barometer, the immense length of the flashes, which were chiefly horizontal, and the comparative lightness of the thunder. About three a. m. a carriage was found on fire at the station, said to have been struck by lightning, but I could neither discover the place where it had been struck nor any melted metal. Also at three a. m. the storm had almost, if not quite, expended itself. The rainfall during the continuance of the storm was 1·71 inch. The barometer remained chiefly steady and high during the month. The mean temperature rose 10 degrees above that of May, and was 3 degrees higher than last year.

There were no striking features during July. The means both barometrical and thermometrical were rather low, and the rainfall high, rain falling on fourteen days. A rather severe thunderstorm occurred on the afternoon of the 7th, and sea fog at times on the 30th. It was rather unusual that neither at nine a. m. nor at nine p. m. did windblow from north-north-east to south-south-east, except once from south-east. August was not so settled as usual, although at times the weather was everything that could be desired. The means as a whole were low, and the weather changeable, the barometer and thermometer fluctuating considerably. On seventeen days rain fell, but not in large quantities, the greatest amount being 0.64 inch on the 25th. The temperature did not rise so high as during 1876 by 11 degs.—75 against 86. From the 26th to 28th, the wind was very strong. Thunder and lightning occurred several times, but no serious storm. [Mem.—From the 8th to the end of the month observations were taken by deputy.]

September was the reverse of August, the weather, especially towards the end of the month, being fine and bright. The barometer was high and steady, but the temperature low for the time of year. The wind was chiefly from north to east. Only 1.07 inch of rain fell, there being only nine rainy days, and on them the rain was chiefly in showers. [Mem.—From the 1st to the 5th, observations were taken by deputy.]

From the 1st to the 20th October was fine, especially towards the commencement, but two or three moderate gales occurred, and a severe one began on the evening of the 14th and continued during the next day. In this gale the “Cleopatra” was abandoned in the Bay of Biscay. From the 20th, the weather remained unsettled till the end of the month, a series of depressions passing across England causing at times severe gales, especially on the 30th. Rain fell every day from the 21st to 30th, except on the 28th.

November was unsettled from beginning to end, numerous depressions, some very deep, passing across us. Rain fell on twenty-four days out of the thirty, and the amount was 7.390, being greater than any month since observations were begun in July, 1874. The mean of the barometer was lower than it had been during the year. The temperatures were high, the lowest being 32·7, whereas in 1876 it fell below 32 degs. three times. The mean temperature was 48 degs., against 45 last year. Specially severe gales occurred on the 11th, when the estimated force was 10, and on the 24th, when a small depression passed to the south of us and force 9 to 10 was registered, and it probably blew harder during the night. The rain-fall on that day was 1·325 inches. Thunder and lightning occurred several times during the month.

Considering the time of year, December was fine, especially after the first week. From the 8th to the 24th rain fell only on seven days, and then but in small quantities. The total fall was 2·7 inches, against 7.190 in 1876. On five days only did the temperature fall below 32 degs. The mean temperature was rather high, but nevertheless 7 degs. lower than that of November. No gale of particular note occurred. The wind reached force 7· on the 12th and 14th. No striking phenomena took place.

I have now finished my own report, and will pass on to the rain returns for the neighbourhood. The following have kindly forwarded me copies of their returns :

HASTINGS.  
Mr. W. Andrews, Borough Surveyor ... 39 18  
Copy of return from Harmer's Reservoir,  
Mr. J. Banks, Bleak House..... 36 29  
Mr. E. Field, Hastings Cemetery ..... 39 75  
Mr. C. Murray, The Firs, Ore ..... 39 85  
Mr. A. H. Wood, The Hollies ..... 41 65  
Mr. W. B. Young, The Grove, Hollington 41 72  
My own gauge received ..... 39 11

WINCHELSEA.  
Miss Styleman ..... 39 64  
Mr. T. Budden ..... 39 49  
Monthly totals have also been kindly sent by—  
Captain W. R. Lewis, The High Beech, Hollington ... 38 55  
Mr. M. Vidler, C.E., Pevensey ..... 38 94

The mean fall for the Hastings District, omitting one return, which I believe to be incorrect, owing to the bad exposure of the gauge, is 39·78. The average rainfall for Hastings, according to calculations made for the British Association, is 27·01, so that we had 12·77 above our proper amount. This fact I think those answerable for our water supply should keep continually in mind, for as we have had during the last few years so much over our average, undoubtedly before long we shall have as much below it.

The diagram now on the scene gives the fall at each station for each month.

On four days during the year—viz., the 8th and 10th of January, 11th June, and 24th November—the fall exceeded an inch ; while on three other days—viz., Oct. 24, Oct. 27, and Nov. 29—it exceeded the same amount at some stations. The greatest fall of all was 2·40, collected by Mr. Young at Hollington on June 11, during the severe storm. On that day the amounts differed considerably at the different stations.

I have also received monthly, from C. Murray, Esq., of the Firs, Ore, a very carefully-kept Meteorological Journal, for which I return many thanks. This has been of great use for comparison ; also much valuable meteorological information from G. W. M. Thompson, Esq.

I must likewise return thanks to the donors of the following books and pamphlets, which I shall be happy to lend to any member of the society :—R. H. Scott, Esq., Secretary of the Meteorological Office—the Daily Weather Charts.

Observations from stations of the Second Order, Part II., 1875.

Ditto, Part I., 1876.

Quarterly Weather Report, 1874, Parts III. and IV.

Supplement to the Report of the Permanent Committee of the 1st International Congress. Report of the Meteorological Committee for 1876.

Signor Guido, Pesaro, Sicily—Meteorological Returns, August and September, 1876, January to August, 1877.

Dr. H. Hildebrand Hildebrandsson, Upsala, Sweden—Bulletin Météorologique, June to December, 1876.

Atlas des Mouvements Supérieurs de l'Atmosphère.

E. G. Aldridge, Esq.—Torquay Directory of September 5 and 12, containing Letters on Climate.

R. Tennent, Esq., Edinburgh—Why the Barometer does not indicate Real Vertical Pressure.

On Barometrical Depressions.

Extract from Journal of Edinburgh Royal Society, being Letter Addressed to Mr. Stevenson.

F. H. Parsons, M.D.—Highlands of Hastings and St. Leonards as a Health Resort.

W. C. Punnett, Esq., Tonbridge Meteorological Report, 1876.

General Meyer, Chief Signal Officer, United States—Report of Chief Signal Office, War Department, U.S., 1876.

G. J. Symons, Esq.—Abstract of Observations made at Royal Botanical Gardens, 1871-6.

At last, to the satisfaction, perhaps, of some of my hearers, I have come to the end of my paper. There is one thing I should, however, like still to mention. Some months ago there was a very interesting discussion at the Meteorological Society on the climate of certain health resorts. By the way, I might mention that Hastings came out very satisfactorily. In the course of the discussion a gentleman remarked that my observations did not represent the climate of Warrior Square. Of course they do not fully. We, on a hill, undoubtedly have the advantage in summer over those who live along the front, and even all the year round I consider a hill the more healthy of the two. For very delicate persons, however, the front would be better during the cold months. I would advise some of our summer visitors to try the surrounding hills instead of the town, although even there they are far cooler, as I have before shown, than in many neighbouring towns. But I am wandering from my subject. I should be very glad if three or four ladies or gentlemen, the more, however, the better, in different parts of the town would take observations with thermometers that have been certified at Kew Observatory. They would only cost about 15s., and one would be enough, the fixing of which would cost about 3s. Placed outside a northern window and read as often as possible, night and morning at nine o'clock, it would yield very valuable comparative results, and would entail hardly any trouble. I do not say that it would be the best position possible, but as I keep two thermometers outside a similar window, besides my proper instruments, they could all be compared together. I shall be most happy to give any advice in my power on the subject, and believe it would not be labour in vain.