SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XXII.] NOVEMBER, 1867. [PRICE FOURPENCE. or 5s. per ann. post free.

ANEMOMETERS.

(Continued from page 88.)

THE last instruments which we have to notice, are those in which the force of the wind is measured, instead of its velocity. Before describing them it seems expedient to draw attention to an oversight of frequent occurrence. In many meteorological works tables will be found based on experiments made by Smeaton, Hutton, and others, by means of which observers are instructed to convert records of pressure into velocity, and *vice versa*. Without presuming to quote their absence from Guyot's splendid tables, as proof that this cannot safely be done, it certainly is an indication thereof, and supports the caution against the practice which we have previously recorded.* "We desire, however, in the first place, to lodge a protest against the possibility of obtaining any *simple* rule for the conversion of velocity into pressure, and *vice versa;* because the momentum of a body varies with its density: hence, if the barometer be at, say 28 inches, the pressure of any wind will be less than if the barometer were at 30 inches, the velocity in each case being the same, since each cubic foot of air would weigh about 36 grains more then, than at 28 inches."

Moreover, the pressure plate though at a right angle to the direction of the wind in azimuth, can only be truly perpendicular to horizontal currents, but we all know full well how rarely the motion of the wind is strictly horizontal, therefore it is only rarely that the plate receives the full force to which it is entitled. There can be no doubt, however, that a pressure record is a desirable addition to any observatory, and that the results are extremely interesting. Perhaps the best proof of this is to jot down some of the places where pressure anemometers are at work, Greenwich, Lloyd's, Liverpool, Wrottesley, Wisbech, Birmingham, Osborne, occur to us immediately, also Plymouth, Edinburgh, and Inverness in former years ; thus widespread has been their adoption. Until very recently the only instrument in actual use as a pressure recording anemometer, was that shown on the opposite page, and for which, by the bye, we are indebted to Messrs. Negretti and

* *Meteorological Magazine*, Vol. I., p. 19.

Zambra, who on their own account, and as successors to Mr. Newman, have hitherto, we believe, had the manufacture almost exclusively in their hands.

Mr. Follet Osler is the inventor of a self-recording apparatus which registers the direction and pressure of the wind, and the amount and duration of rain, upon the same sheet of paper.

The mechanism may be modified in various ways, but the following is a description of the simplest arrangement.

The instrument, of which the engraving is a diagram rather than a picture, consists, first, of a vane, *V*, of a wedge-shape form, which is found to answer better than a flat vane; for the latter is always in a neutral line, and therefore is not sufficiently sensitive. At the lower end of the tube, *T T*, is a small pinion, working in a rack, *r*, which moves backwards and forwards as the wind presses the vane. To this rack a pencil, *x*, is attached, which marks the direction of the wind on a properly ruled paper, placed horizontally beneath, and so adjusted as to progress at the rate of half an inch per hour, by means of a simple contrivance connecting it with a good clock. The paper is shown in the illustration upon the table of the instrument.

The pressure plate, *F*, for ascertaining the force of the wind, is one foot square, placed immediately beneath, and at right angles with the vane; it is supported by light bars, running horizontally on friction rollers, and communicating with flattened springs, 1, 2, 3, so that the plate, when affected by the pressure of the wind, acts upon them, and they transfer such action to a copper chain passing down the interior of the direction tube, and over a pulley at the bottom. A light copper wire connects this chain with the spring lever, *y y*, carrying a pencil, which records the pressure upon the paper below. Mr. Osler much prefers a spring to any other means for ascertaining the force of the wind, because it is of the highest importance to have as little matter in motion as possible, otherwise the momentum acquired will cause the pressure plate to give very erroneous indications. The pressure plate is as light as is consistent with strength. It is kept before the wind by the vane, and is urged out by three or more springs, so that with light winds one only is compressed, and two, or more, according to the strength of the wind.

The rain gauge is placed on the right in the figure, *P P*, being the plane of the roof of the building. The rain funnel, *R*, exposes an area of about 200 square inches. The water collected in it is conveyed by a tube through the roof of the building into a glass vessel, *G*, so adjusted and graduated as to indicate a quarter of an inch of rain for every 200 square inches of surface—*i. e.*, 50 cubic inches. *G* is supported by spiral springs, *b b*, which are compressed by the accumulating rain. A glass tube, open at both ends, is cemented into the bottom of *G*, and over it is placed a larger one closed at the top like a bell glass. The smaller tube thus forms the long leg of a syphon, and the larger tube acts as the short leg. The water, having risen to the level of the top of the inner tube, drops over into a little copper tilt, *t*, in the globe, *S*, beneath the reservoir. This tilt is divided into two equal partitions by a slip of copper, and placed upon an axis not exactly balanced, but so that one end or the other preponderates. The water then drops into the end of the tilt which happens to be uppermost, and when quite full it falls over, throwing the water into the globe, *S*, from which it flows away by the waste pipe. In this way an imperfect vacuum is produced in the globe, quite sufficient to produce a draught in the small tube of the syphon, or the long leg; and the whole contents of the reservoir, *G*, immediately run off, and the spiral springs, *b b*, elevate the reservoir to its original position. To produce this action, a quarter of an inch of rain must have fallen. The registration is easily understood. A spring lever, *z*, carrying a pencil, is attached by a cord, *c*, to *S*. This spring always keeps the cord tight, so that as the apparatus descends during the fall of rain, the spring advances the pencil more and more from the zero of the scale upon the paper beneath, until a quarter of an inch has fallen, when the pencil is drawn back to zero by the ascent of the reservoir.

The clock movement carries the registering paper forward by one of the wheels working into a rack attached to the frame.

The adjustment of the instrument should be carefully made at its first erection. The scale for pressure should be established experimentally, by applying weights of 2, 4, 6, &c., lbs., to move the pressure plate.

The registration trace for twenty-four hours is readily understood. The direction is recorded on the centre part; the pressure on one side, and the rain on the other. Lines parallel to the length of the paper show no rain, steady wind, and constant pressure. On the rain trace, a line parallel to the width of the paper shows that the pencil had been drawn back to zero, a quarter of an inch of rain having fallen. The hour lines are in the direction of the width of the paper.

At the International Exhibition 1862, Messrs. Negretti and Zambra exhibited an improved Osler's anemometer, having combined with it Robinson's cups, so that the pressure and velocity appear on the same sheet, on which a line an inch in length is recorded at every ten miles; thus the complete instrument shows continuously the direction, pressure, and velocity of the wind, and the amount of rain.

METEOROLOGY AT DUNDEE.

(Continued from page 105.)

RAINFALL AT ARBROATH.

Mr. GLAISHER read a communication by Mr. Alexander Brown regarding Observations of the Rainfall at Arbroath. It stated that the want of a proper supply of water for the town of Arbroath had for a considerable time been felt, and along with the recent rapid increase of the town that want had also increased. In the ten years between 1850 and 1860, four reports on the subject of a water supply for Arbroath by three civil engineers had been submitted to the inhabitants by the Town Council, and in two of these reports the question of rainfall in the town and surrounding district had been introduced. In the event of this subject again coming into notice, a table was submitted which it was considered might be of service. It embraced an abstract of Mr. Brown's rain register for a period of nearly twenty-four years from the beginning of March, 1843, to the close of 1866. It contained the amount of rainfall in every month and the total rainfall in each year. It appears that the average annual fall over twenty-four years is 27·013 inches—the highest annual fall being in 1864, 34·020 in., and the lowest in 1854, 20·818 in.; the least monthly fall, March, 1856, 0·121 in., and the greatest, October, 1864, 7·804 in. The rain gauge is 60 feet above the medium sea level, and 2 feet from the ground. The same form and size of gauge has been used throughout, and its position has never been altered. The diameter of the receiving funnel is 7·5 inches. The fall in January and February, 1843, was not observed; assuming that it was equal to the average, it would give a total annual fall for 1843 of 26·984 inches, and throwing the twenty-four years, over which the observations extend, into groups of four years each, the quantities come out as follows:—

MEAN ANNUAL RAIN.

Average of 1843 to 1846—27·786	Mean Annual Rain Average of first twelve years, 26·420.	
„ 1847 „ 1850—26·162		
„ 1851 „ 1854—25·311		
„ 1855 „ 1858—25·598	Average of second twelve years 27·603.	
„ 1859 „ 1862—29·145		
„ 1863 „ 1866—28·066		

A diagram was given, from which it appeared that during the period over which the observations extend, there were three years of great rainfall, namely, 1848, 1856, and 1864, having an interval of eight years between each of greatest rainfall.

Some discussion followed, in which remarks were made on the importance of the subject of rainfall as respects agriculture, commercially, as regards water-power mills, and in a sanitary point of view, as respects our great cities and towns.

LUMINOUS METEORS.

Mr. GLAISHER was called upon by Sir William Thomson for his report on Luminous Meteors. Last year there were such a vast number of observations, that the Committee had had the greatest difficulty in keeping the report within reasonable compass; at the Royal Observatory alone about 9000 meteors had been observed, and the observations of even that one shower would make a bulky catalogue; for these and other reasons it had been decided that the meteors noted at Greenwich should henceforward form part of the annual volume of Greenwich Observations, and therefore it would be unnecessary to print them in the British Association Report. One large meteor was observed at Cardiff, and the luminosity remained visible for about eighteen minutes. One was also seen above Dundee of extraordinary brilliance, which was ascertained to be about 51 to 57 miles above the earth. A curious detonating fire-ball was then described, which was seen in broad daylight in France and the South of England in June last. Another was seen at Glasgow, which passed over St. Andrews, where it appeared to consist of three parts, each equal to Venus, and it was calculated that this meteor passed at a distance of about fifty miles above the earth. At Aberdeen, a brilliant fire-ball was first seen last November, which it was afterwards found was seen also over the whole of Scotland, and as far south as Nottingham. A remarkable fire-ball, seen near Basle—of which there was a colored diagram on the wall—had been observed in the

Observatory at Basle and also in Paris. A large amount of information was given regarding the reports received from various localities where the meteoric shower of last November was seen—the Cape of Good Hope, and other places, which, combined, cannot fail to yield most valuable accessions to our rapidly increasing knowledge of these once mysterious visitants.

Sir WM. THOMSON then said that Professor Herschel would make a few remarks on the character and quality of the meteoric light, a subject in the investigation of which he had been singularly successful.

Professor ALEXANDER HERSCHEL, Glasgow, said that the spectroscope showed a yellow band, but of what this light was composed it was impossible to say. As, however, observers multiplied, with telescopes armed with spectroscopes, this difficulty would no doubt be resolved. The connection between comets and meteors had this year been established without doubt, and that connection gave wide scope for speculation as to the origin and character of meteoric bodies. Mr. Huggins made an observation on the light of a comet, and although that observation was not peifect, still it was sufficient to identify the light of the nucleus of the comet with that of the meteoric bodies. There were two theories as to these meteors. Le Verrier had shown that their orbit extended from that of Uranus to that of the Earth, while an Italian astronomer believed that they came from the utmost fields of space. Fifty-six showers were well established, and it was by the study of these showers that they hoped to continue, and possibly confirm and extend their researches, aided also by the assistance of those zealous obseivers who had hitherto been their supporters and constant assistants among the members of the Association. (Applause.)

In answer to a question from Sir Wm. Thomson,

Professor HERSCHEL said it was too bold to say that every shooting star was a comet. They were more likely the dissipated parts of comets—probably comets torn into shreds by the sun's attraction.

THE METEOR SHOWERS OF AUGUST, 1867.

A paper on this subject by Mr. George Forbes, was read by Professor SWAN. On its conclusion,

Sir WM. THOMSON remarked that the paper they had just heard was from a very promising young naturalist, and it must be very gratifying indeed to the members of the British Association to have a communication from a son of Principal Forbes, who had been so long connected with the British Association.

EVAPORATION FROM RAIN GAUGES.

This paper was by Mr. THRUSTANS, of Wolverhampton, and recounted the results of experiments with six tin cylinders, in each of which a certain quantity of water was placed. Three of these had lids with apertures of different sizes, and three others had apertures of the same diameters as those of the other three vessels, and tubes of the same size, reaching nearly to the bottom. The contents of these vessels had been measured monthly, and it appeared that the total loss was never very considerable, decreasing with the aperture, and being very materially reduced by the pipes, so that with a pipe like that in a 5-inch Howard's gauge, the loss was scarcely appreciable.

METEOROLOGY OF THE MAURITIUS.

Mr. MELDRUM, Director of the Mauritius Observatory, read a paper on the meteorology of that island, in which he reviewed the diurnal and annual variations of the meteorological elements as derived from daily observations taken for a period of seven years. The results were contained in forty-two tables, accompanied by diagrams. Mr. Meldrum called special attention to the fact that at Mauritius the pressure of the dry air had a double maximum and minimum, so that Dove's explanation of the double progression of the total atmospheric pressure, which had been adopted by Sabine, Herschel, and others, did not apply at that station. He (Mr. Meldrum) was aware that a similar behaviour of the dry pressure at Bombay had been ascribed to alternate land and sea breezes, but it might be doubted whether such an explanation would account for the double progression of the total pressure at Mauritius. Another point to which he called special attention was the rainfall, illustrating by a map of the island the great influence of local circumstances on the annual fall. Of late years the island had greatly suffered from drought, which was attributed to the extensive clearings which had been going on; and it would be gratifying to know the opinion of the Section as to the probable effect, with respect to rainfall, of cutting down trees on an extensive scale. Mr. Meldrum next referred to the hurricanes of Mauritius, and stated that no heavy gale or hurricane occurred within 1500 miles to the north-east or south-west of the island, the existence of which was not made known by the barometer and weather. In conclusion, Mr. Meldrum stated that a new observatory was to be erected and furnished with self-recording instruments, the Governor of the colony, Sir Henry Barkly, who had already done so much for science, being a warm supporter of the measure.

THE HURRICANES OF THE INDIAN OCEAN.

Mr. MELDRUM next read a paper on the Hurricanes of the Indian Ocean, in which he dwelt on some points of great interest and importance. After showing how these hurricanes originated between the S.E. trade wind and N.W. monsoon, how the wind in them rotated from left to right, or with the hands of a watch, how they travelled at first to S.W. and then curved to S. and S.E., Mr. Meldrum alluded to their form, showing that the wind blew spirally, and illustrated the subject by interesting quotations from the log-book of the Earl of Dalhousie, a vessel which, he believed, belonged to the port of Dundee, and which in May, 1863, had scudded round and round the centre of a revolving storm three times, at the rate of 10 to 13 knots, nearing the centre each time she went round it. As the S.E. trade wind frequently blew strongly over many degrees of longitude during a huricane with a falling barometer, it was impossible to know the bearing of the centre when a vessel was in front of a storm, and at some distance from the centre, and Mr. Meldrum could adducë instances of great loss of life and property arising from vessels in those circumstances adopting the recommendation usually given of running to the westward or north-west. It could not also be made too widely known that a large portion, perhaps the largest, of the losses caused by hurricanes in those seas arose from the fact that homeward bound vessels took apparent advantage of increasing N.E. winds between 10° and 16° S., and, running to the south-west, got in front of the storm, in which they were often dismasted, if they did not founder; whereas, by lying to for a few hours, or proceeding cautiously to the southward, the storm would have been avoided. Mr. Meldrum illustrated his paper by maps and charts, showing the actual positions of the vessels and the direction of the wind, and stated that the Meteorological Society of the island had collected a large mass of facts and observations bearing on tne meteorology of the Indian Ocean.

Mr. BUCHAN, Secretary to the Scottish Meteorological Society, said the point to which Mr. Meldrum had referred—that of the in-moving spiral direction of the wind—was, he believed, true. Mr. Meldrum was returning soon to the Mauritius, intending to give very special attention to the whole subject of storms in the Indian Ocean, of which they practically knew little except what they had been made aware of by the Meteorological Society in Mauritius. Referring to the map which Mr. Meldrum had exhibited, and which he presumed did not represent the direction of the wind at any specific time, he remarked that the value of such a map, which was to a great extent hypothetical, was not to be compared with actual observations; and the Association should invite Mr. Meldrum when he prosecuted the subject of storms to furnish a succession of charts, in which his actual observations were laid down, and in which they could see the real bearing of the whole question so far as actual observations, unmixed with hypotheses, would show.

Mr. MELDRUM remarked that he had brought with him a great many charts, which were open to inspection, showing the actual observations.

Mr. SYMONS spoke to the value of Mr. Meldrum's papers, and proposed that the former should be printed in extenso in the report of the Association, which was agreed to unanimously.

Sir WM. THOMSON remarked that owing to the double nature of many of the storms in the Indian Ocean, the rule of keep your nose on the wind and the wind on your left might lead to a vessel passing from one storm right into the heart of another. These double storms were of frequent occurrence in the Indian Ocean, and it was of great importance to the security of the navigation of that sea that rules should be drawn up with special reference to the doubleness of storms. In

Mr. Meldrum's paper they had evidence of great industry and skill, and as the Mauritius was one of the most important meteorological stations, it was to be hoped not only that on his return Mr. Meldrum would continue his observations, but also that when a new meteorological observatory was established at Mauritius, there might be an electrical department in it. (Applause.)

NEW TELEGRAPHIC THERMOMETER.

Professor Wheatstone communicated a description of recent improvements in the telegraphic thermometer introduced by him in 1843 ; he did not state the result of actual trials, but the apparatus, divested of accessories, consists of a metallic thermometer in an air-tight box (*a*) which may be placed anywhere, on the top of Mont Blanc or at the bottom of the sea, provided only that two insular wires lead from it to a similar instrument (*b*) in any convenient position. On turning a handle attached to (*b*), the temperature at (*a*) is marked on the dial of (*b*).

PROPERTIES OF VAPOUR IN THE ATMOSPHERE.

Professor Foster then read a paper on the above, by Mr. R Russell, F.R.S.E., in which the author, after admitting the ingenuity of Professor Tyndall's researches on heat as a mode of motion, took exception to some of his deductions on the influence which the vapour of water exerts in modifying the intensity of solar and terrestrial radiation. He, on the other hand, came to the conclusion that the radiant powers of the vapour of water in the atmosphere were not even capable of forming clouds, though they might be capable of forming mists in valleys. In our atmosphere the vapour of water had little power of transmitting its heat into space when it approaches or reaches the dew point. If any cloud had been caused by the radiation of heat into space, its upper surface would be flat, like the mists in the meadows before sunrise. These and other reasons led him to the conclusion that the radiation of vapours into space has, directly a very slight influence on the production of rain.

Sir Wm. Thomson observed that the paper that had been read contained some very important arguments on a difficult question of meteorology. He did not doubt that the author was right in the main in maintaining that cold produced by expansion had a verysmall effect in causing those condensations which gave rise to torrents of rain. But he thought he had undervalued very considerably the influence of radiation in producing that minor condensation by which mists and clouds were constituted. He said minor condensation—meaning condensation from a gaseous condition into small spherical globules, so small that the resistance they met with kept them suspended. The reason why a cloud did not fall down as rain was that every part of the cloud was composed of very minute drops of water. The larger the drops were that constituted a cloud the more rapidly would they fall ; but when very small they fell insensibly, as Professor Stokes had shown, only perhaps a few inches in an hour. When somewhat larger, they formed what we called a Scotch mist, which was something between a shower of globules coming down appreciably and a shower of globules in which the descent was insensible ; and it appeared to him that Mr. Russell had undervalued the influence of the radiation referred to. He would not pronounce, however, at present upon the vexed question of the radiating power of transparent gaseous vapour. Professor Magnus, of Berlin, and Dr. Tyndall had been investigating that subject ; and although up to this time they had not been able to agree on their conclusions, he had no doubt that two such eminent observers would yet arrive at a conclusion, and give the benefit of it to the world. (Applause.) But as to the influence of radiation and the influence of minor condensation to which he had already alluded, as soon as a cloud exists, whether high or low, each particle becomes a radiator. It radiates heat and becomes itself a little cooler than the surrounding air, and so becomes a reservoir of condensation. That takes place at the top of the cloud if there is clear air above it, and so with the mist in the valleys. The observations of Wells, the discoverer of the true theory of dew, demonstrated the accuracy of this assertion. He might now refer to Mr. Russell's remarks upon the temperature at night as influenced by the dew point. The temperature at night was found to be but little different from the dew point which might be observed in the course of the day. The true explanation of that was to be found in Well's theory of dew. A blade of grass could not go to a temperature lower than the dew point of the air touching it, and so was it with particles of mist. Dew was most plentiful in clear calm nights, when the air was very moist, but quite transparent, and when it fell fine leaves of flowers and grass blades could not sink lower than the dew point. Dew did not form to any great degree, indeed hardly at all, when the sky was cloudy, for then the clouds afforded the protection which was not on such nights afforded by the dew. When there was no clouds, and if there was a high wind, then in that case the wind afforded the protection to the leaves and flowers which was to be obtained from neither dew nor clouds. (Applause.) But by an arrangement which they could not but regard as an admirable and wonderful exemplification of design, there was nothing destitute of protection. The protection was sometimes insufficient, and plants were killed by frost; but some degree of protection was never wanting, and there was enough of that protection always to allow plants to live, as we saw them doing, and to survive during weather when, were it not for one of these three causes, the cold would be so great as to destroy them altogether. (Applause.) Physically, it was interesting to remark how it was that in each instance the protection was obtained. There was first the protection afforded by clouds. These prevented the surface of the earth from radiating and reaching a lower temperature than that of the clouds. The temperature of a blade of grass on a cloudy evening would therefore be very nearly the temperature of the lower surface of the clouds overhead. When there were no clouds and no wind, the office of each blade of grass was to collect the air touching it, condense vapour from that air, and so take heat from part of the heat around it. Thus we had a source of heat taken from the air several feet above the surface. The protection was more complete, however, when dew did not fall, for when there was no dew the wind made up so large a portion of heat from the air that the leaves of plants were never allowed to go down even to the dew point. Thus wind was a more complete protection than dew, and it would have been observed that plants were never injured by frost on windy nights, and that in the morning the grass was found dry. (Applause.) It was sometimes remarked that flowers were frosted in hollows, but that close at hand, and on the summits of little hillocks, they escaped damage. The explanation was clear when they took into account the principles developed by Wells. The air in the hollows remained unchanged, and unless there was moisture enough in the air to provide dew as long as the severe condition of weather lasted, and to keep the dew point from going down too low, injurious effects would follow. The plants, in short, got dry, drying the air around them, and if that air was not changed very much for the better, then they were destroyed by frost. This, however, rarely happened. He agreed with Mr. Russell in what he had said regarding the value of Dr. Tyndall's work on "Heat." The scientific world were much indebted to Dr. Tyndall, not merely for his investigations, but for the manner in which he had attracted interest to the results of science, and for the beautifully clear explanations he had given of scientific principles. Scientific men were extremely dependent on the sympathy of the rest of the world, and this was very largely increased when the illustrations of scientific investigations were made known in a clear and interesting manner, as Dr. Tyndall had made them known, to a very large part of the population in this country, and throughout the civilised world. (Applause.)

YELLOW HAZE & S.E. WIND.

To the Editor of the Meteorological Magazine.

SIR.—As regards your correspondent T.L.L.'s letter relative to the above, it appears to me that the explanation of the peculiar haze which accompanies (as I too have invariably observed) an easterly wind, is to be sought for in a consideration of the characters of that wind; these are—dryness, coldness, and consequent density, with but a small capacity for vapour.

The effect of its dryness—the result of its passage across land, and of its coming from intensely cold regions—is excessive evaporation. But the vapour drawn up in this way is immediately condensed, before it can reach to any height, by the extreme coldness of the air, not in the form of cloud, but as a haze of a most peculiar *bronze* hue.

And this is the more marked in Spring, because at that season the coldness of the N.E. current is greatest, and the amount of vapour carried up by evaporation reaches a maximum, from the sun, with increasing power, acting on the land drenched by the winter's snow and rain.

With respect to the S.E. wind; in the first place, we must carefully distinguish two distinct forms of the same. The one is nothing more than a *bent polar* or N.E. current, and is accompanied by all its characteristics, namely : a *high* barometer, great cold, the usual bronze hue, dry weather, &c. The other is a deflected S.W. or *equatorial* current, and is attended with a *low* barometer, warmth, moisture, and often heavy rain.

Now the March S.E. wind is the result of an enormous expansion of air due to the commencing increase of temperature over the vast extent of Northern and Eastern Europe, and of Asia.

These easterly winds constitute the spring equinoctial gales, and are generally followed by a reactionary succession of high winds from the west, which give to April its character of "showery."

In October we meet with both forms of S.E. wind, the first, or deflected N.E., occurs as a reactionary equinoctial after the S.W. gales of September, which latter find their origin in the rapid fall of temperature towards the north and east.

This form of S.E. wind is not so often met with in October as is the second, which, again, is noticed under two aspects ; first, as forming one side of a cyclone (and this is the more usual), and secondly, as a comparatively steady wind, the result of an equilibrium established by opposite currents from N.E. and S.W. holding each other in check.

If in the second case there is no intermingling of the currents, we have towards the S.W. border of the S.E. wind, the conditions mentioned by your correspondent—viz. : a singularly transparent air and large quantities of cirrus, and towards the N.E. edge of the same the haze and high barometer characteristic of N.E. wind.

Under such circumstances it is possible that air from the deserts of Africa may cross the British Isles.

Should the currents mingle, we have drenching rains with a low S.E. wind, and a high S.W. current, the latter naturally prevailing in the higher regions of the atmosphere by reason of its comparative lightness; this is the state of things during a cyclone too.

And now I would briefly refer to Dr. Moffat's most interesting papers on Ozone, abstracts of which you have kindly given in the *Meteorological Magazine.*

You may remember that in a letter written some 14 months ago, I asked for information concerning a phenomenon I had noticed—the occasional discolouration of paint by rain. In that letter I gave the conditions under which that phenomena always occurred ; they were briefly—the prevalence of an under wind from S.E., an upper current from S.W., a very low barometer, and an excessive rainfall. I also suggested that this remarkable fact might be explained by the presence of a large quantity of ozone in the air at the time.

Dr. Moffat has ascertained that the equatorial current, especially when blowing over the sea, is that of most ozone. Is not this confirmatory of the ozone theory of discolouration of paint? That ozone is intimately connected with the electrical state of the air is again borne out by the fact that the equatorial current is at the same time that of maximum ozone, and also the bearer of thunderstorms ; to have thunder and lightning with a pure N.E. current is a most unusual phenomenon.

I will only add that on the night of the 11th of July last, the sea off Kingston and Bray was splendidly phosphorescent, while at the same time a violent thunderstorm was raging in the immediate neighbourhood.—Yours very truly,

JOHN WILLIAM MOORE, B.A., Sch. T.C.D.

P.S.—The colour of the east wind haze was for a long time a puzzle to me, until I one day observed that the inner edge of a solar halo was of an exactly similar tint. The bronze is the representative in the halo of the orange in the rainbow. A peculiar arrangement of the vapour particles forming the haze, no doubt gives rise to its colour.

9, Trinity College, Dublin, *October 22nd,* 1867.

OCTOBER, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	1·92	— ·68	·42	15	16	66·0	22	31·0	6	2
II.		Staplehurst (Linton Park)	2·65	— ·45	·77	16	16	68·0	15	29·0	5, 6	7
,,		Selborne (The Wakes)	3·68	— ·54	·57	15	19	58·5	17	26·0	11	5
III.		Hitchen	1·78	— ·77	·37	27	17	63·0	22*	30·0	4	3
,,		Banbury	2·94	+ ·51	·59	11	24	64·0	22	29·0	11	3
,,		Wisbech	2·31	...	·51	15	20	66·6	22	30·8	6	3
IV.		Bury St. Edmunds (Culford).	2·48	— ·24	·44	15	17	65·0	22	27·0	4	5
V.		Calne	...	...	...	...	...	...	...	...	...	...
,,		Plymouth (Goodamoor)	6·47	— ·20	...	...	...	62·0	...	28·0	...	...
,,		Barnstaple	7·12	+ 3·00	1·11	29	26	66·0	23	37·0	11	0
,,		Taunton (Fulland's School)	3·38	— ·16	·52	10	24	...	...	37·0	26	0
VI.		Shrewsbury (Highfield)	2·93	+ ·05	·61	9	19	...	...	...	...	...
,,		Tenbury (Orleton)	3·20	— ·03	·62	9	28	65·4	22	32·2	20	0
VII.		Leicester (Wigston)	2·29	— ·41	·41	12	16	68·0	22	27·0	4	6
,,		West Retford	...	...	...	...	...	...	...	...	...	...
,,		Derby	3·30	+ ·46	·76	11	21	65·0	22	33·0	4	0
VIII.		Manchester	3·98	+ ·17	·75	27	22	69·5	22	30·5	4	4
IX.		York	1·41	— 1·11	·26	28	18	61·0	16	32·5	6	0
,,		Skipton (Arncliffe)	4·99	— 1·67	·60	16	24	59·0	23	32·0	9, 28	0
X.		North Shields	1·07	— 2·21	·19	4	16	...	...	...	...	0
,,		Borrowdale (Seathwaite)	13·67	— 2·65	2·25	29	22	...	...	...	...	...
XI.	WALES.	Abercarn	5·20	...	·74	18	21	62·0	2	37·0	11	0
,,		Haverfordwest	8·54	+ 3·35	1·09	15	23	60·5	22	37·5	3	0
,,		Rhayader (Cefnfaes)	...	...	...	...	...	...	...	..	..	...
,,		Llanberis (R. Victoria Hotel)	10·14	...	1·00	5	23	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	4·01	— ·91	·68	15	23	62·5	22	29·5	28	5
,,		Hawick (Silverbut Hall)	1·39	...	·29	26	17	...	...	...	...	7
XIV.		Ayr (Auchendrane House)	5·10	+ ·15	·77	20	25	64·0	2	27·0	4	4
XV.		Otter House	10·97	+ 4·49	...	...	26	...	...	27·0	28	2
XVI.		Leven (Nookton)	1·99	— 1·76	·46	14	16	64·0	22	31·4	28	3
,,		Stirling (Deanston)	4·33	— ·58	·83	26	23	65·0	22	26·0	10	6
,,		Logierait	2·89	...	·82	26	18	...	...	...	...	..
XVII.		Ballater	2·83	...	·66	13	16	68·5	11	24·0	6	8
,,		Aberdeen	2·08	...	·50	14	23	61·0	22	30·9	6	1
XVIII		Inverness (Culloden)	2·76	...	1·11	27	21	62·2	...	34·2	...	0
,,		Fort William	11·83	...	2·57	26	28	...	...	...	...	...
,,		Portree	9·68	— 1·10	2·45	26	25	62·5	11	31·5	5	1
,,		Loch Broom	8·35	...	2·25	26	25	...	...	...	...	...
XIX.		Helmsdale	...	...	...	...	...	...	...	...	...	...
,,		Sandwick	6·66	+ 1·74	1·18	26	28	57·0	24	35·1	4	0
XX.	IRELAND.	Cork	4·66	...	·57	16	27	...	...	...	...	...
,,		Waterford	3·88	— ·52	·73	23	24	64·0	10†	37·0	4	0
,,		Killaloe	7·63	+ 2·61	1·39	22	26	63·0	12	32·0	28	0
XXI.		Portarlington	3·51	— 1·62	·60	24	28	60·5	23	34·0	28	0
,,		Monkstown	2·50	— 1·42	·37	9	20	67·0	22	33·5	4	0
XXII.		Galway	5·29	...	·57	27	28	62·0	2	34·0	14	0
,,		Bunninadden (Doo Castle)	7·27	...	·80	13‡	25	59·0	11‡	31·0	26	1
XXIII		Bawnboy (Owendoon)	6·28	...	·76	13	28	65·0	11‡	31·0	3	1
,,		Waringstown	4·15	...	·53	9	25	66·0	22	31·0	27	1
,,		Strabane (Leckpatrick)	7·96	...	·97	26	25	66·0	12	30·0	25	1

*And 24th. †And 12th. ‡And 22nd.

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

METEOROLOGICAL NOTES ON THE MONTH.

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

ENGLAND.

CAMDEN TOWN.—Gale with H and heavy R at 1.10 p.m. on 27th.

LINTON PARK.—First ten days cold, with several frosty mornings; T and heavy R on night of 15th. Very dry, mild and fine from 19th to 26th; the last few days moist but mild. Wind mostly S. and W. High wind and heavy R on afternoon of 27th.

SELBORNE.—T S from S. at 6 p.m. on 3rd; T S also on 9th, and at 3 p.m. on 18th; H storm at 12.30 p.m. 8th; distant T at 4 p.m. 14th; dense fog on 25th.

HITCHIN.—Tremendous R on 27th [for a short time], almost like a water-spout.

BANBURY.—H and R on 3rd and 27th.

WISBECH.—Aurora at 11 p.m. on the 2nd. Early part of month cold; from 21st mild and humid. The late swallows departed on the 19th. Solar halo on 9th; fog on 12th and 24th; gale on 27th. Lime trees divested of leaves on 23rd.

TAUNTON.—H storm on 3rd.

ORLETON.—S on the hills on 5th. Month generally cloudy and damp, with frequent fogs and small R almost daily. The beginning of the month very cold; afterwards changeable, but generally warm; great wind on 27th; distant T S at night on 17th, and T on 19th. Temp. nearly 1°·5 below the average; H storm at 10 a.m. 3rd; heavy R and H for twenty minutes at 9 a.m. 27th.

MANCHESTER.—T and L on 7th; H and heavy R on 27th.

ARNCLIFFE.—Wild, with gale of wind on 2nd; R frequent, though not heavy.

NORTH SHIELDS.—S on 4th and 5th; auroræ on 2nd, 3rd, and 8th.

WALES.

ABERCARN.—A wet month, generally cold, but some close days. Boisterous on 21st and 27th. H shower on 4th.

HAVERFORDWEST.—The first ten days cold, wet and stormy, with heavy H storms, and wind N.N.W.; remainder of month wet; at times very close atmosphere. The wettest October of which I have any record during the last 20 years; only three fine days during the month. Prevailing wind S.W.

SCOTLAND.

DUMFRIES.—The beginning of the month fine, with some frost. From the 11th to close of month R every day but two. Harvest concluded in higher districts the first week in the month. The potatoe crop in some cases much diseased, in others but little; on the whole the crop is above the average, though the tubers are small.

HAWICK.—A hurricane from the West on the 1st, 2nd, 26th, and 27th; during that of the 26th many trees were torn up. Frost on seven nights at the commencement. Swallows last seen on the 5th; last dish of peas on 26th; cereal crops all safely housed by the middle of the month; turnips looking well. The month on the whole has been dry and mild. H on 4th.

AUCHENDRANE.—Harvesting has been a difficult operation, and the late crops have been damaged, as the weather, even when not raining, has been calm, cloudy, and damp.

OTTER HOUSE.—A rainy month. Crops secured, but much damaged; potatoe disease prevalent, half of them being useless.

NOOKTON.—A fine month; stormy from 12th to 17th, and on 22nd and 26th.

DEANSTON.—Gale from W. on 2nd and 27th, with heavy R. Month generally damp, but good weather during daylight for some part of the month. Leaves fell rapidly towards the end of the month.

LOGIERAIT.—The commencement of the month very favourable, concluding the finest harvest weather experienced for many years. The first S of the season seen on the hill tops on the morning of the 3rd. Severe frost on the night of the 24th. Heavy R, with a severe gale, on the night of the 26th and morning of the 27th.

BALLATER.—Lunar rainbow on 14th; meteor at midnight on 23rd. The weather at the beginning of the month was very stormy, and an unexpected fall of an inch of S occurred on the 4th, but disappeared in the course of the day. Severe frost on the 6th. A remarkable improvement took place in the second week, the temp. on the 11th being 68°·5. The remainder of the month continued favourable for harvest, and by the end of the month the crops were secured in good condition.

ABERDEEN.—Auroræ on nine nights. Bar., temp., and R below the average; wind force rather above it. The first part of the month was very cold. T S with H on morning of 3rd; L on 18th. Bar. 28·885 on 27th.

ROSSE PARSONAGE, FORT WILLIAM.—S on Ben. Nevis on the 1st, on the lower hills on the following day, and again on 7th. A wet and boisterous month; it began with S on the hills and went on with wind and R to the end of the month, there being only three days on which R was *not* registered; the total fall was 11·83, as compared with 6·85 in 1866, and 2·80 in 1865. On Saturday the 26th, a fall of 2·57 was registered, by far the heaviest fall in 24 hours since observations have been taken here, it is said to have been the wettest day known here for 30 years; since the 15th of August only nine days have been without R.

PORTREE.—This month has been wet, stormy, and cold, and not (as usual) favourable for the Highlandman's harvest, on the contrary the greater part of the crops are still unsecured, but the weather being so cold there is no second growth in the stooks; the potatoes are not so plentiful as was at one time expected, they are small in size, not so rich as usual, and a good deal diseased. Fine lunar rainbow on the 11th; first fall of S on the 3rd, and frequent H ever since; heavy gale on 1st from W.

LOCHBROOM.—The farmers here have had a trying year—a bad spring, late harvest, and October with only six fine days. Very wild and stormy at the beginning and end of the month. T S on 31st.

SANDWICK.—October has been a cold and wet month, indeed the wettest on record except two; high wind on the first 3 and last 5 days; hills white with S on 8th and 28th; auroræ on four nights, but particularly brilliant on the 18th at 10 p.m. Gale 50 miles an hour on the 2nd. H on 2nd, 3rd, and 4th. Solar halo on 16th.

IRELAND.

KILLALOE.—The greatest rainfall in October in 22 years, the other heavy falls being 6·85 in 1846, 7·61 in 1862, and 6·22 in 1863.

MONKSTOWN.—Remarkable variations of temperature; from 3rd to 10th bitterly cold, milder to 22nd, which was very close and heavy; this was followed by heavy gales on 27th at 3 a.m., and 28th at 10 p.m.

DOO CASTLE.—An exceedingly wet rough month; low-lying lands much flooded; hay and oats not harvested before the beginning of the month now present a sad spectacle. The night of Saturday the 26th was tempestuous in the extreme, with showers of H, H also fell on 3rd.

OWENDOON.—More R has fallen than in any month since January, 1866. The 26th was very wet and squally.

WARINGSTOWN.—The whole month was showery, and very unfavourable to farming operations; there was scarce any evaporation, and the ground became so wet as entirely to put a stop to the preparing for and sowing of wheat. Heavy gale on the night of the 26th.

LATEST INTELLIGENCE.

Meteor Shower of November 14th.—We have only time to state, that from 2.30 to 8 a.m., the sky was so obscured by mist and cloud that even the moon was quite invisible at Camden Town.

CATOR'S LEVER ANEMOMETER.