From the Quarterly Journal of the Royal Meteorological Society, Vol. X, 1884, p 172.

On the Origin and Course of the Squall which capsized H.M.S. "Eurydice," March 24th, 1878.

By the Hon. Ralph Abercromby, F.R.Met.Soc.

[Read April 16th, 1884.]

The squall which capsized H.M.S. *Eurydice* caused one of the greatest disasters which has befallen our Navy for many years, but, strange to say, its meteorological characteristics have received very little attention. Except a short letter on the subject by the author in the columns of *Nature*, the only other notice was a very valuable memoir on the history of the squall by the Rev. W. Clement Ley, in *Symons's Meteorological Magazine* for April, 1878, and afterwards in the *Nautical Magazine*, Vol. XLVII. 5. The most striking result of his investigation is given in two maps, showing the areas covered by the rain and snow associated with the squall at 10 a.m. and 8 p.m. respectively. The latter map is reproduced by his permission in fig. 1. In both maps this area takes the shape of a truncated cone, the squall being apparently connected with the commencement of the rain. In the latter map, the cone is curved like a horn, or like a portion of a crescent.

Though the positions of the isobars at 8 a.m. were carefully and accurately described, and both the surface and upper aerial currents surrounding the squall were specially noted, the relation of the isobars to the rain area was not commented on.

The most important addition which the author of the present Paper has received to the materials which were then available, is derived from the international charts issued by the United States Government, which embrace the greater portion of the Northern hemisphere. He has also availed himself of the results of his own investigations on the nature of V-shaped depressions, which have been undertaken since then. His researches entirely bear out Mr. Ley's conclusions, and in fact this Paper may be considered rather in the light of an addition to the work of that gentleman.

It will be convenient to describe (1) the general condition of the meteorology of the northern hemisphere for the four days, March 21st to 25th, 1878; (2) the synoptic conditions of the complicated weather system on March 24th, to which the *Eurydice* squall belonged; and (3) the sequence of

weather observed at different stations during the day; and after that to endeavour to show the connection of the whole.

In all the charts for these days, the normal Atlantic anticyclone was found stretching far north till it nearly met another anticyclone lying over Greenland; and in each relatively low pressures were found over Northern Europe, and the Eastern States of the American Union.

On March 22nd each of these low areas contained a cyclone, one over Finland, giving Northerly winds and cloudy weather over Great Britain, the other about 800 miles west of Newfoundland. By next day, though the position of the Finland cyclone had hardly changed, its area had extended westwards, and the weather over our Islands became rather worse. Thus the barometer had fallen about 0·8 in. in some parts of England, but not owing to the passage of a cyclone.

On the other side of the Atlantic the Newfoundland cyclone had moved westwards—a very uncommon case.

By midday of the 24th the Finland cyclone had lost its definite shape, while another centre had formed over the Carpathians, and a complicated system of secondaries covered Western Europe.

It was in a squall associated with one of those secondaries that the *Eurydice* was capsized, as we shall presently explain in detail. Lastly, by next morning the two centres of the European cyclone had moved as if they were revolving round each other, or round a common centre, while the whole level of atmospheric pressure had risen, and the secondaries had much diminished in complexity. With these changes, and the rise of the barometer, the weather in Great Britain had much improved, but the wind retained its prevailing Northerly set. So far for the broad features of the weather, but it is necessary now to go into more detail for the day in question.

In fig. 2 we give a synoptic chart for 8 a.m. on March 24th, 1878. The centre of the Finland cyclone lies near Stockholm, and gradients for North or North-west winds are found over Great Britain. Influencing our Islands there seem to be portions of three secondaries with centres, one near Wick, another near Antwerp, and a third near Brest. The weather, owing to their action, is squally, with rain or snow in some parts, but blue sky in others.

By 0.48 p.m. (fig. 3) no definite centre is found for the primary cyclone, but the secondaries have much increased in intensity and complexity. The Wick secondary appears to have enlarged and moved a little south; the Brest one has rather contracted, but hardly changed its position; while the Antwerp one is probably represented by a secondary which was then near Paris.

But in addition to these, two new ones have formed over the South-east of England. The one which most concerns us is of the class known as V-shaped secondaries; its trough stretches from the Wash to the Severn, and is marked by a dotted line in fig. 3. It will be particularly noted that, on the whole, the wind, in front and near the trough, is more from the West than in rear, where it blows more from the North-west or North. Also that there are more symbols marked *s*, for snow, in its rear than in its front.

FIG. 2.

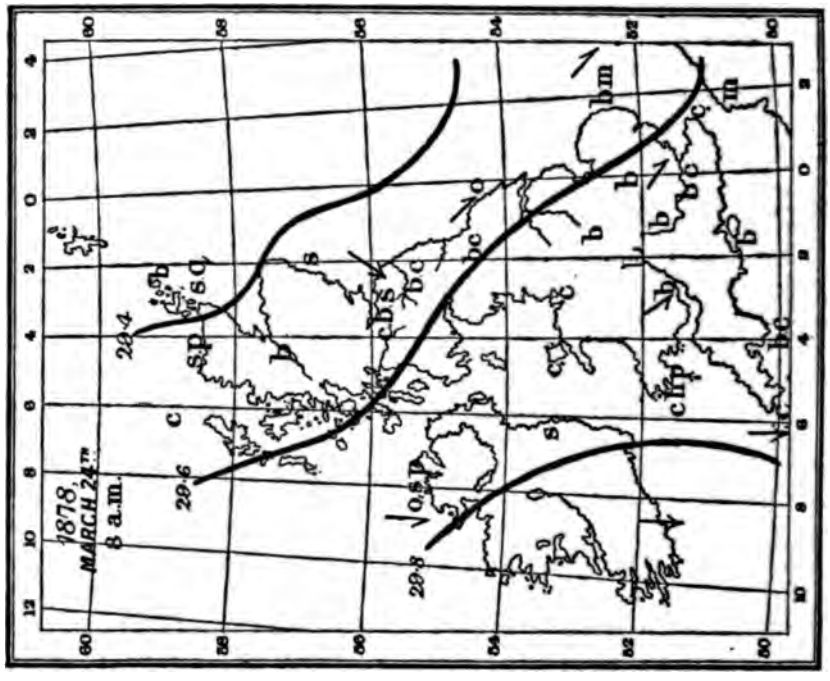
1878
MARCH 24TH
8 a.m.
29·4
29·6
29·8

FIG. 1.

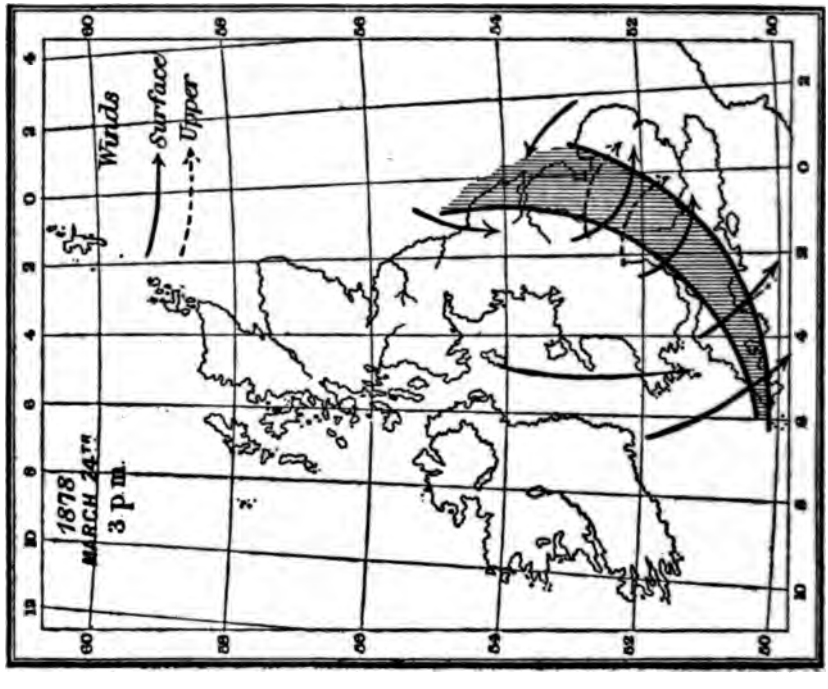
Winds
Surface
Upper
1878
MARCH 24TH
3 p.m.

Fig. 3.

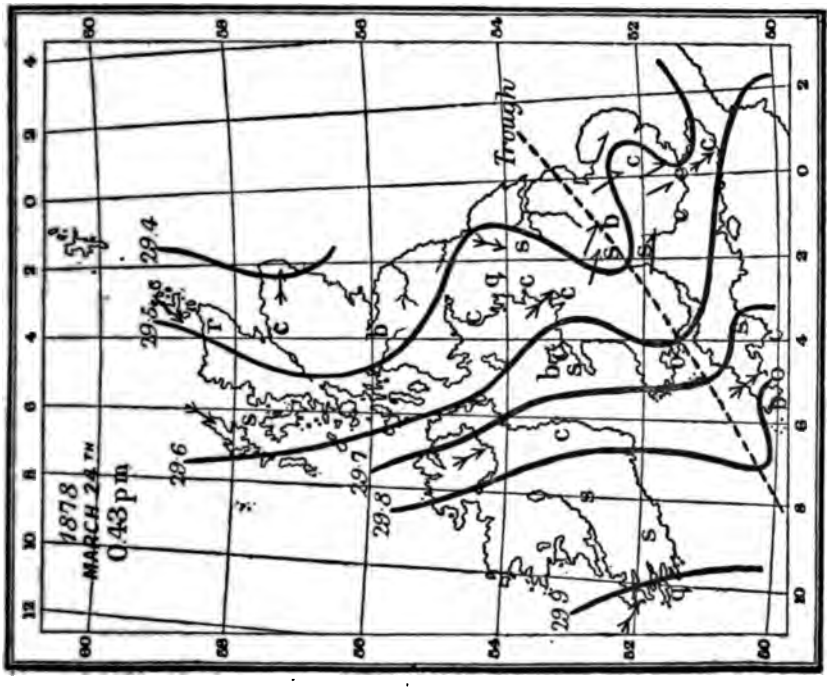
1878
MARCH 24TH
0.43 pm
Trough
29·4
29·6
29·7
29·8
29·9

Fig. 4.

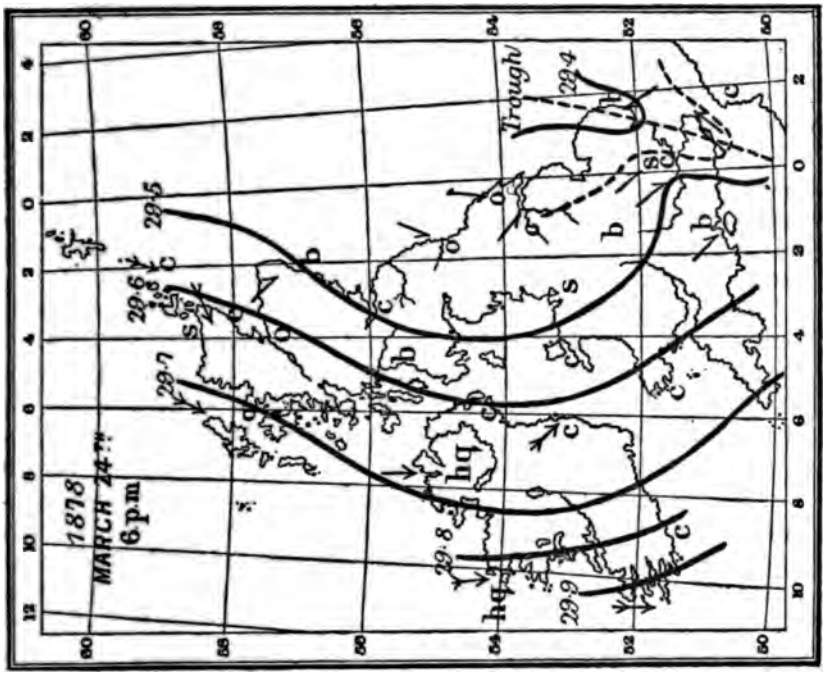
1878
MARCH 24TH
6 pm
Trough
29·4
29·5
29·6
29·7
29·8
29·9

Fig. 4 gives the isobars and weather for 6 p.m. on the same day, by which it appears that the Wick secondary had moved still further south, and that all the four secondaries found at 0.48 p.m. over the south of England and the north of France had coalesced into one larger V-depression, the trough of which now just skirts the south-east of England, and is marked by a dotted line in the diagram. The other dotted line is an interpolated isobar of 29·45 ins., which it was desirable to draw, so as to mark the very peculiar shape of the isobars. Confining our attention to this V only, it is seen that the wind is from South-east to South-south-east in front of the trough, with cloudy weather, and from North-west with snow in the rear of the trough.

Taken as a whole the trough of the V appears to have wheeled round a distant centre near the Scaw, so that while the portion between the Wash and Yarmouth has only progressed at the rate of about thirteen miles an hour, the portion which travelled from the Severn to Normandy moved at the rate of nearly forty-eight miles an hour, and the portion which swept over the Isle of Wight at the rate of thirty-eight miles an hour. The *Eurydice* was capsized in a squall off the Isle of Wight at 8.45 p.m., that is, at about the middle of the interval between the two last charts. We must therefore endeavour to explain how the changes in the isobars, as shown in these charts, affected the sequence of weather as observed in the Isle of Wight and elsewhere.

As V-depressions are scarcely yet recognised by meteorologists as a characteristic form of isobars, it may be desirable to call attention to their leading features. They are so called, because in them the isobars which enclose an area of low pressure run into a point like the letter V. A typical example of the commonest form in this country is given in fig. 5. As the V moves generally towards some point of east, a line drawn through all the localities where the barometer, having fallen to its lowest point, has just turned to rise, is called the trough of the V, and is marked by a dotted line in the figure. In most cases this line is curved, the convexity being towards the direction of its motion. The wind in front of the trough is nearly from the South, and a little incurved to the isobars, while in rear the wind comes from North or North-west, and is very slightly incurved. The shape of the rain area is like the double shaded portion of the diagram, and the rim of cloud—single shaded in the diagram—between it and the blue sky further in front of the V, is very narrow. The extreme rear or western edge of the rain area is usually very sharply defined by the line of the trough, and this line is also usually marked by a squall or heavy shower,

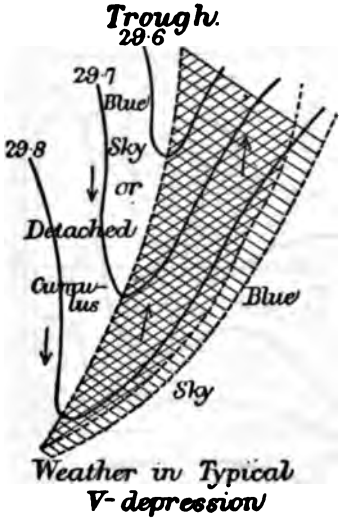

FIG. 5.

Immediately in the rear of the trough there is blue sky or cumulus clouds again.

The sequence of weather at any single station as a V-depression passes over will obviously be from blue sky through a very narrow belt of cloud to rain, with a nearly South wind and a falling barometer. Just as the barometer has reached its lowest point, a squall or heavy shower will be experienced, with a sudden shift of the wind to North-west, after which the sky will soon become blue again, as the barometer rises quickly. Thus viewed on a chart a somewhat crescent-shaped area of rain is seen sweeping across the country, coming on quietly but ending abruptly.

These Vs are usually formed along the southern prolongation of the trough of a cyclone, or in the "col" or furrow of low pressure which lies between two adjacent anticyclones. The most interesting circumstance concerning them is that they are entirely non-cyclonic, though in many respects they either resemble or differ from true cyclones.

In rare cases we find V-depressions which present a marked contrast to the normal type. In them the front of the V is characterised by cloudy weather only, or at least only slight rain with a falling barometer; the line of the trough is also marked by a line of squalls, after which rain falls pretty continuously for a short time with a rising barometer.

This class the author has only observed in connection with another secondary following close in the rear of the V, but they are so uncommon that he cannot generalise much upon them. In this case there is also seen on a synoptic chart a crescent shaped area of rain sweeping across the country, but the front of the area is bounded very approximately by the line of the trough, whereas in the former class the same line marked the termination of the rain. We can also picture to ourselves the idea of a line of squalls, in the case of the *Eurydice* more than 400 miles long, sweeping across the country at a rate varying from thirteen to nearly fifty miles an hour, and thus we can understand how London and Ventnor could be struck simultaneously. To this class belonged the V we are now discussing.

In case it may seem difficult to conceive two kinds of V-depressions with such opposite characters, the author ventures to make the following theoretical suggestion, for there are few observations on upper currents to guide us at present. Suppose that for whatever reason a South-west current meets a North-west one, it is quite reasonable to imagine that instead of both being deflected upwards, one tilts the other up, and remains horizontal itself.[1] In the common kind the South-west current would be deflected up, and the rain would precede the trough. In the rarer class, the North-west current would be tilted, and the rain would follow the trough.

With reference to the sequence of weather at different stations during March 24th, we quote from Mr. Ley's paper:—"A change of an important

[1] The Author believes that the idea of one current being tilted downwards was first suggested by Prof. E. D. Archibald, with reference to certain "North-Westers" in Bengal.

kind occurred in the snow storm during its transit. In the north of England, and as far as the Midlands, the snow began some time before the severe part of the squall. Thus at Stonyhurst the wind rose to fourteen miles an hour at 10 a.m. and reached thirty miles an hour at 11 a.m.; whereas in the metropolis, and in the south of England generally, strong gusts occurred with, or even before, the falling snow. In Leicestershire the wind rose slightly with the fall of the first snow flakes, but the actual squall, which I should estimate at force 7, did not occur till fifteen minutes later, and scarcely lasted twelve minutes. It is also noticed that in the north the wind continued to blow rather strongly at and after the end of the snow storm, *e.g.* at Stonyhurst it blew twenty miles per hour one hour after the sky had cleared; but in the south the wind, at the conclusion of the snow storm, subsided very quickly. This is clearly shown in the Beckley's Anemograph at Addiscombe, and Mr. Mawley remarks that 'at the same moment that it ceased snowing, the wind dropped even more suddenly than it had risen an hour and a half before.'

"As regards the direction of the wind on the Earth's surface at most if not all of the inland stations, the North-west wind which had prevailed at the earlier hours backed to a point South of West before the storm commenced, and veered suddenly northward (at most places to North-north-west and at a few temporarily to North-north-east) during the squall. At North Shields, which lay somewhat near the centre of the small secondary, at 9.30 a.m. the change of wind was from West-north-west to North. At Yarmouth, which experienced the centre of the small depression at 6 p.m., the wind changed at that hour from South-east to North-west. Snow is reported at this station to have fallen from daylight to dark. But at none of these stations on the east coast does the wind seem to have blown with much force, and nothing remarkable beyond the sudden veering seems to have been observed."

In London, the author's own observations were that the morning was cloudy with detached cumulus cloud. At 8.45 p.m. a squall which had obviously been brewing for some time burst with great violence, and lasted for about twenty minutes. It was followed by very threatening looking weather, during which the wind backed a little to West-north-west, having been North-west during the squall, but at 4.40 p.m. it shifted to North-north-east and became strong, with heavy snow, till 5.20, when the weather moderated.

The only barometric data available for our purpose is the copy of the Kew barogram, a portion of which is given in Mr. Ley's paper. From this it is seen that the barometer had been falling all day till 8.45 p.m., when it rose suddenly during the squall, as is usually the case, and then fell slowly to about its previous level, where it remained till 9 p.m., after which it rose steadily.

Mr. Ley gives in his paper the map of the area covered by the squall at 8 p.m. which has already been reproduced in fig. 1. He also gives a table of all the hours at which the snow storm began and ended at a number of places. From this table it appears that the storm had begun at so few places at 0.48 p.m. that it is impossible to draw a similar map for that hour. His

other map of the area covered by a snow storm at 8 a.m. shows that it then lay over a long patch of country, stretching across England from Berwickshire to the Mersey. The front of the area is sharply marked by a line drawn nearly from Shields to Liverpool. There is, however, no trace of this at 0.48 p.m.

H.M.S. *Eurydice* was a full rigged frigate, homeward bound from the West Indies. At 8.45 p.m. she was off Ventnor in the Isle of Wight, running free before a nearly Westerly wind, with all sails set; at that moment she was struck by a squall from the North-west. Before sail could be shortened she went on her beam ends, and the lee ports being open, she filled and foundered. So far for the actual observations, which must now be combined into a consecutive story.

First, as to the wind-changes. From the description just given, and an inspection of all the charts, there is no doubt that the squall was associated with a V-depression, and not with an ordinary secondary cyclone. Also, as all reports speak of the squall as occurring at the time the wind shifted suddenly, there is no question that the squall was of the kind associated with the trough of a V.

Then, as to the class of V, with regard to the position of the rain or snow area, the observations are not so easy to reconcile.

Mr. Ley's remark as to the snow preceding the squall as far south as the Midlands can only be explained either by the hypothesis that the V-depression actually changed its type during the day, or more probably that the apparent change was due to the complicated fusion of the V with some of the secondary cyclones, but there remains some uncertainty on this point.

The 8 a.m. chart (fig. 2) shows no sign of a V-depression, though it was then snowing at Shields and in the north-east of Ireland, owing to the complicated system of cyclones and secondaries then found over Great Britain.

By 0.48 p.m. the V-depression is already well pronounced, but there are no means of knowing to what circumstance the rain seen on Mr. Ley's map for 10 a.m. is due.

It will be observed that the front of the crescent-shaped rain-area in fig. 1 is more curved than the trough of the Vs in the synoptic charts. The map (fig. 1) of course only shows the land-area covered at 8 p.m. According to the table given in Mr. Ley's paper, the snow began at Falmouth at 2.45 p.m., so that the real front of the squall would have been out at sea. Allowing for this, the curvatures would nearly coincide; and considering that in some places a few flakes of snow may have fallen before the actual squall, and that with the high velocity of the western portion of the trough, a slight error of time would cause a large error in the position, the agreements between the two which have been obtained by totally different methods, may be considered fairly satisfactory.

The Kew barograph tracing, in so far as it shows that the squall really occurred at the trough or turn of the barometer, is very satisfactory, but it is not possible to give a complete explanation of all the curve. If there had been

no disturbing influence the natural barogram for the passage of a V-depression would obviously be a slight fall of the barometer till the trough passed, after which the mercury would begin to rise again. But in this case the situation is much more difficult to deal with, as the action of the primary Finland cyclone on the secondary V must be considered. The same remark applies to it as to the detail of weather in London, given above. After the twenty minutes the squall lasted a more complicated disturbance certainly set in, the details of which cannot be explained.

The results of this paper may be summarised as follows:—The squall which capsized H.M.S. *Eurydice* was one belonging to the class which is associated with the trough of V-shaped depressions.

The line of this trough was curved like a scimitar, the convexity facing the front. The whole revolved round a point near the Scaw, in Denmark, like the spoke of a wheel.

For this reason the portion of the squall over the East of England moved only at the rate of thirteen miles an hour; while the Western portion travelled nearly fifty miles in an hour. The portion which struck the *Eurydice* was advancing at the rate of thirty-eight miles an hour.

The length of the squall over England was more than 400 miles, but only one to three miles in breadth.

Hence we have the picture of a scimitar-shaped line of squalls, 400 miles long and about two miles broad, sweeping across Great Britain at a rate varying from thirteen to fifty miles an hour.

The V-depression was one of an uncommon class, in which the rain occurs after the passage of the trough, and not in front of it, as is usually the case.

The weather generally for the day in question was unusually complex, and of exceptional intensity, and for this reason some of the details of the changes cannot be explained.

DISCUSSION.

The Rev. W. CLEMENT LEY in a note to the Secretary said:—I have for many years been engaged in an investigation of the morphology of Squalls, the results of which I hope hereafter to lay before this Society. In connection with the present paper I wish now to point out that squalls of the same type as that which occurred in our Islands on March 24th, 1878, having a scimitar- or crescent-shape, are not uncommon in other parts of the world. I have called attention to this fact in a short article in *Nature*, Vol. XXVIII. p. 132. I would specially call attention to the charts of a squall on July 31st, 1877, contained in the *Special Bulletin of the Iowa Weather Service* for October 1877, and also in the *Notes on Cloud-forms and the Climate of Iowa*, by Dr. G. Hinrichs. The modifications undergone in the figure of the squall during its progress to the South-east are almost identical with those which characterised the Eurydice squall. Dr. Hinrichs remarks: "A storm peculiarly characteristic of our summers is the *squall*. It generally occurs after a continued spell of hot, rather sultry weather, the wind having blown steadily, but very moderately from the South or South-east—the barometer not changing much. In the North-west the storm-front will make its appearance; threatening, dark, towering clouds, or at times an immense roll-like cloud will approach; the air cools rapidly as the storm-front comes nearer, and with a high straight blow, bending young trees to the ground, and driving the rain almost level, the fierce storm passes over, while the barometer rises rapidly. Such a blow does not last long—but may be repeated with

gradually weakened force at intervals. A steady pouring rain generally follows, after which the sky clears, and the wind wheels back to the South-east, the weather being as hot as before the storm. These, often quite destructive storms, are not related to the so-called cyclones of modern meteorology, nor have they any thing in common with tornadoes. They are apparently due to the sudden descent of great masses of air from the upper regions, arriving at or near the ground with almost all the velocity peculiar to the high strata of the atmosphere."

The convexity of the front of these squalls frequently diminishes during their progress, as is shown in another of Dr. Hinrichs' charts for June 28th, 1881. I think that the increase and diminution of convexity are related to the increase and diminution of the general intensity of the weather, at the time, over the district traversed by the squall.

I further believe that squalls of this kind are invariably associated with depressions of the type described by Mr. Abercromby as "V-depressions," and that the "V-depressions" which produce this type of squall are usually shallow but of rapid movement, always forming the furrow of reduced pressure between moving adjacent anticyclones, but being further only secondaries of a larger cyclone (often itself very shallow), around the right-hand rear segment of which they revolve. I think it is going rather far to say with Dr. Hinrichs and Mr. Abercromby, that these V-shaped depressions are "entirely non-cyclonic." The fact pointed out by Mr. Abercromby in this paper, that the wind incurves in their front rather than in their rear (which I have long ago shown to be characteristic of European cyclones), coupled with the further fact, that the upper-currents, when affected by these depressions, back while the under-currents veer during their passage, seems to indicate that they are rather cyclonic than anticyclonic in character.

There appears to me to be no mystery about the V-depression, the formation of which seems an obvious result of antecedent conditions of pressure; but much mystery still hangs over the formation of crescent-shaped squalls.

Capt. TOYNBEE said that the sudden change of wind in connection with cyclonic systems is well known to sailors, so much so that when the barometer is falling fast and heavy rain has set in with a Southerly (South-easterly to South-westerly) wind in the northern hemisphere, a sudden change to West or North-west is expected. In the southern hemisphere the fast falling barometer and heavy rain occur with a Northerly (North-easterly to North-westerly) wind, and the sudden change is to West or South-west. In both cases the barometer generally rises quickly after the change. The data sent in for the daily charts of the North Atlantic now being prepared by the Meteorological Office prove this fact, as many captains have recorded the sudden wind-changes which they experienced. They generally occurred to the southward or south-eastward of the areas of lowest pressure, as shown by Mr. Marriott in his paper on the Storm of January 26th, 1884; his diagrams showing that a squall with lightning occurred in that position. It seems most probable that the heavy rain squall is caused by a collision between the warm damp air of the Southerly wind with the cold dry air of the Westerly or North-westerly wind. When revising his remarks Capt. Toynbee added:—May not the V-shaped depression be formed by a trough of low pressure which must exist between a North-westerly and a Southerly wind, when the North-westerly wind is advancing to the eastward and displacing the Southerly wind which is compelled to yield to it? There would of course be a perpetual squall of wind and rain accompanied by a sudden change of wind in this trough. The North Atlantic Charts already alluded to seem to indicate cases of this kind.

Prof. ARCHIBALD said there was little doubt that these V-shaped depressions were identical with what were known in India and elsewhere as North-westers. It had been noticed by Prof. Eliot and other meteorologists, that these storms invariably travelled in a direction contrary to that of the surface winds, and also that there was a marked fall of temperature and simultaneous rise of pressure at their centres. Prof. Eliot considered that this was due to the descent of a cold upper current in their central areas; and in alluding to this explanation in a recent article in *Nature* he (Prof. Archibald) had ventured to suggest that the upper current was probably tilted downwards by the sudden uprush of a mass of heated air travelling in the opposite direction.

Mr. WILFRID AIRY stated that he had acted as Secretary to the Wind Pressure Committee, and in the course of his investigations as to wind pressure he had collected together many observations respecting the *Eurydice* squall. He then read a statement of the pressure and direction of the wind during the passage of this squall at several places in Great Britain, and also exhibited a tracing of the record of the anemometer at Greenwich on that day, the change in the direction of the wind at the time of the squall, as shown by the trace, being extremely sudden. A very noticeable feature of the squall at almost all the places mentioned was the extreme suddenness with which it came on.

Dr. MARCET remarked that on the Lake of Geneva in the neighbourhood of that town, he had frequently observed sudden changes in the wind from South or South-west to West and North-west. The threatened westerly squall can be usually foretold from the presence of dark heavy clouds collecting over the Jura Mountain in the west; after a lull of the South-west Föhn, a line of dark and ominous looking cat's-paws from the western shore of the lake announce the impending puff. It seldom lasts longer than half-an-hour, although he had known this wind, which is called at Geneva the "Joran," last for three days in succession, blowing very hard the whole time. The "Joran" is dangerous to navigation on the lake, but from the state of the sky and general look of the weather, a careful navigator will always be warned in time to shorten sails.

Mr. WHIPPLE had a very clear recollection of the *Eurydice* squall, as he was out walking at the time of its occurrence, but he could not agree that it came on with extreme suddenness, for in fact he saw the approach of the snow, and had time to get nearly home before the squall reached him. If the *Eurydice* had been farther out at sea, instead of close to the land, no doubt the man on the look-out would have seen the squall approaching, and therefore, would have been able to give timely warning and possibly saved the ship. He thought that the term 'V-shaped depression' was not a convenient one, and suggested 'cusped' instead.

The CHAIRMAN (Mr. LAUGHTON) thought that the Fellows would be interested by the account of a remarkable squall, which was experienced by the *Talbot* frigate in the Mediterranean now forty-six years ago, and which seemed to have a certain resemblance to the squall under consideration. The *Talbot* was at the time commanded by Captain, afterwards Sir Henry Codrington, from whose letters, printed for private circulation, he would read the following:—"On Friday, 14th September, 1838, about 2.30 p.m., the *Talbot* got under way from Smyrna. At first we were bothered with light variable winds; but getting well over to the northward, near the low land and marshy banks on the right hand, we picked up a nice moderate breeze from the northward, and then, with the wind about abeam, were running merrily along with royals set, the water being as smooth as a mill-pond. We had been setting the foretopmast studding sail, and were in the act of giving the last pull to tack and halyards, when it freshened a little. 'Lower the royals,' &c. At this time I was on deck myself, with a steady old lieutenant passenger also abaft, besides the officer of the watch, who was carrying on the duty; and looking to windward, I saw nothing on the water (the day being perfectly fine and clear) that I would not have carried whole topsails and topgallant sails to over and over again, and should do tomorrow. Suddenly it freshened. 'Topmen aloft, take in royals—lower the top-gallant sails.' Then instantly came a gust aloft, to which the ship heeled over at once. I had barely time even to sing out 'Lower the topsails—let go the main sheet' (and there was no time to execute the order) when with one crash all was over, things having been summarily settled. At one instant, the ship with her topsails at the mast head, and top-gallant sails not yet down, nor royals in, bowed down with her masts all a-taunto. At the next moment she was bolt upright in a calm, with her jib boom, fore and main topmasts, and every mast and sail above them, lying in fine *negligé* over her larboard side, while the mizen-topmast was looking over after them to see what had become of its companions." [Then follows a detailed and technical account of the wreck and refitting the ship.] "I don't think I've said much about the squall coming on. Neither myself nor friend (the steady old lieutenant passenger), though looking out to windward, saw any wind coming: the ship heeled comparatively very little, the water just for a moment coming in at the maindeck ports. On deck we felt no wind worth mentioning: nothing about courses or spanker was strained; only one wine glass slipped on the ward-room table, and I never was

more surprised than on hearing the crash and seeing every thing gone over to leeward. The fact is all the wind was above the lower masts." It would be noticed that from the suddenness with which the squall came on, the *Talbot* was taken unprepared, and heeled over, so that the water came in at the main-deck ports. The same was the the case with the *Eurydice*. Between the two ships, however, there was this very important difference : the *Talbot* had the old hempen rigging, which parted under the severe strain ; the ship shortened sail for herself : the *Eurydice* had the new-fangled wire-rigging, which unfortunately held fast, and the ship went to the bottom.

Mr. ABERCROMBY could not agree with Mr. Ley that a V-depression was in any way cyclonic. The wind was always incurved to the isobars which bounded an area of low pressure, whether cyclonic or not. If the opposite to a cyclone was an anticyclone, the antithesis of a V-depression was a wedge. In true cyclones, that portion of the trough which lay to the south of the centre was usually associated with a line of squalls, which has some points of resemblance, and others of contrast, with the squalls of a V-depression. In a cyclone, the wind has generally veered gradually from South-east or South to South-west before the sudden jump to West occurred. Besides this, there is the fundamental difference that cyclonic isobars are circular ; while those of V-depressions are angular. He believed that V-squalls were analogous to the "Nor-westers." of Bengal ; also to certain squalls on the Lake of Geneva, described by Dr. Marcet ; and to others in Iowa, referred to by Mr. Ley. The term V-depression is certainly a little awkward, but he did not think the word 'cusped' was more suitable. He had made it a fundamental rule in all his researches to classify isobars by their shape, and then group certain phenomena of wind and weather round these forms. He selected the word V-depression as exactly defining this shape of isobars. The great advantage of this method is that it avoids any theoretical considerations. The squall described by Mr. Laughton was not one of the line squalls which belong to a trough. It was, however, very interesting, as it showed how a ship could have her topmasts sent overboard, while little wind reached the main deck.