XXII.—*On the Cyclones of Tasmania and the surrounding Seas in July and August,* 1852. *By* THOMAS DOBSON, B.A. [*Read 9th February,* 1853.]

THE general nature of the gales that prevail on the South Coast of Australia, Bass's Straits, and on the Coasts of Van Diemen's Land was correctly described by Flinders forty years ago. This description is the more valuable and trustworthy, inasmuch as Flinders was ignorant of the modern theory of rotatory storms. It occurs at pp. 244-5 of vol. i. of the "Voyage to Terra Australis," published in 1814. He says:—

"The progress of the gales is usually this: the barometer falls to 29·50, or lower; and the wind rises from the Northwestward, with thick weather, and commonly with rain. It veers gradually to the West, increasing in strength, and the weather begins to clear up so soon as it has got to the Southward of that point. At South West the gale blows hardest, and the barometer rises, and by the time the wind gets to South, or S.S.E., it becomes moderate, the weather is fine, and the barometer above 30 inches.

"Sometimes the wind may return back to West, or something Northward, with a fall in the mercury, and diminish in strength, or die away; but the gale is not over, although a cessation of a day or two may take place.

"In some cases the wind flies round suddenly from North West to South West, and the rainy, thick weather then continues a longer time.

"Such is the usual course of the gales along the South Coast, and in Bass's Straits; but on the East side of the

Straits, the winds partake of the nature of those on the East coast, where the gale often blows hardest between South and South East, and is accompanied with thick weather, and frequently with heavy rain."

Mr. Piddington, in the "Sailor's Horn Book of Storms," has thrown out the very probable suggestion that these gales are the Northern portions of Cyclones, which have an Easterly progressive motion. So long as this remains a mere suggestion, few would have the temerity to *act* upon it, in cases where life and property were involved. To justify a practical application of the suggestion, a demonstration of its correctness is necessary. In the following investigation of the Storms of July and August, 1852, I have been fortunate in obtaining accurate data from the log of H.M.S. *Fantome*, the Journal of Captain Major, of the ship *Duke of Lancaster*, of Liverpool; the log of the Packet Brig *Emma*, and the meteorological observations at the Magnetic Observatory, Hobart Town. The meteorological observations at Sydney, published in the "Sydney Morning Herald," are as complete and correct as could be desired. The barometrical observations at Melbourne, published in the "Argus" newspaper, are taken at midnight, and therefore only once in twenty-four hours; the barometrical curve for Melbourne consequently has not the same pretensions to accuracy as those for Sydney, Hobart Town, and the *Fantome* which are formed from three, or more, daily observations. (Fig. IX.) *

On the 28th July, the *Duke of Lancaster*, from London to Hobart Town, was in 43° 48′ S., and 121° 20′ E., that is, about due West of Van Diemen's Land, and South of King George's Sound:—

* See "Australian Cyclonology."

"From 9 P.M. of the 26th to 9 A.M. of the 27th, there was a calm. At noon, the wind was W.N.W.; P.M., an increasing breeze from W.; midnight strong increasing gales, W.S.W.

"28th.—3 A.M., strong S.W. gale and high sea. Noon, S.W. gales, squalls, and hail; P.M., strong increasing S.W. gale, squalls, and a high rising sea; midnight, hard S.W. gales and frequent squalls.

"29th—6 A.M., squalls terrific; hail and thick snow showers. 10 A.M., more moderate, sea dreadfuly high; noon, 42° 40′ S., 127° 11′ E.; strong S.W. gales, frequent violent squalls, very heavy sea from S.W.

"30th.—More moderate."

The barometer fell from 30·33 to 29·42, from the 27th to the 29th, and then rose gradually. The centre of this Cyclone passes the meridian (120° E.) of the ship early on the 28th, and the vessel sails in the N.W. quadrant until it leaves her in 130° E., on the 30th. About the same time that the *Duke of Lancaster* is dropping behind the N.W. margin in 130° E., the central area is passing over Van Diemen's Land in 147° E. The following is an abstract of a memorandum from the journal of the master of the brig *William*, which left Sydney on the 14th July for Launceston:—

"On the morning of the 28th got the wind strong from the westward, and crossed the Straits, under all sail, hoping to get in before sun-down. At 5 A.M. the light-house in sight, bearing S.W., distant 10 miles; the weather looked very threatening to the N.W. At 8 P.M. tacked in shore, and made another attempt to fetch the Heads, (George Town); but finding that impossible, and the gale having fairly set in, thought it prudent to keep what offing I had. At 10 P.M., wore off shore. Up to midnight carried all

possible sail, hoping to be able to hang to windward till daylight; but at midnight the gale had increased to such a fearful extent, that I was obliged to bring the brig under close-reefed topsails, after the main-trysail gaff had been carried away. During the whole of Thursday, (29th), the gale raged with unabated fury; but the barometer being stationary at 28·95, I hoped I had the weight of the gale at sun-down, although the weather looked, if anything, even worse. At 8 P.M. the barometer again falling, and at 9 P.M. barometer 28·80. It was at this time blowing harder than I ever remember before, and a terrific sea was running. At 10 P.M. our decks were filled with lightning, and immediately after a peal of thunder burst close on our weather bow. We had then a calm for about a minute, which I well knew would be followed by something awful, and we were immediately struck by a squall, which drove the brig's lee rail under. About 4 A.M. of the 30th the weather moderated a little, and continued so till noon, when it again assumed a threatening appearance, and finding myself as far to the eastward as Cape Portland, (148° E.), I bore up for Swan Island, and anchored there at 2 P.M. Just when bearing up, we were struck by one of the furious westerly squalls, and snapped the starboard bower cable. The second anchor brought the ship up with 90 fathoms of cable. I remained here till Tuesday, the 3rd August, when the wind came away at S.E., then weighed, and came through the Straits, and arrived at Launceston at day-break on the 4th, twenty-one days from Sydney, and through the severest gales I have ever experienced on the coast."

The deck filled with lightning, the single peal of thunder, the calm, the minimum-barometric depression, and furious westerly squalls, are so many well-known marks of the passage of the northern margin of the central portion of the

Cyclone. The extreme cold, which is characteristic of the central space, extended over the whole of Van Diemen's Land. During the whole of the 30th, and the forenoon of the 31st, there were continuous heavy snow squalls. Eight years had passed since the last snow storm in Hobart Town. The hills in the neighbourhood were covered with snow; and at Oatlands, Jericho, &c., the snow was two or three feet deep. The thermometer at the Observatory was 37° at 6 A.M., 37° at 2 P.M., and 36° at 10 P.M. of the 30th.

The newspapers furnish the following corroborative notices:—

"The *Charles Carter* left Hobart Town for Sydney on the 28th July. On the 30th she fell in with heavy gales from N.N.W. to S.W., which continued for four days."

"At 2 A.M. of the 1st August, the brig *Mary*, of London, was lost on Kent's Group, Bass's Straits."

"On the 31st July, the schooner *Spy*, of Hobart Town, was on shore at Kent's Group."

"The barque *Gratitude*, of London, from Sydney the 26th July, was compelled to return to port on the 31st, the weather being most terrific."

"The schooner *Gem* left Launceston on the 26th July, and whilst trying to beat into Waterloo Bay on the evening of the 30th, had nearly the whole of her canvas blown away, and was compelled to bear up for Twofold Bay to refit."

H.M.S. *Fantome* was then lying at the Auckland Islands, in 166° E., *i.e.*, about 18° to the E. of Cape Portland. The barometer on board falls rapidly on the 30th, and reaches its lowest point early on the 31st. During this interval the direction and force of the winds are:—

July 30.—N.N.E. 4; N. by E. 5; N.N.E. 6. 7.

July 31.—A.M., N.N.E. 6, 8, 9, 6.

showing the passage of the South Eastern quadrant. From

the 31st July to the 3rd August the mercury is low, and oscillates within moderate limits, and the wind is variable and moderate (4, 5, 2). On the 4th August the South Western quadrant approaches, and continues its passage until the 7th, the wind being steady at E. and then at S.E. On the 3rd there is a calm, and on the following days the force of the S.E. wind is 3, 4, and 5.

At Sydney, on the 30th, the changes of wind were N.W., W.N.W., W., W. by S., and W.S.W., indicating the transit to the eastward of the extreme northern margin. That the track of the centre lay between the parallels of Van Diemen's Land and the Auckland Islands is shown by the order of veering of the wind at each of these places. Consequently, a shorter chord of the Cyclone passed over Melbourne and Sydney than over Hobart Town. This accounts for the *great breadth* of the barometric depression at Hobart Town, indicating that the mercury began to fall sooner there, and was longer in rising, than at the more northern stations. The *eastward progress* of the Cyclone is likewise demonstrated by the comparison of the several barometric curves, (fig. IX.)*; for the minimum depression, which occurs almost simultaneously at Melbourne and Hobart Town, happens early next day at Sydney, (4° to the Eastward) and at least two days later at the Auckland Islands, (18° to the eastward.) Since the Northern Margin extended to Sydney, and the Southern to the Auckland Islands, the diameter of the whole Cyclone was not less than 1000 miles.

Assuming the centre to have passed the *Duke of Lancaster* in 120° E. early on the 28th, the meridian of Van Diemen's Land early on the 30th, and that of the Auckland

* See "Australian Cyclonology."

Islands on the 1st August, it would have traversed 45° in five days, or 9° a-day; that is, 9 × 42 miles in 24 hours, which gives a mean velocity of progression of about fifteen miles an hour.

Now, from noon of the 28th to noon of the 29th, the *Duke of Lancaster* sailed to the eastward at about 11 miles an hour; and I have shown that the Cyclone overtook and passed her; therefore the velocity of fifteen miles an hour is probably not far from the actual rate.

This Cyclone was followed in a few days by another, of which the central track seems to have been considerably to the Northward of that of the first. A correspondent of the "Adelaide Observer" states that on Saturday, the 7th of August, there was a most fearful flood at Clare, (north of Adelaide), and no arrival of mails from the South, because of the floods at the intervening parts. In Clare the rains commenced on the night of Thursday the 5th, and continued till 5 P.M. on Saturday, when it poured down in torrents for ten hours. All the houses were flooded, one man was drowned, and a settler had 1700 sheep drowned in the River Bremer. (Adelaide 35° S. 138° E.)

At Portland (141° 38° E.) on Friday night, (6th August), there was one of such fearful gales from the South East, that the oldest inhabitant had not known the like before. The *Margaret and Agnes* went on shore, and was wrecked.

At Circular Head (145° 20° E.) a most severe gale was experienced on Saturday night (7th), and continued with unabated violence up to Sunday morning. The oldest inhabitants do not recollect ever witnessing such a gale and sea before, and with the highest tide. The schooner *Toroa* struck, and was driven up by the sea to a considerable distance. The schooner *Antares*, which had sailed from Launceston, put back from contrary winds, East. The gale

commenced with the barometer at 30·30, and the mercury fell to 29·30.

At Sydney the barometer begins to fall on the 6th, and continues low until the 15th. The corresponding meteorological remarks describe the passage of the N.E. half of the Cyclone:—

"Friday, 6th August.—6 A.M. rather heavy rains.

"8 A.M., wind in squalls from S. by E., then light, veering to E. Atmosphere raw and chill, and heavily charged with nimbus. P.M., became very coarse and squally from E. and N. of E., with driving showers. Towards evening grew more and more boisterous from N.E., and continued to blow with increasing violence throughout the night. Strong gales and squalls, veering to almost due N. at times, and latter part sometimes W. of N., with driving rain occasionally. Night altogether dark and dismal.

Saturday, 7th.—At daybreak, gusts quite furious from N.E. by N. with hard rain, and increased after 7 A.M. to still more violent gales from the same quarter. Between 1 and 2 P.M., gales from almost due N.; after 2, veered to N.W. by N., with severe squalls and rain. After 3 P.M. the tempest abated, clouds began to open and show patches of blue sky; and, after some very heavy showers, the whole sky became most rapidly clear on all sides, and the wind fell as rapidly to moderate breezes. Evening and night, light N.W. wind, and clear sky."

During the 8th, 9th, and 10th, the winds are moderate from N.W.; the *sky clear*, and the atmosphere *cold and wintry*.

On the 11th, a dark, dusky gloom all round; grew thicker during the forenoon. At 1 P.M. the N.W. wind arose, blew strong during the afternoon and night, and then shifted to about W. by N. A heavy swell on the sea still.

" 12th.—Wind rapidly rose to strong gales from W. by N. before 10 A.M., and subsequently kept increasing in force, and blew with extreme violence till about 4 P.M. Brisk gales all night.

" 13th.—Atmosphere dry and clear; no clouds. Strong westerly gales. Noon, wind a little S. of W., and rose to heavy gales before sunset; after that tacked to N. of W., and increased to most violent gales by 8 P.M., and continued to rage till 4 A.M. of the 14th. Between 9 and 11 P.M. of the 13th, there were some most furious gusts, and large stunted bushes and trees, which had withstood many heavy storms, fell a sacrifice to these, and were shivered or blown clean away by the roots.

" 14th.—Before 8 A.M. gales had again set in strong from W. by N., and blew with increasing violence all day, rising to heavy gales before noon. Atmosphere keen, and remarkably dry and clear. Gales continued with great violence till past midnight.

" 15th.—Moderately fresh breezes all day; clear fine weather, very sharp and dry. Wind W. by S. and W.S.W.

" 16th—Cold frosty air, wind W. by S.; S. by W.; S., and S. W. Evening, light wind and clear sky."

A correspondent of the " Sydney Morning Herald " writes from Goulburn on the 16th August:—" In the course of last week we had all the rigour of a northern winter, in a blustering cold piercing wind, with frequent showers of rain, hail, and snow. Snow fell to a considerable depth on Saturday evening. On Sunday we had a keen frost, which prevented the white covering of the earth from disappearing; in some places it remained till the following day, (Monday, 9th.) The rain which fell in the early part of last week caused the Woollondilly and Mulwarre rivers to rise to such a degree as to prevent communication at the ordinary crossing places for several days, &c.

The Launceston papers contain long accounts of the disastrous floods of the South Esk, at Longford, on the 9th, and at Perth and Launceston on the 10th August. The stone bridges at Entally and Perth were destroyed, the coaches stopped, and the Royal Mail Coach washed down the river at Ross. Meanwhile, very little rain fell around Hobart Town.

The central area, which is accompanied by extreme cold, heavy rains, snow and hail showers, appears to have swept over Victoria, Bass's Straits, and the northern portion of Van Diemen's Land; and this conclusion is confirmed by numerous notices of the weather at sea.

" On the 4th August, the *Duke of Lancaster* sighted the S.W. Cape of Van Diemen's Land, distant 15 leagues N.E., having light variable airs and calms until Friday, the 6th, when, at noon, the wind was E.N.E.

7th.—Wind moderate, N.N.E. 7 P.M., strong increasing breeze. 9 P.M., violent squalls off the land. Midnight, barometer falling rapidly. 7 A.M., hard gales and squalls. The Mewstone W.N.W. 7 leagues.

" 8th.—Sunday, hard gales, E.N.E., violent squalls and a heavy sea. 11 A.M., found the main piece of the rudder sprung. Noon, a furious gale and sea.

" 9th.—Furious E. gale, violent squalls and rain. 4 A.M., hove-to. Noon somewhat abated.

" 10th.—Strong increasing gales, E.N.E. 10 A.M., nearly calm, swell heavy. Noon, light northerly airs, and clear.

" 11th.—Calm, a heavy swell from E.

" 12th.—Wind N. light, swell from E. 3 A.M., wind E.N.E. 9 A.M., wind S. and S.W. Noon, strong S.W. gales, thick, dirty, and rainy. A furious *cross-swell* from E., ship pitching, *forecastle under*.

" 13th.—6 P.M., a severe S.W. gale, with furious squalls

and rain. Midnight, moderated and hauled to the W.N.W. Noon, light and variable.

" 14th.—Variable—anchored in Storm Bay, below the Iron Pot Light-house. 1 A.M. suddenly a hard gale, furious squalls and snow. Ship began to drift. Squalls furious, with thick snow showers. 2h. 30m. A.M., anchored in harbour of Hobart Town."

The barometrical curve of the observations on board the *Duke of Lancaster* does not differ materially from that at Hobart Town.

The *Emma* left Hobart Town for Sydney on the 4th August :—

" On the 6th, at 5 P.M., land was seen west of Cape Howe, wind E., inclining to E.N.E., the sea rising. Split the main-trysail. Midnight, gale increasing.

" Saturday 7th.—Wind steady at N.E. by E. 4 A.M. blowing very hard, hove-to. Noon, gale increased to a complete drift, with a sea running mountains high. 4 P.M., mizzling rain. 7 P.M., rain fell very heavy, when a sudden gust of wind nearly tore the masts out, and immediately after it fell a " clock calm." The main-boom, secured with three tackles and a strong guy, tore all adrift, &c. A light N.E. wind and a heavy sea running.

" Sunday 8th.—Light N.E.

" 9th.—Light W. throughout. Cape Howe N.E. Heavy swell from East.

" 10th.—Light, veering from W. to S. Midnight, rounded Cape Howe.

" 11th.—Off the Dromedary, strong N.N.W. gale, sea running heavy.

" 12th.—Veering to W. and W.N.W.

" 13th.—Off Wollogong, W.S.W. blowing a complete drift, hove-to. 2 P.M., moderating. 7 P.M., entered Sydney

Heads. 8 P.M., blowing a drift of wind from W. Both anchors down off Shark Island.

" 14th,—Midnight, blowing fresh; the second officer fell overboard out of the boat, and was drowned."

The ship *Falcon*, 1106 tons, left Melbourne on the 5th and arrived at Sydney on the 18th August. On leaving she was three days with a strong drift from E. (6th, 7th, and 8th); and on the 9th was to the W. of Cape Otway (143° 30′ E.), sea still very heavy. Light westerly winds through the Straits, when it again began to blow from the eastward, veering round to N.W. On the 15th carried away her fore-topsail and foresail, and split her mainsail. The wind set westerly, and continued so until the evening of the 17th.

The *Duke of Cornwall*, which was in the same gales as the *Falcon*, was for several days under close-reefed main-topsail, and was driven as far as 154½° E.

The *Clarence*, steamer, was compelled to return to Sydney by the heavy gales on Saturday, the 7th August. The gale was principally from the E.N.E., and shifting thence to the N.W.

The *Hawkesbury Lass*, Captain Liddle, left Twofold Bay on the 7th August with an easterly gale. Sighted the Sisters on the evening of the 10th, when it became calm, with a very heavy sea from E. At daylight had drifted to leeward of the Sisters, blowing a strong gale from N.W. At 2 P.M. wind shifted suddenly to S.W., blowing very hard with heavy rain until 10 P.M., when the wind shifted round to N.W. Ship drove on shore on Babel Island, where the captain and crew subsisted on penguins for 14 days, until taken off by the schooner *Free Trader*.

The *Robert Syers*, from Melbourne to Sydney, when off Twofold Bay on Friday the 6th, was hove-to until Sunday

evening, the wind veering N.N.W. to S.W. during that time.

The *Miranda,* of Hobart Town, was wrecked on Rabbit Island.

The *Victoria Packet* left Melbourne on the 5th August, with about seventy passengers, and 200 sheep. On Monday the wind blew "great guns," and the sails were torn to pieces. All but 25 of the sheep were washed overboard. During the gale a passenger jumped overboard, and was drowned. When the vessel got outside of the Heads, early on the morning of the 6th, she had strong easterly winds, which continued increasing until 9 P.M., when it blew a heavy gale from eastward, with heavy rain and very thick weather. About midnight, they rounded-to, vessel's head N.E., and directly after that the main-topsail and foretop staysail were blown away. The screw-steamer, the *City of Melbourne,* was in company all day until 8 P.M., when it came on thick, and she was last seen on the port tack looking up for the Tamar. The *Victoria Packet* had very severe weather until daybreak, lying-to all night, head N.E. At daybreak they discovered the south end of King's Island close under their lee. The crew immediately wore ship, but could not weather the land on that tack, running into the breakers, and just clearing the eastern end of the Island. After getting the vessel on the port tack, they made sail, but it was all blown away, except the lee luff of the foresail, which brought her out. The gale continued until 11 A.M. on Saturday, when it lulled.

The steamer, *City of Melbourne,* was beached, about the middle of the East Coast of King's Island (39° 47′ S.), at 4½ P.M. of the 7th August. By the admirable coolness and skill with which this difficult manœuvre was successfully

accomplished, under most trying circumstances, the lives of the 250 persons on board were all saved. When the Emigrant Ship *Cataraqui* was wrecked on King's Island, in 1845, only 9 lives were saved out of 423! The following is the statement of Captain Saunders, of the *City of Melbourne*, steamer:—

"August 6th.—8 A.M., left Port Phillip Heads, wind N.E. All possible sail set. 10 A.M., fresh breezes—in foretop-gallant sail, outer jib and mizen. Noon, wind increasing, close-reefed the foretopsail, stowed the jib, and in two reefs of mainsail. 8 P.M., strong gale from E.N.E. with a heavy sea. Midnight, blowing very hard, with much rain. Close-reefed the mainsail, stowed the foresail and foretopsail.

"7th.—2. A.M., gale still increasing. 4 A.M. shipped a heavy sea. Carried away the weather main gangway, a great quantity of water went down into the engine-room and into the cuddy. 5 A.M. wind East. At daylight repaired the gangway, and wore ship to the North; took in the fore-trysail, which had split. Set the mainsail, close-reefed. Gale still increasing from East, sea running very high. 10 A.M., wore ship to S.S.E., the gangway having broken in, again filled the deck with water, a great quantity going down below. At 1h. 30m. P.M. saw breakers on the lee bow, supposed to be Sea Elephant Rocks. Wore ship to the North, set fore-trysail and square foresail, to claw off the land. The gale at this time was awful. Obliged to call up about 60 of the passengers from below to get the fore-tack aboard. At 4 P.M. saw breakers a-head, and the land about two points on the lee-bow. The weather was so thick that it was impossible to see half a mile from the ship. Finding that the vessel could not clear the land on either tack, for she was not more than half a mile from the breakers, and night setting in fast upon us, I determined, after consulting with

the passengers, that the only way to save life and property would be to run the vessel on shore while it was daylight.

"I then went up to the mast-head to look out for the best place to beach the vessel. At 4h. 30m. P.M. the helm was put up, and the passengers called up from below. In ten minutes the vessel struck the ground, and carried away the rudder and false keel. At the same time a tremendous sea broke over the poop, carrying all before it on to the main deck. The next sea took the vessel inside of the reef, about 50 yards from high-watermark, where she now lies, with her head to the North, on a rocky bed covered with loose stones."

In a published letter of one of the passengers, written on the 8th August, at King's Island, it is stated that "the Captain ran the vessel ashore over a tremendous reef in the most seaman-like manner. She grounded firmly upright, about 200 yards from the shore. All the passengers are saved, 250 souls, but we have only three days' provisions, &c."

The mate of the steamer arrived in a boat on the 12th at Circular Head, whence provisions, &c., were sent. All the people, including several very fortunate gold-diggers, were got off the island; and the steamer itself was recovered about four months after. A testimonial was afterwards presented to Captain Saunders by the passengers expressive of their gratitude for, and admiration of, that calmness and presence of mind by which he was instrumental in preserving the lives of all on board.

The North Eastern quadrant of the Cyclone appears to have passed between Moreton Bay and Sydney. On the 13th August, the *Thomas Lord* left Moreton Island in company with the *Zone*. She had heavy S.W. gales from the 13th up to the evening of the 19th. The *Zone* had

strong S.W. gales for three days after passing Smoky Cape, and a strong set to the N.E.

The *Fantôme* sailed from the Auckland Islands on the 8th, and arrived at Hobart Town on the 13th August. The direction and force of the wind show that she sailed into the S.E. quadrant of the Cyclone. These are :—

On the 7th....S.E. (3) ; E. (1) ; N.E. (2).
„ 8th....N.E. (2, 5, 6, 7).
„ 9th....N.E. (8) ; E. by N. (7) ; E. (7).
„ 10th...E. (7) ; N.N.E. (6) ; N.W. (3) ; N. (1) , W. (3) variable.

The barometric curves show that the mercury began to fall on the 6th at Melbourne, Hobart Town, and Sydney, but not until the 8th at the Auckland Islands; demonstrating the easterly progressive motion of the Cyclone. In the diagram VIII.,* the figures 28, 29, and 1 are the positions of the *Duke of Lancaster* on the 28th and 29th July and 1st of August respectively. The lower Cyclone (a) is in the position assigned to the 30th July, when the weather was moderating at 29, where there had been " hard S.W. gales, terrific squalls, hail, and thick snow showers" on the preceding day. In the Straits, the brig *William* had furious westerly gales, a terrific sea, lightning, &c., on the 29th and 30th; and at the Auckland Islands the *Fantôme* had the wind from N.N.E. on the 30th and 31st July, and afterwards from E. and S.E.

The second, or upper, Cyclone (b), is in the position assigned to the 6th and 7th August, causing a South East gale at Portland, an East gale in the Straits, and N. and N.E. gales off the coasts of New South Wales. The *Duke of Lancaster,* off the S.W. Cape of Van Diemen's Land, has had E.N.E. gales, and the *Fantôme,* on the 7th, has

* See Dobson's " Australasian Cyclonology."

the wind increasing in force from 1 to 5, 6, 7, 8 on the 9th, and veering from E. to N.E. By supposing the upper Cyclone to have moved a little towards the E.S.E., it will be easy to trace the origin of the strong S.W. gales encountered by the *Zone* and *Thomas Lord* to the North of Sydney, after the 13th August.

The reading of the barometer at Melbourne at midnight of the 8th August is 27·38, showing a fall of two inches in the preceding 24 hours, and there is a rise of two inches during the following day. If this is not an error of the press, 27 being printed for 29, such a great and sudden fall and rise would indicate that the very centre itself passed over Melbourne, which seems probable from other considerations.

The supposition of the passage of two successive Cyclones in the tracks which have been assigned to them will be found to explain all the meteorological phenomena that have been here recorded. No false theory could bear the application of such a host of independent tests without betraying discrepancies or contradictions.

Each of the Cyclones just investigated may be regarded as the type of a class to which Bass's Straits are obnoxious. The first producing the well-known gales described by Flinders 40 years ago, which changed from N.W. to S. and S.W.; and the second those which change from N.E. to E. and S.E.

It is gratifying to be able to confirm, by such good and conclusive evidence, the suggestion hazarded by Mr. Piddington, one of the best writers on Cyclonology, and certainly the best teacher of the practical application of the art.

[*Supplementary, published in* "DOBSON'S" *Australasian Cyclonology.*]

HAVING now established a general rule for the motion of the Gales on the South Coast of Australia, we are enabled to interpret and explain the nature of isolated cases like the following, given by Sir James Ross in his account of the Exploring Expedition, carried on in the *Erebus* and *Terror* :—

" 1840, August 12.—Noon, S.W. Cape of Van Diemen's Land, bearing N.E. by N., distant 9 or 10 leagues. The wind increased so suddenly and violently that we could hardly take in our sails quickly enough, and in a few minutes were reduced to close-reefed mainsail. At 8 P.M., when blowing a perfect hurricane, the lee main-topsail sheet gave way, and in one instant the sail was rent into numberless ribbons, and soon entirely disappeared. The only sail then left on the ship, a new mainsail, was soon afterwards blown away. No canvas could stand against such a storm. At 10 P.M. barometer 28·16, and although it then began to rise, we could not perceive the slightest abatement of the hurricane until after midnight, when it gradually moderated, and at the same time shifted from North to West. It continued to blow a storm of ordinary violence, with only occasional furious squalls, throughout the 13th, 14th, and 15th, when, having been driven a great distance to the southward, we again stood in shore; we saw the land of Tasmania at 3 A.M., and anchored in Storm Bay at 11 P.M.

This Cyclone was moving to the S. of E. At Circular Head (7), at the Hampshire Hills (8), and at Hobart Town (9), the wind shifts from N. to W., and then to S.W. On referring to the barometric curves for each of these places,

it will be seen that the depression increases at the Southern Stations, and was greatest at the ship, which lay farthest to the South. This fact, and the veering of the wind, show that the centre lay to the South of Van Diemen's Land. (Fig. X., A, 7, 8, 9.) *

The following two instances of Easterly progression in a high latitude occur at pages 167 and 181, vol. 1 respectively, of the same work.

" 1840, Dec. 25.—A strong gale, constant snow and rain as usual, attended the northerly gale. Hove-to. Noon, 62° 10′ S., 170° 24′ E.

" 26th.—Wind veered to westward, hove-to until 2 P.M. Stood to southward.

" 27th.—A strong south westerly gale, clear weather, and violent squalls, with snow-showers. Early next morning the gale moderated."

The centre of this Cyclone lay to the south of the ship; in the next case, the centre lies to the North of it.

" 1841, Jan. 8.—8 P.M., increasing breeze from North, with thick snow.

" 9th.—Northerly breeze increased to a strong gale, reducing us to close-reefed topsails. Noon 69° 15′ S., 176° 15′ E. The wind veered round gradually to eastward, and blew with great violence until 2 A.M. of the 10th, when it began to abate, and by 9 A.M. had moderated so much as to admit of our setting reefed courses. Noon, 70° 23′ S., 174° 50′ E. The wind soon afterwards veered to the S. E."

I regret that I have not been able to procure more information respecting the gales which prevail at New Zealand, which appears to lie in the way both of the Cyclones of the South Pacific and of those of the South Indian Ocean. Meteorological observations at this point would have an

* See " Australasian Cyclonology."

additional value on account of the occasional activity of the volcanic forces in those islands. The following severe Cyclone experienced there by Captain Cook seems to have belonged to the Port Essington class.

After leaving the Bay of Islands, in order to pass round the North Cape of New Zealand, Captain Cook appears to have fallen in with the northern half of a violent Cyclone moving to the eastward, and which had therefore probably passed along the South Coast of Australia previously. The details are given with Cook's usual precision, at p. 159 of the First Voyage; the storm began at N.N.W., veering to W., with a large swell rolling from westward. On the 28th December, 1769, it veered to S.W., and increased from a gale to a hurricane, with a prodigious sea. Nothing is said of the behaviour of the barometer, but Cook's concluding observations show the violent nature of the storm: he says, "it is very remarkable that in 35° S., and in the midst of summer, I met with a gale of wind which, for its strength and continuance, was such as I had scarcely ever been in before; and we were three weeks in getting 10 leagues to the westward. During the gale we were happily at a considerable distance from the land, otherwise it is highly probable that we should never have returned to relate our adventures."

Captain Brown, of the brig *Emma*, has favoured me with his Journal of the voyage of the ship *Strathisla*, from Auckland, New Zealand, to London, in 1846, which enables me to trace this class of Cyclones far to the eastward of New Zealand. On the 23rd October the ship was hove-to, in a heavy gale from the North. On the 24th the wind shifted from N. to N.W.; from N.W. to W.; and from W. to S.W., which *hove the sea up in sugar-loaves*, and caused the ship to strain and labour much. Position 52° S. and 131° W.

This exactly describes the passage to the eastward of the northern portion of a Cyclone, with the pyramidal seas caused by the interference of the superimposed ridges at the central area.

Colonel Reid has shown that the gales in the neighbourhood of Cape Horn are probably produced by Cyclones passing to the eastward, so that there seems reason to believe that Cyclones pass from South Australia across the whole breadth of the South Pacific Ocean. In the voyage of Captain Weddell towards the South Pole (1822-3) occur several instances of gales shifting "from N.N.W. to S.W., and leaving a most distressing sea." When off James Island, New South Shetland, in 62° 52′ S. and 62° 30′ W., they experienced a severe hurricane, in October 1823. On the 26th October, A.M., wind shifted to North and weather became foggy, and soon after freshened from N.W. to such a degree as to oblige them to take in the foretopsail, and it was with difficulty they obtained an offing. On the 27th a great westerly swell; at midnight a gale at West. At 8 A.M. of the 28th the wind shifted suddenly into the S.W., and increased to a complete hurricane. Sail reduced to the size of a mere napkin, and cold intense. In consequence of the wind having shifted, the sea ranged on board on the lee-side, sweeping everything before it. The gale continued with great violence from the S.W. by S. On the morning of the 29th it moderated, and afterwards continued at S.S.W. Lay-to; many ice-islands rolling with the noise of an earthquake.

This Cyclone was clearly moving towards the E.S.E. When we see a vessel near a dangerous and desolate coast, surrounded by huge icebergs, and on the point of being involved in a furious hurricane, we cannot fail to be forcibly reminded of the value of a science which would enable her

anxious commander to *foresee*, and therefore to *prepare for and profit by* a series of successive shifts of wind, which are certain to occur during the next few days in a fixed order. Among Captain Weddell's observations on the winds and weather in the neighbourhood of Cape Horn, the following quite establishes both the Cyclonic nature of the prevailing Gales, and their eastward progressive motion. At pp. 237-8, he says, "a North gale comes on gradually, draws from the N.W., and brings rain, and presently shifts into the S.W., without ceasing to blow, and continues from that point 12 or 15 hours. A vessel may anchor anywhere for shelter from a S.W. wind without fear of its shifting to the northward; but the contrary must be guarded against as the wind shifts from N.W. to S.W., continuing to blow with great violence." Captain Weddell states that Bridgeman's Island, in 62° 4′ S. and 56° 57′ W., is volcanic, having seen it emit smoke while passing it within 200 yards in 1821.

As little is known of the Cyclonology of this part of the track of the Australasian homeward-bound traders, I shall give here an extract from the log of the barque *Berwick Castle*, from Dundee to Valparaiso, from which it appears that she was carried around and in front of the centre of a Cyclone to the North of the Falkland Islands, in 1848, the Cyclone moving to the south-eastward:—

After several days of light winds, the barque was in 42° 22′ S. and 50° 33′ W., at noon of the 21st February, 1848.

"22nd Feb.—Midnight, increasing breeze W.N.W.; rain, thunder and lightning. 8 A.M., double-reefed topsails; strong wind and heavy sea. Noon 44° 9′ S., 52° 6′ W.

23rd.—Strong gale W.N.W., heavy showers of hail, hove-to. Noon 44° 47′ S., 51° 36′ W.

24th.—Strong gale W.N.W., hard squalls. 6 A.M., more moderate. Noon 45° 10′ S., 51° 5′ W.

25th.—Variable, clear, out reefs. 6 P.M., calm. 10 P.M. increasing breeze, N.E. Noon, 45° 53′ S., 50° 31′ W.

26th—Fresh breeze N.E. and hazy. 10 P.M., wind E.N.E. 6 A.M., strong East wind and rain, in studding sails, &c. 10 A.M., E.S.E. Noon, S.E. 47° 35′ S., 53° 45′ W.

27th.—Strong S.E. gale, and heavy rain. 6 P.M., wind S.S.E. 10 P.M., S., hove-to under main-topsail. Midnight, more moderate. Noon, light S.S.W. wind, out reefs. 47° 7′ S. 54° 33′ W.

Afterwards a heavy swell from S.W."

By marking off on a chart the successive positions of the ship, it will be seen to have actually described a track, nearly semicircular, to the eastward, while the successive shifts of wind from W.N.W. to S.S.W. show that it was carried through three-quarters of a circle relative to the moving centre of the Cyclone. This relative track may be conceived by supposing, in Fig. V.,* the *Berwick Castle* to start from D, and to be carried round the right-hand portion of the circumference until it reaches a point near to C[1].

In nearly the same position, in March 1849, the *Berwick Castle* met a Cyclone in which the successive shifts of wind were N.E., E.N.E., E. by S., with a lowering barometer and rain; S.E. and S.S.E., a heavy gale and a heavy cross sea running from South; W. by S. with a heavy cross sea from S.W. Hove-to. W.S.W. and S.W. gales, squalls, and showers of hailstones. Eight days afterwards sighted the Falkland Islands. The centre passes to the eastward, and North of the ship.

* See "Australasian Cyclonology."

In sailing from Australia towards Cape Horn, mariners have frequently observed a sudden and considerable barometrical depression, without experiencing the usual gales of which such a fall is considered a certain prognostication. A detailed instance of this is given in a recent number of the Nautical Magazine, and I have met with another well-marked instance in the excellent Journal of Captain Harmsworth, of the barque *Derwent*. The following is suggested as a probable explanation of this apparent anomaly. Considering, for the nonce, a Cyclone to be a conical spout piercing the atmosphere vertically, as in Fig. I., it may be easily conceived that one of the Port Essington class may have become considerably exhausted by the time that it has reached the meridian of New Zealand; and that, in passing on towards Cape Horn, the huge eddy may cease to reach down to the surface of the earth, and may therefore cease to create a whirlwind on the ocean—although the barometer will not fail to recognise the sudden removal of the superincumbent air, as the otherwise unnoticed eddy passes over the ship. This is, in fact, no more than an extension of Mr. Piddington's notion of the lifting-up of a Cyclone, and is analogous to the drawing-up of an exhausted waterspout. In such cases as these the sailors, who have been called to make all snug, may grumble at the Captain's "barometer-gales," but the faithful instrument never gives a false alarm; the enemy was in reality hovering above the vessel, though his arm was not long enough to reach her.

An inquiry into the nature of the Gales of the Coasts of South Australia, Victoria, New South Wales, and Van Diemen's Land would be incomplete without such a notice of the peculiar *hot winds* that proceed from the interior of Australia, as may put the seaman on his guard against their

effects. These winds occur three or four times every summer, and continue from 24 to 36 hours. They blow from the north-westward, causing the thermometer to rise to upwards of 100° F., and are succeeded almost instantaneously by a violent southerly wind, which lowers the temperature so rapidly that the thermometer has been known to fall 25° in 20 minutes. Their arid parching nature not only injures the fruit and crops, but leaves the timber and herbage an easy prey to the "bush fires" which prevail, whether by accident or design, during the summer months.

The most fearful and destructive visitation of this kind occurred on Thursday, the 6th February, 1851—a day ever since distinguished in the Australian calendar as "Black Thursday." The loss of life was serious, but the loss of property was immense and extensive. The fires swept over a tract of country of upwards of 600 miles in length. A few abridged extracts from the newspapers of the period will show the nature of this fiery tempest, both on land and at sea.

The most striking features of the Cape Otway country are, the immense size and crowdedness of the timber trees, and the density and luxuriant growth of the fern scrub. This *scrub*, in ordinary circumstances, burns slowly; while a fire may continue for weeks in some parts of the *timber* without extending far. Such a fire was, in fact, known to have existed for a month past in the mountain ranges, but no alarm was felt in consequence. The hot blast of Thursday, however, playing upon the kindled nucleus, caused the fire to spread with such fury that the dense scrub was swept away like stubble, and the flames were carried along the tops of the trees, leaving the massive trunks ignited wherever any decayed, hollow, or dead branch gave the fire a nestling place.

The body of flames came down with such rapidity from the mountain ranges towards the coast, that those who left their huts for a few hours found all swept away on their return.

At Portland there was a furious hot-wind from N.N.W., and thermometer in the sun 116°. After noticing the destruction of much property on shore, we are told that at sea the weather was even more fearful. Captain Reynolds reports that, on Thursday, when twenty miles from the Laurence Islands (in Portland Bay), the heat was so intense that every person on board was struck almost powerless. A sort of whirlwind in the afternoon struck the vessel, and carried the topsail, lowered down on the cap, clean out of the bolt-rope; and had he not been prepared for the shock, the vessel, he has no doubt, would have been capsized. Flakes of fire were at the time flying thick all around the vessel, from the shore, in the direction of Portland.

The *Portland Herald* states that the Master of the *Henry Edward* (Mr. T. Maybee), on arriving at the Laurence Island, on Thursday, experienced a hurricane of hot winds, which parted the vessel from her cables, riding at 100 fathoms on each cable. The fire flew above the vessel in large flakes, which burnt the running gear, so that the sails fell down on deck, and the great difficulty of the master and crew was to prevent the sails taking fire. The lights below were lit from 11 A.M. to 2 P.M., and burnt as blue as possible. After this the gale ceased, and blew from the W.S.W. a moderate breeze.

The Geelong and Melbourne papers are filled with accounts of the wide-spread destruction of flocks of sheep, horses, crops, buildings, &c.

About 4 P.M. the black, roaring tempest had crossed the Straits to Van Diemen's Land. The ship *Tasman*, on the

evening of Thursday, was off Cape Pillar, and was covered with dust and burnt wood. The land was invisible, and the ship driven so far to the S.E. that she only sighted land again on Saturday.

The following notices occur of the passage of the tempest across the Straits :—

On 6th February a captain of a vessel, about sixty miles from Port Fairy, saw an ominous cloud on the horizon, and immediately took in sail. He had scarcely done so when the vessel was laid on her beam-ends, and the atmosphere became oppressively hot. Hundreds of birds of all descriptions, driven by fire and wind across the sea, tried to alight on the masts."

Extract from the log of the *Velocity*, M'Veigh, from Sydney : —

" Thursday, Feb. 6.—Noon, light breeze from N.N.E., inclined to be hazy. 12h. 10m. rapid scud flying from N.W., took in all studding-sails, reefed topsails and foresail. 2 P.M. wind roaring terrifically over the ship, a great quantity of sand and leaves falling on board ; ship at this time becalmed. 3 P.M. the sky had the appearance of livid fire ; the hands on deck looked more like demons than men ; quantities of burnt bark, leaves, and birds falling on deck. $3\frac{1}{2}$ P.M. squalls. $4\frac{1}{2}$ P.M. in total darkness, such as I never experienced before ; sun this evening set at seven, heat excessive. At 5 P.M. electric lights all over the ship, heavy squalls with lightning and thunder, which continued until 9h. 45m., ship under bare poles. The wind then came in squalls from W.S.W. At 5 P.M. barometer 29°. Wilson's Promontory bearing about W. by N., distant 18 miles."

The ship Diana, 527 tons, Captain Fletcher, from Manila to Sydney, was then off Kent's Group, to the eastward of Bass's Straits. Captain Fletcher states :—

"At noon, Feb. 6, we were in 39° 3′ S. and 147° 26′ E. A clear sky overhead, but a strong haze all round. At 1 P.M. the haze increased in thickness from E.N.E. by N. to N.W. extending up to the sun and preventing it from casting a shadow. At 1·30 the breeze freshened, bringing more haze with it; which increased so fast that at 2 P.M. the sun was invisible, and at 3 P.M. it was difficult to read in the cuddy. Small dry, dark, burnt-looking leaves were borne along by the breeze, and a considerable quantity of dragon-flies. At 3 P.M. the breeze was light, the haze increasing in thickness in the W.S.W. and assuming a peculiar dark-looking colour. At 3·15 the haze began to disperse a little in the S.W., the breeze shifting to N.W., increasing, and bringing hot puffs of wind with it: sail was at once reduced, so as to prepare the ship for the worst. At 3·30 the haze thickened all round, increasing so fast that at 4 P.M. it was as dark as it ever is at night. The sun, however, made one more attempt to exert its power by tinging the haze red for about a quarter of an hour soon after 3·30 P.M. At 4·15 the whole heavens were darker than ever remembered by any one on board. It was literally impossible to see even a mast while standing within half a yard of it, much less any of the upper spars; the boom, painted white, could not even be seen—the darkness was complete. The breeze from 3·14 to 4 was variable between N.W. & W., bringing with it a fine black dust very similar to powdered charcoal, in addition to hot wind, the hottest of which came from W. in gusts; in the face of which the thermometer rose to 98°, and no doubt would have risen much higher, had the gusts lasted long enough to affect the mercury fully before the colder portion of the breeze blew upon it again. At 4·15 the breeze settled down at N.N.W. increasing fast, so that at 4·30 it blew a fresh gale, continuing so until 5·45, when it began to lull, and at

6·30 had fallen to a moderate breeze. During this period, viz., from about 4·30 to 5, we had an exhibition of the phosphoric lights, illuminating the points of the three topgallant yards, the gaff, and fore-topmast studding-sail boom-ends, and the royal-yard lifts, both to leeward as well as windward, these latter being quite covered with it.

This gale brought with it a great quantity of the fine dust, preventing any one from looking to windward.

From 7h. 30m. P.M. it blew hard again in squalls, the air becoming cooler during that time. At 8h. 30m., the breeze since eight having been light and variable from N.W. to S.W., a most severe gust came from the W., lasting about a minute, when it settled down into a strong breeze from that quarter, bringing more hot wind; this breeze, however, only lasted till 8h. 45m., when another severe gust came from the South, settling down into a strong breeze from S.W., phosphoric lights again appearing on the royal-yard points, though not to the same extent as previously. The S.W. breeze continued steady until 2 A.M. of the 7th, when it veered to the westward—and the darkness then, for the first time, began to show symptoms of decreasing; so that at 2h. 30m. A.M. the masts and yards could just be distinguished, at 3 the horizon pretty plainly, and at daylight the sky merely presented a very hazy aspect: the sun, however, was not at all visible until 6 A.M., when it appeared as a red ball, and at 7h. 30m. A.M. again cast a shadow."

Captain Fletcher has given thirty-six readings of the barometer from noon of the 5th to noon of the 7th; I have projected these in a curve in Fig. VII.* The mercury falls from 29·66 at noon of the 5th to its minimum 29·31 between 2 and 3 P.M. of the 6th, and rises to 29·645 at noon of the

* See "Australasian Cyclonology."

7th. The shower of burnt leaves, &c. reached New Zealand (Otago), on the morning of the 7th February.

In Van Diemen's Land, on the night of the 6th, a violent hurricane accompanied the hot wind. At Hamilton, the crashing and uprooting of forest trees was sublime—fences, palings, &c. were whirled in mid-air. The heat was intense. The whole of the "new country" adjacent to the Repulse and Gordon Rivers was in flames.

At New Norfolk, property worth £1,000 was destroyed. A verandah was blown some yards into the air, and alighted on the house.

Two seamen of the *Alcmène*, French corvette, were drowned at Hobart Town by the capsizing of a boat. The hurricane at Hobart Town was accompanied by vivid flashes of lightning, but no thunder nor rain.

In a hot wind the thermometer will be a much more sensitive index than the barometer. Though the hot wind was the proximate cause of the atmospheric disturbance on the 6th February, yet the resulting phenomena, both on land and at sea, were undoubtedly greatly influenced by the immense area in a state of intense conflagration. The barometrical and thermometrical fluctuations were, therefore, the results of the combined action of the bush-fires and the hot wind. The effect on the barometer of a hot wind alone I have shown by a curve of eighteen readings during fifteen hours, at Sydney on the 23rd and 24th of March, 1849. (Fig. VII.)*

These comparatively inconsiderable barometric depressions tend to show that the atmospheric disturbance produced by a hot wind is not a Cyclone.

* See "Australasian Cyclonology."