On three several hurricanes of the Atlantic, and their relations to the northers of Mexico and Central America, with notices of other storms / by W.C. Redfield.

CHART I.


WESTERN ATLANTIC,
WITH THE COURSES
of Various
HURRICANES,
By
W. C. REDFIELD.
1835,
with Additions.
NEWFOUNDLAND
NOVA SCOTIA
Toronto
Boston
New York
Philadelphia
Baltimore
WASHINGTON
Charleston
New Orleans
Galveston
TEXAS
Metamoras
Tampico
MEXICO
Vera Cruz
Bermuda
JAMAICA
HAITI
P. Rico
Antigua
Dominica
Martinique
St. Lucia
St. Vincent
Barbadoes
Grenada
Tobago
Trinidad
G. of Tehuantepec
PACIFIC OCEAN
COLUMBIA
Cartagena
30th Aug. 1842 (XII)
10th Oct. 1842 (XIII)
17th Dec. 1839 (XVI)
100°
95°
90°
85°
80° W. of Greenwh.
75°
70°
65°

ON

THREE SEVERAL

HURRICANES OF THE ATLANTIC,

AND THEIR RELATIONS TO THE

NORTHERS OF MEXICO AND CENTRAL AMERICA,

WITH

NOTICES OF OTHER STORMS.

BY

W. C. REDFIELD.

NEW HAVEN:
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Printer to Yale College.

1846.

CONTENTS.

Maps and Plates.

For Explanation of Charts IV to X, inclusive, see pages 84–85.

ERRATA.

For the several references to "this Journal" on pp. 3, 14, 16, 35, 85, 92, 107 and 112, read "American Journal of Science."

P. 6, foot note, line 3 from bottom, for "next," read "above."

P. 14, l. 9, for "vortica," read "vortical."

P. 45, l. 5 of recital 37, for "N. N. W.," read "W. N. W."

P. 47, erase "[(?) 28° 46′,]" on bottom line.

P. 53, l. 1 of recital 97, for "lon. 77° 40′," read "lon. 76° 19′."

P. 75, l. 7, instead of "which follows," read "page 78."

——, l. 23, after "Table III," insert "at page 81."

P. 76, l. 12, after "Table II," insert "at page 80."

P. 85, cancel the second foot note, and insert "† See page 16."

P. 93, l. 5 of foot note, for "this Journal," read "these pages."

P. 95, l. 20, for "*," insert "†"—l. 24, for "†," insert "‡."

P. 109, l. 12 from bottom, for "disturbing," read "gyrative."

——, l. 19 from bottom, for "or," read "and."

P. 110, cancel second foot note, and insert "† See foot note, page 15."

In the head line on Chart X, (p. 114,) for "6th and 7th," read "5th and 6th."

ON

THREE SEVERAL HURRICANES

OF THE

AMERICAN SEAS AND THEIR RELATIONS TO THE NORTHERS,

SO CALLED, OF THE

GULF OF MEXICO AND THE BAY OF HONDURAS,

WITH CHARTS ILLUSTRATING THE SAME.

Introduction.

In some former investigations of the hurricanes of the Atlantic Ocean and other seas, I have been enabled to trace the progress of these tempests in a westerly direction while in the intertropical latitudes, and thence in a recurved or northeasterly direction through a portion of the temperate zone.* The routes pursued by several of these storms have been delineated on my chart of 1835, which, with several additions, is appended to this communication.†

Of the storms which have been thus examined, some have been traced in their daily progress for a distance of 2500 or 3000 miles; while the places of their first origin, as well as of their final disappearance, remain still undetermined.

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* See this Journal, (first series,) April, 1831, (Vol. xx,) Art. IV:—October, 1833, (Vol. xxv,) Art. XV:—October, 1836, (Vol. xxxi,) Art. VIII:—January, 1839, (Vol. xxxv,) Art. II, p. 201:—January, 1842, (Vol. xlii,) Art. XII.

† Chart I.

The nearly symmetrical forms of the semi-orbital curves which are shown in the routes of these storms, and their obvious relations to the observed courses of the great aerial currents, both in the intertropical and temperate latitudes, appear to warrant the conclusion that they all pertain to one prevalent system of atmospheric dynamics, and that these several storm-routes indicate, with much certainty and precision, the general or aggregated course of circulation pursued by the great currents or moving strata of the lower atmosphere, at the several periods and localities in which these storms have appeared.

Some of these storms, however, have been traced only in their westerly course in the lower latitudes, and have not been followed in a subsequent northeasterly course; but in these cases there appears no good reason to doubt the ultimate extension of the semi-orbital curve of the storm-path into higher latitudes.

The storm-routes which have been established by the inquiries of Col. Reid, on both sides of the equator, constitute an important addition to our knowledge on this subject, and are found on the charts which accompany his valuable work on the law of storms.* The elaborate investigations made by Mr. Piddington of Calcutta, have also contributed much to our knowledge of the courses pursued by Asiatic storms.† Other and distinguished writers have shown, to some extent and at different periods, a corresponding course in other tempests, while moving through a portion of the temperate latitudes, but with no clear indications of an orbital or semi-orbital course of progression in the body of the storm.‡

Antje's Hurricane of August and September, 1842.

Three several storms, the routes of which are marked I, II and V, on my storm chart of 1835, were traced only in their westerly

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* "An attempt to develop the Law of Storms, by means of facts arranged according to place and time;" by Lieut. Col. W. Reid, C. B., F. R. S.; Weale, London, 1838 and 1841.

† See eleven successive Memoirs "on the Law of Storms in India;" published by Mr. Piddington, at Calcutta. Mr P. infers that some storms of the China sea have probably pursued a southwesterly course; but we can hardly admit this anomaly without full evidence derived solely from the progress of the storm over successive and extended localities.

‡ Since these pages have been preparing for the press, I have met with Mr. Thom's "Inquiry into the Nature and Course of Storms in the Indian Ocean south of the Equator." (London, 1845.) This interesting work fully confirms the vorticular rotation and orbital progression of the Mauritius hurricanes, in directions of revolution which are counterwise to the storms of the northern hemisphere, as had been shown by Col. Reid. It will doubtless prove valuable to navigators.

course and in the lower latitudes.* To this group I have now to add the observed route of the storm which appeared in the American seas at the end of August and in the early days of September, 1842, the route of which is marked XII on the same chart.

This hurricane is distinguished as having pursued a course which is nearly due west, so far as it has been successfully followed by our inquiries, and its progress and observed phenomena will now be considered.

Our earliest notice of this gale is August 30th, in lat. 25° 54′ N., lon. 63° W., where the schooner *Antje* was dismasted by it, and our latest is September 8th, in Mexico, lat. 23° 28′ N., lon. 102° W.; the meridional distance between these points being equal to thirty nine degrees of longitude.

In submitting a condensed statement of the various observations obtained, I shall first exhibit the reports from places which were on or near the right margin or border of the gale as it proceeded westward; second, those reports which relate to the left margin or southern border of the storm's path; and, lastly, those which relate to the right center and left center of the advancing gale.

Right Margin of the Gale.

1. From Bermuda, which is over 400 miles† N. 13° W. from the position assigned to the Antje on the 30th of August, and apparently beyond the direct influence of the gale, we have the following observations.

Date.	Hours.	Winds.	Force of wind.	Aspect of weather.	Barometer.
August 30.	noon.	W. N. W.	2 (light breeze.)	blue sky.	30·07 inches.
31.	noon.	W.	2 " "	blue sky.	30·11 "
September 1.	5 A. M.	N. E. by N.	6 (single reef gale.)	cloudy.	30·05 "
"	noon.	N. E.	4 (moderate breeze.)	cloudy.	30·09 "
"	9 P. M.	N. E.	6 (single reef gale.)	cloudy and rain.	30·09 "
2.	noon.	N. E.	5 (fresh breeze.)	blue sky.	30·13 "

[We find here a moderately high barometer throughout, with light and faint winds on the 30th and 31st. On the 1st of September, when the gale should have passed far to the westward in its course, we have fresh winds from northeast, which winds existed in like

* See Chart I.

† The miles referred to in this paper will be statute miles of 5280 English feet, unless otherwise expressed.

force, at that time, as far west as the American shores and over a large extent of country, north of Florida and bordering on the Gulf of Mexico.]*

2. Savannah, Geo., lat. 32° 05′, lon. 81° 07′, Sept. 1st, wind N. E., A. M. cloudy, P. M. fair; 2d, cloudy, A. M., wind E., P. M. N. E.; 3d, wind N. E., fair; 4th, wind N. E., P. M. cloudy; 5th, fair, A. M. wind E., P. M. S. E.†

3. St. Augustine, E. Florida, lat. 29° 40′, lon. 81° 35′, Sept. 1st, fair, with high winds from E.; 2d, cloudy, high winds from N. E.; 3d, wind N. E.; 4th, *rain* A. M., *fair* P. M., *wind N. E.*; 5th, fair, wind N. E.; 6th the same.

4. Palatka, East Florida, on the river St. John, lat. 29° 38′, lon. 81° 47′, Sept. 1st, wind E., cloudy, N. E., fair; 2d, wind W., fair, N. E., rain; 3d, wind N., cloudy, N. E., fair; 4th, *wind N. E., fair;* 5th and 6th, wind N. E., fair.

5. Fort Micanopy, East Florida, lat. 29° 5′, lon. 82° 5′, Sept. 1st, A. M. wind N. E., fair, P. M. N., rain; 2d, A. M. wind E., P. M. N. E., fair; 3d, S. E., fair; 4th, *N. E., fair;* 5th, *S., fair;* 6th, S. E., cloudy.

6. Fort Brooke, Tampa Bay, (west coast of Florida peninsula,) lat. 27° 57′, lon. 82° 35′, Sept. 1st, wind E., P. M. cloudy; 2d, E., fair; 3d, E., P. M. cloudy; 4th, A. M. N. E., fair, P. M. *E., rainy;* 5th, *E., cloudy;* 6th, E., fair.

7. Cedar Keys, East Florida, (northeast angle of the Gulf of Mexico,) lat. 29° 9′, lon. 82° 56′, Sept. 1st, A. M. wind S. W., fair, P. M. N. E., rain; 2d, E., fair, P. M. rain, high winds; 3d, E., fair; 4th, E., fair; 5th, A. M. *N. E.*, P. M. *E., fair;* 6th, E., fair.

8. Fort Fanning, Florida, lat. 29° 33′, lon. 83° 9′, Sept. 1st, A. M. wind S., fair, P. M. E., rain; 2d, S., fair; 3d, A. M. N. E., P. M. E, fair; 4th, A. M. N., P. M. E., fair; 5th, A. M. S. E., P. M. S., fair; 6th, E., fair.

9. Fort Stansbury, Middle Florida, lat. 30° 18′, lon. 84° 8′, Sept. 1st, wind E., rain; 2d, A. M. E., P. M. S. E., rain; 3d, A. M. S. E., P. M. E., cloudy; 4th, E., fair; 5th, A. M. N., P. M. S., fair; 6th, A. M. E., P. M. S. E., fair.

10. Fort Pickens, Pensacola Bay, West Florida, lat. 30° 18′, lon. 87° 12′, Sept. 1st, wind N. E., rain; 2d, A. M. N. E., rainy, P. M. E., cloudy; 3d, A. M. N. E., P. M. E., cloudy; 4th, A. M. E., P. M. S. E., fair; 5th, E., fair; 6th, E., fair; 7th, S. E., fair.

11. Fort Morgan, Mobile Bay, Ala., lat. 30° 16′, lon. 88° 10′, Sept. 2d, A. M. wind S., fair, P. M. S. E., rain; 3d, S. E, rainy; 4th, S. E., fair; 5th, S. E., fair, rainy P. M.; 6th, S. E., fair; 7th, S. E., fair; 8th the same.

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* Capt. BEAUFORT'S symbols for denoting the strength of winds and the state of weather, which are very generally adopted by English authorities, and to which we must often refer, are substantially as follows:—

The scale of the winds is from 0 to 12, the first indicating a calm and the last the full force of a hurricane. These numbers are not used with precision, but 5 and 6 may be viewed as pertaining to a storm-wind, when found in proximity with a gale or hurricane and in directions which are accordant with its winds, and even 4 or 3 may sometimes be thus viewed.

The state of the weather is denoted as follows:—

b. Blue sky, with or without clouds.
c. Detached or opening clouds.
d. Drizzling rain.
f. Fog.
g. Gloomy dark weather.
h. Hail.
l. Lightning.
m. Misty or hazy, intercepting view.
o. Overcast with impervious cloud.
p. Passing showers.
q. Squally.
r. Continuous rain.
s. Snow.
t. Thunder.
u. Ugly and threatening appearance.

• Under any letter denotes an extraordinary degree.

The reader will find frequent occasion to refer to this note.

† Most of the following observations in the United States are from the returns made to the Surgeon General's Office, from the military posts, kindly furnished by Surgeon General LAWSON.

The scale of the wind's force prescribed for the United States military posts consists of ten numbers, in which 9 denotes a hurricane force, and 10 a violent hurricane. Thus a like force may be sometimes expressed by a number which is lower by two than in the English scale, which is next mentioned, so far as relates to the higher numbers.

There are some observers who use a scale of only six numbers to express the force of the wind, instances of which will occur in this article.

12. New Orleans Barracks, La., lat. 30°, lon. 90° 9′, Sept. 2d, wind N. E., P. M. rainy; 3d, N. W., P. M. rainy; 4th, N., cloudy; 5th, N. E., cloudy; 6th, A. M. N. E., P. M. S. W., cloudy; 7th, A. M. N. W., P. M. S. W., cloudy.

13. Fort Jessup, La., lat. 31°, lon. 93°, Sept. 3d, wind S., fair; 4th, S., fair; 5th, S., cloudy; 6th, S. E., cloudy; 7th, S. E., cloudy; 8th, A. M. N., P. M. S., cloudy.

With reference to the foregoing observations it is well to state here that the body of the hurricane passed over the southern part of the peninsula of Florida on the 4th day of September, on its route to Mexico. From the 1st to 4th a rain passed over part of Florida in a nearly opposite direction.

Left Border of the Gale.

14. Nassau, N. P., (Bahamas,) Sept. 10th.—The brig *Rolla*, from Glasgow, arrived this morning, having touched at Antigua. She encountered none of the severe weather which was experienced here and at the adjacent islands on the 2d and 3d instant. On the contrary it was a perfect calm. [We must suppose that this vessel first made the latitude of Antigua and then ran to the westward in the usual way. Thus the storm might pass down to the westward on a more northern parallel, without being noticed by the *Rolla* either before or after her arrival at Antigua. See Chart II.]

15. We come next to the well kept log of H. M. S. *Pilot*, then on her passage from Jamaica to Nassau, N. P., the full insertion of which our limits preclude. The *Pilot* was westward of Hayti on the second and third of September, when the gale passed her meridian, working up for the passage between Hayti and Cuba, with easterly and variable winds, moderate in force, "and just feeling it enough to make her testimony highly interesting," as shewn by the following extract: "Sept. 2d, A. M., wind N. E.; out first reef of topsails, set royals and flying-jib: Noon, Cape Maize, [E. end of Cuba,] bore N. 22° E., distant 90 miles; at 2 P. M. taken aback, wind N. N. E.; turned round on the starboard tack; 3 P. M. in royals; 3h 40m. set royals; 5 P. M., wind southward; 7 P. M., wind S. W., in royals; ends calm. Sept. 3d, light variable winds, N. W. to E.; 5 A. M., a breeze from E.; 6 A. M., E. b. S.; 10 A. M., E. S. E.: Noon, Cape Maize, N. 2° W. 58 miles; wind light from E.; 7. P. M., in royals, flying-jib and reef in topsails, wore ship, in top gt. sails; 9h. 50m. P. M., set fore-topmast staysail, down jib, up foresail, lowered topsails to a squall; 11h. 40m. in two reef fore-topsail. Sept. 4th, 1 A. M. hoisted topsail, set foresail, wind S. E. varying to W. and calm, no stars visible; A. M., winds S. E., to E. by N." On the 4th and 5th, from E. end of Cuba to Fortune Island, winds light and moderate, from S. to S. E. [I consider the changes of wind on the afternoon and night of the second as due to the influence of the gale in passing; and the squally or cloudy weather on the night of the 3d as due to the recurrence of the lower trade wind, as disturbed by the passage of the storm on the N. side of Cuba.]

16. From the logbook of H. M. S. *Ringdove*,* sailing from Vera Cruz to Laguna des Terminos on the southern side of the Gulf of Mexico:—Sept. 5th, calms and variable winds in the forenoon, lat. 19° 15′, lon. 95° 8′; P. M., winds northerly, force 4 and 5; Sept. 6th, latter part of night calm, A. M. winds N. N. E., N. W. and westerly, lat. 19° 9′, lon. 93° 31′, P. M. wind W. N. W., 3; Sept. 7th, winds W. S. W. and S. W. by W., 3, lat. 18° 37′ lon. 91° 45′; P. M., light, variable, 1, and calm. On the 8th the wind freshened from S. E.; with a heavy swell from S. E. on the 9th. [The storm appears to have passed the meridian of the *Ringdove* on the 7th, but at a considerable distance to the northward.

17. At Vera Cruz, lat. 19° 12′, lon. 96° 04′, there was no gale at this period.

18. At Tampico, lat. 22° 15′, lon. 97° 50′, the gale was not felt in any force, although this point was near the left centre of the storm. [Had we barometrical observations from

* The logs of the *Pilot* and *Ringdove*, with those of other British ships of war, were kindly furnished by Col. Reid, of the Royal Engineers, now Governor of Bermuda.

Tampico they might serve to show the true state of the storm at that point, which from its position on the eastern coast is sheltered from the force of the westerly winds, which constituted the left hand side of the storm.]

After careful inquiry I cannot find that this gale appeared to the southward of the chain of islands which forms the northern boundary of the Caribbean Sea, nor in that southern portion of the Gulf of Mexico which is known as the Gulf of Campeche.

We will now follow the course of the storm, directly in its path of violence.

Right and Left Center of the Gale.

19. Our first report is that of the Dutch Schr. *Antje*, already mentioned as having been dismasted, Aug. 30th, in lat. 25° 54′, lon. 63°, "in a violent gale from S. and E." [Perhaps this report of the wind's direction is intended for southeastward; *i. e.* "*southward and eastward*," as the phrase is often used by seamen. It is probable that the date is given in nautical time, and applies more especially to the time of the casualty. Thus it *may* refer to the afternoon of the 29th, and to the latter part of the gale. This will agree better with the next report.]

20. At Turk's Island, lat. 21° 30′, lon. 71° 4′, Aug. 30th, "heavy tempest from S. to S. W."

21. The Brig *Helen and Elizabeth* reports a hurricane on the evening and night of Sept. 2d, at Rum Cay and Watling's Island. The latter island is in lat. 24°, lon. 74° 28′, and the effects of the gale were here most disastrous; not a house on the island but had been more or less seriously injured, and most of them were in ruins.

22*a*. A Nassau account, already quoted, shows that the hurricane passed over the Bahama Islands on the 2d and 3d of September. The loss of life and property at these islands is represented to have been very great.

A comparison of the above accounts and positions will show that the Turk's Island date is given erroneously, perhaps in nautical time. These reports are sufficient, however, to show the arrival of the gale on the evening of Sept. 2d at the eastern portion of the Bahama Islands. From these islands to the center of the Gulf of Mexico the reports are sufficiently numerous and full for the objects of this inquiry. The next report, though much abridged, affords a good account of the access and progressive phases of the storm, first on the northern margin and then in the more central portion of its track; showing the direction and modifications of the wind successively induced as the ship and the storm advanced westward in their respective, and, in part, coincident courses.

22*b*. Ship *St. Mary*, Foster, for New Orleans, at noon of Sept. 2d was in lat. 27°, lon. 76°, [then in advance of the northern border of the gale,] "a favorable N. E. wind wafting the ship swiftly to the southward." . . "Low fleecy clouds flew swiftly to the west;" "*a high sea, without any apparent cause*, rolling furiously from E. N. E." On the morning of Sept. 3d, [front centre of the gale then nearly as far westward as the ship,] the wind increased, the east sea had swelled to mountains, the sun shone silvery bright, and the clouds displayed fiery copper tints. At 8 A. M. passed near the Hole in the Wall, [S. E. end of

Abaco, lat. 25° 51′, lon. 77° 11′,] tem. of air 82°, water 81½°, wind increasing, in sudden gusts; sails reduced and well secured. Shortly after noon of the 3d, passed Stirrup Key and entered upon the great Bahama Bank. The wind, from E. N. E., continued to increase, but was fair for crossing these smooth shallow waters. Appearances now altered and the clouds flew to the west with great velocity and low elevation; ship reduced to close-reefed topsails and reefed fore courses. At half-past 8 P. M., departed from the Bank and encountered, in the Gulf of Florida, a heavy breaking sea. The night was dismal in the extreme, but the ship scudded with safety.

After daylight on the 4th, the sea ran very dangerously, and during the morning the clouds came flying from the east with heavy squalls of wind, lightning and torrents of rain. By 10 A. M. the Florida Reef, near to Loo Key, was seen, over which the sea was breaking frightfully, the wind blowing E. by S. About noon the wind had increased to a perfect hurricane; to run was no longer safe, and the ship was hove to with head to the south, under a storm mizen topsail, which soon blew to fragments. At 6 P. M. had drifted into shoal water, but to set sail was impossible, as no canvass could stand, and for four anxious hours the ship drifted to the west. The wind during that long night blew steadily from E. by S. with increasing violence. Towards morning of the 5th it veered gradually to the S. E. and moderated to a hard gale, with heavy rain. Finally, the morning of the 6th brought, in the Gulf of Mexico, a clear sky and a gentle breeze.—(*Jour. of Capt.* FOSTER.)

[The veering of the wind from N. E. to S. E., to the *right* on the compass card, during the storm, together with its force, shows the ship to have been in the right center of the gale, as will appear also from a collation of the other reports. The duration of the gale and the slowness of the changes of its direction, with this ship, are largely due to her westerly progress, which in the later part coincided with the course of the storm.]

23. Brig *Florida Banca*, at noon of Sept. 2d, was in lat. 29° 30′, lon. 75° 54′; took the first of the gale about 10 P. M., wind N. E., veering afterwards to E., at which point it stood at noon of the 3d, about six miles south of the Hole in the Wall. Had the hardest of the gale between Stirrup Keys and the Banks in the afternoon and night of the 3d. (*Journal of Capt.* ELDRIDGE.)

24*a*. Barque *Rapid*, WARD, bound for Havanna, Sept. 2d, A. M., wind E., five and six knot breeze; lat. obs. 26° 31′. P. M., wind N. E., begins fresh gales and clear weather. At 4 P. M. made the Hole in the Wall, S. W. by W., 15 miles. At 8 P. M. the Hole bore N. E. by E., 7 miles; ends with fresh gales and squally appearance.

Sept. 3d, at 1 A. M., made the Berry Islands bearing W. S. W., five miles, fresh gales and squally, took in main-top gallant sails. P. M., fresh gales and squally; at 2h. 30m. P. M., went off the Bank; wind N. E. by N.; at midnight made the Doubled-Headed Shot Keys and hauled up west.

Sept. 4th, at 2 A. M., the Double Shots bearing E. N. E. about nine miles distant, close reefed topsails and sent down fore-royal yard; at 5 A. M., finding the gale increasing sent down top gt. yards and took in flying-jib boom; reefed all sails and furled them as fast as possible; running before the wind under bare poles, wind N. N. E. At 8 A. M., still scudding, and judging the land of Cuba at not more than ten miles distance, brought the barque to under the main spencer. In less than ten minutes she was hove on her beam ends, the water rushed into the cabin, and every thing was soon washed from the deck. Finding no relief, cut away the mizen topmast to get her off before the wind, rather than founder. Lost the fore-topmast staysail, fore-topmast and head of the foremast, could not get the barque before the wind, and the sea constantly breaking heavily over her. By this time it was noon, and the wind, *which had suddenly shifted*, was blowing a tremendous hurricane from S. to S. W. At 1 P. M. the force of the hurricane began to abate, still blowing very heavy and in squalls. At 4 P. M. more moderate, and at 6 P. M. kept away S. W. under foresail, the wind at S. E. Sept. 5th, at daylight made the Pan of Matanzas. (*Logbook.*)

[It will be seen that the *Rapid* was further south while exposed to the gale, than either of the three vessels last mentioned. The sudden shift of the wind to an opposite direction shows that the barque was at that time near to the axis of the gale, and that this axis passed near to the north coast of Cuba in its westerly progress.]

24*b*. Capt. WARD states that a Spanish ship was dismasted at Ginger Key, [lat. 22° 53′, lon. 78°,] the hurricane shifting "round the compass."

25. Barque *William Engs*, sailed from Key West, Sept. 3d, at 6 A. M., wind light from N. E. and fine clear weather; at noon sixteen miles S. S. E. from Key West light; barometer 30·10. At 6 P. M. the wind began to freshen, with dark clouds rising at N. and barometer fell rapidly till 8 P. M., when it stood at 29·70. Took in all light sails and put the ship under double reefed topsails; weather continuing to wear the same appearances.

Sept. 4th, at 2 A. M. took a heavy squall from N., which reduced us to close-reefed main topsail; barometer still at 29·70. The wind continued to blow with great violence from N. till 4 A. M., when it began to haul gradually to the eastward, which continued till 8 A. M., when it stood at E. S. E. and blew, if possible, with increased violence. We were now on soundings on the Florida Reef, and gaining nothing off shore, the sea breaking over us and preventing all communication with the cabin, so that the barometer could not be observed. At noon still blowing a hurricane from E. S. E. and continued steady at that point, with squalls of rain, till about 3 P. M., when it began gradually to subside, and at 10 P. M. had so far moderated that we could get up new sails from below and bend them; the wind continued to die away at E. S. E. till it fell calm. The barometer near the close of the gale stood at 30 inches. At noon of the 5th was in lat. 24° 15′, lon. 83° 35′. We judged our position at the commencement of the gale to be in lat. 24° 5′, lon. 81° 25′, making a drift of one hundred and eight miles to the west, which we could account for only by our being on soundings and having a strong counter current. We afterwards made Key West and found our chronometer correct.—(*Letter from Capt.* COE.) [This vessel was clearly in the right side of the gale.]

26. Capt. SMITH of ship *Christoval Colon*, states that on the 4th of Sept. a very heavy gale was experienced at Havanna and Matanzas, commencing at N. about sunrise, at Havanna, and veering westward round to S. S. W., and blowing with great violence for ten hours; causing much damage to the shipping in port. This is confirmed in substance by Capt. Boss of the barque Merchant, from Havanna, who states that by noon the gale had veered to N. W., increasing in force: and also by the statement of Lieut. MCCLURE, commanding H. M. S. Roman, furnished to Col. REID, from which we learn that in the afternoon the gale blew furiously from S. W., and continued from this quarter till 1 A. M. of the 5th, when the wind ceased, but heavy rain continued till 3 A. M.

27. Ship *Hilah*, from New Orleans for New York; Sept. 4th, 11 A. M., in sight of Havanna, a tremendous hurricane from N. W. At 5 P. M. gale increasing, saw the land about 300 yards to leeward; attempted to work the ship off, *when the wind suddenly shifted to S. W.* and blew still heavier. Cut away sails and rigging to save the spars.

28. Brig *Harriet*, in lat. 25° 1′, lon. 84° 9′, experienced a hurricane, lost spars, sails, &c.

29. Schr. *Emporium*, lat. 24°, lon. 84° 15′, in a severe hurricane, lost topmast, sails, &c., and sprung lower masts.

30. The barque *Euphrates*, from New Orleans for Marseilles, was dismasted on the 5th of Sept. in lon. 85° 30′.

31. Ship *Oconee*, from New Orleans, Sept. 5th, 6th, experienced a heavy gale, 100 to 150 miles S. E. of Balize, from N. E. by E. to E. by N., *with a heavy sea running from S. E.* Laid to *with head to S. E.* under close-reefed maintopsail for twenty four hours.—(*Statement of Capt.* JACKSON.)

32. Barque *Columbia*, from New Orleans, crossed the N. E. bar Sept. 1st, and had light winds from E. and E. S. E. till Sept. 4th, when the wind became fresh and squally from N. N. E., lat. 28° 8′, lon. 87° 28′. Sept. 5th, commenced blowing from N. E. with squalls and rain; lat 26° 49′, lon. 86° 51′, the gale increasing and veering to E. N. E. with a heavy sea. Sept. 6th, lat. 25° 31′, lon. 85° 30′; shortened sail to a three reefed maintopsail and main spenser; continued blowing a complete hurricane; from 6 to 10 P. M. expected every moment to see the masts go over the side. Sept. 7th the wind veered E. and abated; lat. 24° 35′, lon. 85° 2′: for two days after the hurrricane *had a very heavy sea from W. S. W.* which led us to expect a renewal of the gale from that quarter, the winds at the time being light from E. S. E. and E.—(*Statement of Capt.* TRUSSEL.)

We now pass to the left side of the storm.

CHART I

N.B. The arrow points in the several ship-tracks indicate only the general course of the vessel.

Eng.d by J.M. Atwood N.Y.

39. Mr. STEWART JOLLY, the British Consul at Tampico, to whom we are indebted for Baron KARWINSKY'S report, states that at Tampico, during the time when the storm was passing so near there to the north, "it was a dead calm and the air insufferably hot and oppressive."

From the observations above recited, we may derive the deductions and remarks which follow.

Daily Progression of the Storm.

If we take the storm date of the *Antje* as noon of August 30th, we find the rate of the storm's progress from thence to Victoria to have been four and one third degrees of longitude per day; but if this date be for the afternoon of 30th in *sea reckoning*, 29th in civil time, then the rate is about four degrees per day.* From the meridian of Havanna, lon. 82° 20′, to the place of the *Rover* at 2 P. M. of Sept. 6th, near lon. 90° 27′, the storm was about two days in its progress, which also shows an advance of four degrees per day.

This rate of progression would bring the storm to Soto de la Marina, in lon. 98° 10′, on the 8th of Sept., which is the date given above for its appearance at Victoria in lon. 102°, where it should arrive on the 9th, according to the above rate of advance. Still there can be little or no doubt that the storm of both Soto de la Marina and Victoria was identical with that which was passing through the Gulf of Mexico on the 5th, 6th, and 7th; and we must leave it to Mr. JOLLY or the Baron KARWINSKY to reconcile or explain the dates, as they appear in the Bermuda Gazette.

Course of the Storm and Route of its Vortical Axis.

The course pursued by this storm, as deduced from the foregoing reports, was nearly due west; and the route of its vortical axis, at least from the Bahamas, must have been between 23° 30′ and 24° north lat.; being nearly parallel and coincident with the tropic of Cancer. The axis appears to have been nearer to the

* The daily sea reckoning is made up at noon, commencing from noon of the preceding day; and the absurd custom still prevails of affixing to the afternoon, or first twelve hours of the reckoning, the date of the succeeding day. This useless and perplexing practice has, for many years, been excluded from the English navy, but I am sorry to find that it is still continued in our own naval service. Many intelligent masters in our merchant service have abandoned it. To attain fully this desirable end nothing more is necessary than to affix their true dates to each of the twelve-hour tables of the logbook.

In this article, to avoid confusion of dates, care has been taken to reduce the several nautical dates to civil time, in all cases where it has been practicable.

tropic when off the point of Florida and in Mexico, than when off the Campeche Bank in lon. 90°.

On the north coast of Cuba we find two vessels, the *Rapid* and *Hilah*, which had the first part of the gale from the northward and then shifting suddenly to the southern quarter and blowing with like violence, which shows them to have been near the line pursued by the axis of the gale. At Soto de la Marina on the coast of Mexico and at Victoria in the interior, we find the gale blowing first from the north, then a short *lull*, such as appears to mark the axis in all great hurricanes, and then the recurrence of the blast in full violence from the south as the gale advanced; which fixes the course of the axis at or near these points, and shows, also, the rotative character of the gale.*

It is well to bear in mind the direction of these successive winds, as not being first from the west and then from the east, parallel to the route of the storm, but on the contrary, *crossing*, in succession the path of its axis.

Hourly Progress, and Prolonged Duration with Vessels moving Westward.

We have seen that the rate of progression in this hurricane was about four degrees of longitude per day; which, if we estimate the degree on the parallel pursued by its axis at 63·2237 statute miles, shows an advance but little exceeding ten and a half miles per hour. This will fully account for the increased duration of the gale with those vessels which were running or drifting westward while exposed to its violence.—See cases 22 *b*, 24 *a*, 25, and 32.

Vorticular Character of the Gale.

The continuance of violent easterly winds in this gale on the northern side of its axis, the simultaneous presence of violent and accordant winds from northern points of the horizon in the front side of the gale, the westward veering of the northwesterly winds on the southern side of the storm's axis, and the further sweeping of the winds across the center path of the storm, in the rear side of the gale, from southern points of the horizon.—all go to sustain the conclusion that it was one vast whirlwind, blowing around a vortical axis, which advanced with the storm.†

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* This unfailing "*experimentum crucis*" of the character of storms appears to have been sufficiently obvious from the time of the first inquiries on their rotatory action.

† Had the violent winds which were exhibited in the front portion of this gale been [illegible] blowing from the west, in the more central portions of its path, and had the later

Strength and Extension of the Trade or Northeasterly Wind on the Northern Side of the Storm.

It has been seen that along an extensive portion of its path and on its northern side, this storm was preceded and attended by a strong northeasterly wind, which appears to have coincided with the right front of the stormy vortex and to have extended as far northward as the Carolinas. This coincident wind, pressing upon the northern border and right front of the hurricane, may have contributed to the vortica extent and activity of this portion of the storm, and doubtless had no small influence in producing its unusually western course.

Eccentrical Position of the Vortical Axis in the Storm.

The greater extent of the gale on the right or northern side of its axis of revolution, or axis route, as compared with its extent on the left side of the axis line, constitutes a remarkable feature in this storm. One probable, if not principal cause of this unequal extension has just been noticed.

This extension of the sensible effects of the storm on the right of its axis path, conforms very strikingly to the effects which have been observed in the paths of small and destructive whirlwinds or tornadoes. This is shown in the case of the tornado which visited New Brunswick, N. J., in June, 1835,* and in that which passed near Providence, R. I., in August, 1838;† and these agree with other observed cases which have not been published. This characteristic has pertained, likewise, to other great storms; owing, probably, to causes which differ somewhat from those which produce the like effect in smaller whirlwinds. But this peculiarity in great storms appears not so common and so strongly marked as in the tornadoes.

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winds of the storm blown along the path of its axis from the east and with still greater force, or had two set of winds, from opposite sides of a central or axial east and west line, blown severally and simultaneously towards that line or some point on the same, in direct opposition to each other, and each set been found limited to its own side of the axis line, instead of blowing *in succession across extensive portions of the same path*, then might it have been claimed that the winds from all sides of the storm blew towards a central point or line, in the body of the storm. But the facts which have been observed appear to forbid such a supposition; not only as relates to this storm, but also as regards every other American tempest which has been duly examined.

* See this Journal for 1841, Vol. XLI, pp. 73, 79, with diagram of survey.

† This Journal for 1842, Vol. XLII, pp. 269 to 278.

Absence of a Brisk Trade Wind on the Southern Margin of the Storm.

We may infer from the reports of the Brig *Rolla* and H. M. Ships *Pilot* and *Ringdove*, that calms and light winds prevailed in the Caribbean Sea and on the southern margin of the storm during the observed progress of the latter. The usual prevailing course or tendency of the lower currents of air, in these regions, at least in the hurricane months, *appears to be from a point south of east*, instead of north of east, as is often supposed.* This general tendency towards some point which is north of west must usually control the courses of the storms in this region. But the lightness of the surface winds of the Caribbean Sea at this period,

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* I have ascertained, long since, from logbooks, published journals and nautical directories, that the course of the trade-winds, at their inferior surface, is often parallel to and even one point or more *from* the equator; particularly inside the tropics. From the reported courses of the lower clouds and squalls, by intelligent voyagers and residents in the West Indies, I have also learned, that the course of the lower cloud currents is often, if not generally from southeastward, at least during the northern summer: while the observed courses of the West India hurricanes has demonstrated the northwesterly tendency or courses of of the lower currents, viewed as a whole, in these regions.

Mr. LAWSON, in JAMESON'S Edinburgh Phil. Journal, for July, 1845, has given the results of his observations both on the surface winds and cloud currents at Barbadoes, lat. 13° 10′ N., in 1841; from which it appears that from May to September inclusive, the observations on the surface winds, made at regular periods, have resulted, numerically, as follows: viz. N. W. winds, 3; N., 2; N. N. E., 4; N. E., 13; E. N. E., 106; E., 122; E. S. E., 66; S. E., 41; S. S. E., 13; S., 1; S. W., 2: the E. N. E. being the most frequent wind north of east, while the S. E. and S. S. E. winds greatly predominate over those from N. E. and N. N. E.

His observations on the cloud currents are still more interesting and important. Complete tables of these are given for September and October, which may be taken for nearly average months, as between summer and winter. Two or more currents commonly appeared, above the surface wind; a lower current from south of east and a higher one from S. W.; *both* of which, as well as all *cloud currents* in non-mountainous regions, should be viewed as pertaining solely to the lower atmosphere. The numerical results for the two months were as follows: viz.

Abstract of Observations of the Surface Winds and Cloud Currents at Barbadoes, in September and October, 1841. (Observations taken at 5 A. M.; 10 A. M.; 3 P. M., and 9 P. M.)

From what direction.	Winds.	Cloud currents.	Totals.	From what direction.	Winds.	Cloud currents.	Totals.
W. N. W.		1	1	E. S. E.	21	8	29
N. W.		5	5	S. E.	29	26	55
N. N. W.	1	16	17	S. S. E.	4	31	35
N.	1	18	19	S.	3	11	14
N. N. E.	5	4	9	S. S. W.	1	6	7
N. E.	12	9	21	S. W.		89	89
E. N. E.	90	16	106	W. S. W.	1	6	7
Northeasterly & northerly obs.	109	69	178	*Southeasterly & southerly obs.*	59	177	236
	East obs.		30		15		45

These, with a vast extension of similar phenomena, merit the serious attention of those naturalists who rest on the calorific theory of the general and trade winds; and they seem fully to account for the northwesterly courses of storms in the West Indies.

when viewed in connection with the strong trade or northeasterly wind which we have noticed as then existing in more northern parallels of latitude, may be deemed sufficient to account for the unusual west course of this hurricane.

The hurricane of August and September, 1842, which has now been considered, caused great injury to commerce and the total loss of many vessels with their crews.

What is meant by Rotary or Vortical Action in Storms.

When in 1830 I first attempted to establish by direct evidence the rotative character of gales or tempests, I had only to encounter the then prevailing idea of a general rectilinear movement in these winds. Hence I have deemed it sufficient to describe the rotation in general terms, not doubting that on different sides of a rotary storm, as in common rains or sluggish storms, might be found any course of wind, from the rotative to the rectilinear, together with varying conditions as regards clouds and rain.

But I have never been able to conceive, that the wind in violent storms moves only in *circles*. On the contrary, a vortical movement, approaching to that which may be seen in all lesser vortices, aerial or aqueous, appears to be an essential element of their violent and long continued action, of their increased energy towards the center or axis, and of the accompanying rain. In conformity with this view, the storm figure on my chart of the storm of 1830* was directed to be engraved in spiral or involute lines, but this point was yielded for the convenience of the engraver. Some indication of the character of a great vortical movement is found in the arrows of the storm figures on my chart of 1835, on tracks I, V, and VII.† In Vol. xxxv, pp. 203–205, of this Journal, and Vol. xlii, p. 114, I have noticed, cursorily, the variable as well as vortical conditions which pertain to great storms. Some of the effects of vortical rotation are also discussed in my account of the Providence tornado.‡

The common idea of rotation in circles, however, is sufficiently correct for practical purposes and for the construction of diagrams, whether for the use of mariners or for determining be-

* This Journal, Vol. xx. The dotted part of this figure was intended to indicate the area of rain.

† See also the storm figures in this Journal, Vol. xxxi, p. 117, and Vol. xxxv, p. 214.

‡ Vol. xliii, p. 271—275.

tween a general rectilinear wind, on one hand, or the lately alleged centripetal winds, on the other. The *degree* of vorticular inclination in violent storms must be subject, locally, to great variations; but it is not probable that, on an average of the different sides, it ever comes near to forty five degrees from the tangent of a circle,—and that such average inclination ever exceeds two points of the compass, may well be doubted.

Second Hurricane of September, 1842.

Between the 18th and 22d of September another storm of violent character crossed the Gulf of Mexico, probably in a northeasterly direction and at a slow rate of progress; but I have not sufficient means for tracing its further advance with much accuracy. This storm also occasioned much injury to the vessels which were exposed to its violence.

Rate of Progression in Storms observed only in the Tropical and Lower Latitudes.

In the following table I have presented some of the principal facts relating to the progress of four several storms of the American seas, the courses of which have been observed only in the lower latitudes. I have also added to this table a storm of the Bengal Sea and Indian Ocean, described by Mr. PIDDINGTON in his Eighth Memoir on the Law of Storms in India. This storm is also distinguished as having moved nearly to the west, but in much lower latitudes than the *Antje's* hurricane.

No. of the track on Chart I.	Date of Storm.	Approximate course of the storm.	Approximate latitude of known route.	Direction of the vorticular rotation in the storm.	Length of known route, in statute miles.	Average rate of advance per hour.
I.	June 23d—27th, 1831.	N. 74° w.	14° 30′ N.	Right to Left.	1900 miles.	18·5 miles.
II.	Aug. 10th—17th, 1831.	N. 64° w.	20° 30′ N.	" "	2160 "	14·4 "
V.	Aug. 12th—18th, 1835.	N. 73° w.	21° 4 ′ N.	" "	2430 "	16·5 "
XII.	Aug. 30th—Sept. 9th, 1842.	w.	23° 45′ N.	" "	2650 "	10·5 "
	Oct. 22d—Nov. 1st, 1842.	w.	12° N.	" "	2100 "	9 "

The average progression of the four American storms of this table somewhat exceeds fifteen miles an hour. It will be seen that the East Indian storm advanced only at the rate of nine miles per hour, which is one of the slowest rates yet observed, and is much below the average rate of progression of storms in the Asiatic

seas.* Perhaps the tardy progression in this case was owing to the proximity of the storm to the equatorial region and to a sluggish state of the aerial currents then prevailing on its track.

These five storms may be viewed as belonging to one group in the great system of storm paths; a system which appears to me as resulting *directly* from the dynamical influence of the diurnal and orbital revolutions of our planet.

Gales distinguished as Northers, in the Seas of Mexico and Central America.

The term *Northers* may well be applied locally to such storms as the first four comprised in the above table, which passed westwardly through the Mexican sea; for their vorticular rotation being in the direction from right to left, thus, ↺, they necessarily, on arriving near the coast, commenced to blow from some northern point of the horizon.

But the term is most frequently and technically applied to the numerous gales which visit the seas of Mexico and Central America from September to April, and which are almost unknown among the islands of the Antilles or West Indies. Two of these Northers, of much interest, will next claim our attention.

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* Mr. THOM computes the diurnal progression of the Rodriguez hurricane of April, 1843, in the South Indian Ocean, at about 220 or 230 miles, or between nine and ten miles an hour, during its early stages in the lower latitudes; and that it gradually diminished till, when near the tropic, it scarcely exceeded fifty miles per day.

Mr. THOM appears to think that the hurricanes of that region probably break up and disappear near the southern margin of the southeast trade wind. This view I cannot reconcile with previous observations in the two hemispheres. A wider scope of observation than was had in the Rodriguez storm would probably show that these hurricanes turn eastward in their course, after crossing the tropic, and that they are identical with some of the violent gales which China ships fall in with while running eastward in the Southern Ocean, between 36° and 40° of south latitude.

The Rodriguez hurricane may have commenced its *easterly* course soon after crossing the tropic; and its slow rate in this region I ascribe, chiefly, if not wholly, to the gradual cessation of its westerly progression.

I apprehend that to a like change in the winds from a westerly to an easterly progression, and *vice versa*, is also to be ascribed, mainly, the several parallel belts of calms and variables which are found on the exterior borders of the trade winds, between the trades and the monsoon winds, and on the equator. Such a system of changes in the great winds of the globe, in the regions referred to, I deem may be fully established by a proper analysis of existing authorities and observations.

Gale or Norther of the Gulf of Mexico in October, 1842.

This storm appeared at the southwestern borders of the Gulf of Mexico at the close of September and beginning of October; but from what direction it arrived in that region, does not clearly appear. We may suppose its previous course to have been westwardly, like other storms of these latitudes; and on almost any hypothesis its route must have been, in part, on the nearly adjacent portions of the Pacific Ocean and the gulf of Tehuantepec, a region which has long been noted for its tempestuous character.*

From the region first mentioned, this gale appears to have moved in a northeastwardly or more easterly course through the Mexican sea, across the peninsula of Florida, and over the Atlantic Ocean, touching the Bermudas, till, near the 60th degree of west longitude, it becomes lost to our present inquiries.

The route of this storm is indicated on Chart I, (track XIII;) and our reports and observations which relate to it are as follows. (See also Chart III; where the localities are indicated numerically.)

1. Weather at Vera Cruz, as per logbook of H. M. S. *Ringdove*:†—Sept. 29, A. M., wind N. N. W., force 4-2, b. c.; P. M., N. N. W. 4, b. c.—N. N. W. 6; o. c. q. r. At sunset struck topmasts and pointed yards to the wind; N. 7, q. r.—midnight, N. 8, b. c. q. Sept. 30th, b. c., wind N. 7; N. W. 5; W. 2; N. N. W. 6-7;—midnight, N. N. W. 6. Oct. 1st, A. M., b. c., wind N. N. W. 5; N. W. 4; P. M., W. N. W. 5, o. c. q.; N. N. W. 7, o. c. q. r.;—midnight, N. N. W. 6, o. c. q. Oct. 2d, A. M., wind N. N. W. 6, o. c. q.; N. W. 5, 4, b. c.;—P. M., N. W. 4; N. N. W. 5, b. c. Wind more moderate on the 3d, but continued N. N. W. and N. W. till about noon of the 4th. [This storm at Vera Cruz was a proper Norther of the Mexican coast, and its duration from Sept. 29th to Oct. 2d, shows its progress to have been very slow at that time. This protracted duration is not unfrequent, but rather common in the Northers at Vera Cruz. This may be ascribed, with probability, to the cessation of the westerly progression of the storm, and the gradual commencement of an easterly course.]

2. The Mexican brig *Secunda Fama* sailed from Vera Cruz on the 29th September. On the 2d of October in sight of the bar, [of Tampico, lat. 22° 15′,] was suddenly attacked by a violent gale of wind, which drove her on a reef of rocks four miles northward of Lobos Island, [lat. 21° 30′, lon. 97° 24′,] where the vessel filled, and those on board lost all hope of escape. On the morning of the 3d the clouds cleared away, and they discovered the Texan sloop of war *Austin* under the lee of the island, whose officers succeeded in reaching the wreck with a life-boat, saved the people, and landed them at Tampico.—(*Marine Report.*) [The shorter duration of the gale here than at Vera Cruz, shows a nearness to its northwestern border.]

3. The schr. *Caroline*, from Metamoras, took the gale at N. E., Oct. 1st, about 100 miles east of the Rio Grand del Norte; the wind first veered eastward, [as the vessel moved

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* Vide HUMBOLDT's New Spain; New York, 1811, Vol. I, pp. 21, 64—66. The Pacific coast of Central America being seldom visited by our navigators, we are unable to obtain reports from that region.

† For an explanation of Capt. BEAUFORT's meteorological symbols, see note at page 6.

southeastward,] and afterwards by N. to N. W. The gale lasted through the 2d of October, and the schr. was driven near to the Campeche Bank.—(*Statement of Capt.* COLLINS.)

4. The brig *Sabine*, for Campeche, went ashore at the Alacranes, on the Campeche Bank, [lat. 22° 30′, lon. 89° 43′,] Oct. 2d, in the hurricane, after cutting away both masts; was left in two feet of water after the sea went down.—(*Marine Report.*)

5. The ship *St. Mary* left the bar of the Mississippi on the 29th of September; on the 30th, wind E. N. E., squally, and a rolling sea *from S. E.*; lat. at noon 26° 33′, lon. 88°: prepared for bad weather. Oct. 1st, at noon lat. 25° 40′, lon. 88° 20′; calms and sudden gusts. Oct. 2d, before daylight the sea ran in all directions, as if at a distance the gale was blowing in a circle towards its center. At noon lat. 25° 20′, lon. 88° 40′; dense clouds in the eastern horizon and a cross sea.

At 7 P. M. on the 2d, after a calm, a tremendous gust from the east struck the ship; the hurricane had now commenced in earnest, and with a force seldom felt. The wind continued without cessation; and early in the morning of the 3d, the ship was hove to under a small storm staysail, which soon blew to fragments. Lat. at noon 24° 10′, lon. 89°;* the wind from the *East* continued to blow without intermission, with tremendous force; the sea ran cross and high, and the deck load was thrown overboard. Shortly after noon the wind veered suddenly to North, and blew with increased fury. The east sea, breaking in upon the decks, swept away from the lashings every movable article, burst in the front of the cabin and filled it with water. About 4 P. M. the wind shifted suddenly to the westward and blew, if it was possible, with still greater fury—the ship now on her beam ends, and the sea making a clear breach over her. It being evident the ship was settling and must soon go to the bottom, the only resource was adopted of cutting away the masts, and the topmasts and foremast went over the side. At 6 P. M. the extreme fury of the tempest ceased, leaving a prodigious sea, and the ship lay during the night a helpless wreck.†

The position at noon of the 4th, by good observations, was lat. 23° 57′, lon. 89° 30′, near the Bank of Campeche.—(*Journal of Capt.* FOSTER.)

6. Barque *Claremont*, from Laguna, on the 3d and 4th of October, lat. 25°, lon. 87°, had a severe gale of wind from S. E. to S. W.—(*Marine Report.*) [The veering of the wind in this case from the eastern to the *southern* and western quarter, the course of the storm being northeastward, shows this vessel to have been on the right of the line pursued by the axis of the gale. The opposite course and suddenness of the wind's changes with the *St. Mary*, show this ship to have been in the left center of the storm, and near the line pursued by its axis; the latter passing between the two vessels.]

7. Brig *Jena* was wrecked in the hurricane on the 4th of October, in lat. 25° 35′, lon. 87°.

8. Barque *Helen Maria* encountered the gale of the 4th-5th of October, off the Balize, and returned on the 12th.

9. Brig *Kanhawa*, from New Orleans, on the 4th and 5th of October, lat. 28°, lon. 86° 45′, experienced a violent hurricane from the east; was hove on her beam ends, lost spars, &c.—(*Marine Reports.*)

It may be perceived that this storm advanced but slowly, particularly on its first entrance upon the Gulf of Mexico. Capt. BUNKER, of the ship *Alabama*, for New Orleans, was hence enabled to avail himself of the strong southeasterly winds pertaining to the right front of the storm, in making a rapid passage from near

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* Capt. FOSTER states that his D. R. longitudes were found too far east, on getting an observation, owing to the strong westerly current then prevailing.

† Capt. FOSTER states that the carcasses of sea and land birds, in great numbers, were floating in the sea the day after the hurricane. These last could not have come from land to the eastward or even northward of the ship, as the winds then prevailed; but must have been blown from southern Mexico or Yucatan by a gale turning south and east around its axis.

the Tortugas to within forty miles of the bar of the Mississippi, where he hove the ship to, under the main-topsail only, headed to the southward. His statement continues as follows.

10. At sunset on the 4th, the wind continued increasing, the sea running high, and the barometer still falling, I was led to expect a hurricane, and made every thing doubly secure. The wind had veered to about east, and continued increasing, sounding more like thunder than wind. I looked often at the barometer, which was lower than ever I had seen it. At 3 A. M. of the 5th the foresail got loose, and in spite of all efforts was soon destroyed. I made preparation, for the first time in my life, to cut away the masts; but after getting all prepared, I looked at the barometer again and saw it was rising, and discovering at the same time that the wind had veered northwardly, I ordered the men to turn in for sleep; telling the mates they would want close-reefed sail on the ship by 8 A. M., which was the case as it proved. Was about 80 miles from the Balize at the close of the gale.*

Capt. BUNKER states that the ships which were nearer the north shore did not have the wind so heavy; and that the *Deucalion* of Boston carried double reefs till midnight, in order to weather the south point of the delta of the Mississippi.

11. Ship *Norfolk* for New Orleans took the gale about 200 miles from the Balize, [lat. 27°, lon. 86° 20′?] On the 3d the ship was hove to under bare poles. At 4 A. M. of the 4th was hove on her beam ends, and cut away the mainmast. Lost all the sails but one, with most of the spars, and suffered other damage.

12. Barque *Eliza Thornton*, from New Orleans, experienced tremendous gales on the 4th, in lat. 27°, lon. 86°. Lost topmasts, bulwarks, &c.

13. Brig *Horace*, from New Orleans, took the gale on the 4th, about 100 miles west of the Tortugas; was thrown on beam ends, lost spars, sails, bulwarks, &c.

14. Ship *Charlotte*, in gale of 4th–5th, lat. 28° 30′, lon. 85°, laid to 18 hours under bare poles: lost spars and sails, and suffered other damage.—(*Marine Reports.*)

The next report enables us to mark the access and progress of the *right border* of the storm, between the Tortugas and the western part of Cuba.

15. Barque *Mallory*, for Campechy, Oct. 3d, off Key West, begins with light airs and variable; A. M. strong breezes from S. S. E. and passing clouds: lat. at noon 24° 24′. P. M. commences with strong breezes from S. S. E. and passing clouds; at 8 P. M. took in the light sails; ends with strong breezes and heavy squalls. Oct. 4th, at 2 A. M. wind *South;* double reefed fore and main-topsail, took in jib and mainsail; 8 A. M. close reefed fore-topsail; forenoon strong gales and head sea; lat. obs. 24° 3′, lon. 82° 40′; P. M. commences with strong gale and cloudy; at 2 P. M. close reefed main-topsail, blowing hard in squalls; at 4 P. M. took in fore-topsail: 6 P. M. *wind S. W.;* wore ship, head to the southward, [which tended to carry the ship out of the gale;] midnight, more moderate. Oct. 5th, at 6 A. M. wind *W. S. W.;* at 8 A. M. made sail by the wind; at noon lat. obs. 24° 36′, lon. 83° 20′; P. M. wind W. S. W., moderate breezes and pleasant weather. Oct. 6th, light airs, and passing clouds; lat. obs. 23° 33′, lon. 83° 20′.†—(*Logbook.*)

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* When Capt. B. hove the ship to, he was uncertain of his latitude, having had no observations for two days.

† It will have been seen that the successive changes of wind on the south side of the *Antje's* gale, in September, were by the west towards the south, the progress of the gale being *westward*, and this the *left* side of the gale. In this October gale, however, which advanced in an easterly direction, the southerly side of the gale becomes the *right* side, and the order of the changes of wind is consequently reversed. Thus, with the *Mallory* the changes of wind were by the south towards the west, successively, while in the other storm, with the *Solway* and *Rover*, the changes were from westward towards the south. These opposite results necessarily pertain to whirlwind gales which revolve from right to left around their axis, while severally pursuing opposite courses.

16. Barque *Christiana*, from Jamaica for Greenock, lost topmasts, &c. in the gale while lying to under bare poles. [Place not given, but probably in the east part of the Gulf of Mexico, and west of the Tortugas.]

17. Brig *T. Street*, from New Orleans for Jamaica, lost masts, sails, &c. in the gale of Oct. 4th; which increased to a hurricane, and continued so for fifteen hours, from every point of the compass. [Position not given.]

18. Brig *Pantheon*, from Tobasco, [south side of the Gulf of Mexico,] was spoken on the 9th, between Matanzas and the south point of Florida, with loss of main-topmast in this gale on the 4th.

19. Schr. *Fancy* dismasted and wrecked in lat. 26° 15′, lon. 82° 23′, (south coast of the peninsula of Florida,) Oct. 6th. [This nautical date probably refers to the afternoon of the 5th, civil time.]

20. The brig *Ann Eliza*, on the north side of the Gulf of Mexico, off Cape San Blas, [about lat. 29° 30′, lon. 86° 20′,] had the gale severe from N. E. Oct. 5th, veering to N. and N. W.—(*Marine Reports.*)

21. Brig *Samson* came to anchor off St. Marks, Florida, [N. E. border of the Gulf of Mexico,] on the 4th, weather squally from the eastward with much thunder and lightning. Every squall became harder, till at 4 A. M. on the 5th, it was blowing a severe hurricane from E. by S., which drove the brig from her anchors, and continued, varying one or two points eastward, till 4 P. M., when it suddenly died away calm. This lasted about fifteen minutes, when the wind came from N. N. W. and blew with increased fury for about three hours, when it began to abate to a common gale of wind, which after 12 hours moderated. During the hurricane no canvass could stand a minute.—(*Statement of Capt.* SAWYER.) [This account marks the border of the *central lull* of the storm's vortex, which, from the statements of Capt. SAWYER, and of other seamen from this part of the Gulf, appears to have passed between St. Marks and Cedar Keys.]

22. At Cedar Keys, lat. 29° 9′, lon. 82° 56′, the hurricane commenced on the 4th from E. and S. E., and continued on the 5th, from S. E. and S., with heavy rain, till late in the night. On the 6th, cloudy and high winds from N. E. The water is stated to have risen 20 feet above low water mark, and within six feet of covering the island. [This shows the powerful effects of the southerly winds in the right side of the gale.]

23. At Apalachicola, lat. 29° 42′, lon. 85° 5′, Oct. 5th, it blew one of the severest gales on record during the whole day. The wind was at its greatest height about 4 P. M. Most of the houses were unroofed.

24. Fort Brooke, Tampa Bay, Oct. 4th, wind E., fair; 5th, storm, wind E. and. N. E.; 6th, N. E. and E., fair.*

25. Pensacola, lat. 30°, lon. 87° 12′, Oct. 3d, wind E., fair; 4th, N., high winds and rain. [This appears as near the northwestern limit of the storm.] 5th, wind E., cloudy,—S. E., fair.

26. Fort Stansbury, lat. 30° 18′, lon. 84° 8′, Oct. 3d, wind N., fair,—S., cloudy; 4th, E. and N., rain; 5th, N. E., rain and high wind; 6th, N. and N. W., rain; 7th, N. E., fair.

27. Fort Fanning, lat. 29° 38′, lon. 83° 9′, Oct. 3d, wind E., rainy; 4th, E., rain and high winds; 5th, N. and N. E., rain and high winds; 6th, N. and N. E., rain and windy; 7th, N. E., fair.

28. Fort Gamble, lat. 30° 25′, lon. 83° 25′, Oct. 3d, S. E., fair; 4th, N. E., rain; 5th, violent hurricane from N. E. with rain; 6th, N. W., cloudy; 7th, N. E., fair.

29. Fort King, lat. 29° 5′, lon. 82° 7′, Oct. 3d, E., fair; 4th, N. E., rain; 5th, S. E., rain with very high wind; 6th, S. E. and E., cloudy; 7th, S., cloudy.

30. Fort Micanopy, lat. 29° 5′, lon. 82° 5′, 4th, S. E., cloudy, N. E., fair, rain at night; 5th, E. and N. E., latter part a hurricane from S. E. and rain; 6th, N. E., cloudy and high winds; 7th, E., cloudy; 8th, E., fair.

31. Fort Shannon, lat. 29° 31′, lon. 81° 47′, Oct. 3d, N., fair; 4th, N., fair,—N. E., rain, (one third of an inch;) 5th, N. E., heavy gale and rain, (two and a half inches;) 6th, S. W. and N. W., heavy gale and cloudy; 7th, N., fair.

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* Reports from the military posts, Surgeon General's Office.

32. St. Augustine, lat. 29° 53′, lon. 77° 1′, Oct. 4th, E., rain A. M.; 5th, great gale from the E. and heavy rain. During the evening the wind varied from S. E. to S., and continued with increased violence during the night. Early on the 6th, the wind hauled round to the west, and somewhat abated; but about ten at night it shifted to due N., and blew much severer than had been experienced for years; 7th, N. E., rain; 8th, N. E., cloudy; 9th, S., fair.—(*Meteorological Reports to the Surgeon General.*)

Having crossed the peninsula of Florida with the gale, we again take up the Marine Reports.

33. Capt. LIOT, superintendent of the West India line of R. M. steam-ships, informs me that on his return from Nassau (N. P.) to Havanna, after dispatching the Isis, [see 56,] he encountered this gale in some force, on the Bahama Bank.

Barque *Effort*, from S. side of Cuba through the strait of Florida, took the gale on the 6th, lat. at noon, 27° 17′, lon. 79° 30′. At 8 P. M., wore ship and hove to on starboard tack, wind then about N. W. The gale lasted till midnight of the 7th, between N. W. and N. N. W.—(*Statement of Capt.* DAVIS.) [This vessel, aided by the Florida stream, run into the gale after it entered upon the Atlantic, and being under the lee of the peninsula, would be measurably protected from the right hand winds of the gale, but would encounter it in severity from N. W., as the gale become more advanced. It is usual for vessels coming through the strait of Florida, to keep the Gulf Stream as far as Hatteras, unless driven out of it by stress of weather.]

34. Brig *Delaware* had the gale severe on the 6th, lat. 28° 57′, lon. 79° 27′.

35. Packet *Hayne*, bound south, had a hurricane on the 6th and 7th, from all points of the compass, and was hove on her beam ends: lat. 29° 30′, lon. 80° 30′.

36. Brig *Caspar Hauser* sailed from Matanzas, Oct. 2d; took the gale on the 5th, lat. 30°, lon. 80°, and on the 6th it increased to a complete hurricane. During the night the gale raged with great violence, making a complete breach over the vessel, which had now sprung a leak. On the 7th, while the gale was still blowing, the crew were taken off by Capt. HUFFINGTON, of the barque *Cowper*, which also suffered in the gale. The *Caspar Hauser* had the gale at N. E., veering to N. W. [This shows the brig to have been in the left side of the storm, or N. W. of its axis line.]

37. Schr. *Maria* had the gale from northeastward; was hove on beam ends on the 6th, lat. 30° 30′, lon. 80°.

38 *a*. Barque *Virginia* was dismasted in the gale and abandoned on the 7th, in lat. 30° 30′, lon. 78° 36′ (?) Gale commenced Oct. 5th, from S. E., and continued increasing till noon; then moderated, to 4 P. M.; when it again came out in a tremendous squall from N. E., and continued till noon of the 6th; when, being water-logged, the officers and crew took to the long boat, and were taken up at 4 P. M. by schr. *Maria*, [last mentioned.] The gale continued through the night of the 6th, and moderated afternoon of the 7th.—(*Statement of* THOMAS TABER, *mate of the Virginia.*)

38 *b*. Brig *Florida Banca*, Oct. 4th, had the wind at E. N. E., veering to E. by S.; lat. at noon, 30° 10′, lon. 79° 15′. Oct. 5th, the gale became severe; lat. 31° 44′, lon. 78° 25′; P. M., gale E. N. E., veering to N. E. Oct. 6th, had the very hardest of the gale, from N. N. E.; lat. 31° 31′, lon. 79° 38′. Oct. 7th, wind north, lat. 31° 30′, lon. 79° 3′; wind abating and hauled to the northwestward.—(*Journal of Capt.* ELDRIDGE.)

39. Brig *Peru*, from New Orleans for Baltimore, took the gale in lat. 32° from E. N. E., which veered to W. N. W.

40. Brig *J. A. Lancaster*, for Savannah, took the gale Oct. 5th, ten miles south of Tybee light, [lat. 32°,] carried away spars, and was drifted as far south as lat. 28° 30′, and was in seven fathoms water off Cape Carnavaral.

41. At St. Mary's, Georgia, lat. 30° 44′, lon. 81° 42′, during the gale the waters rose very high; the streets near the river being several feet under water.

42. At Savannah, Georgia, lat. 32° 8′, lon. 81° 10′, Oct. 4th, wind E., fair. On the afternoon of the 5th, the wind commenced blowing hard from S. E. and E., with rain, until about 4 or 5 P. M., when it shifted to N. E., and increased in violence during the night to a hurricane, and continued, with torrents of rain, to 5 or 6 P. M. of the 6th. On the 7th, wind N. E., fair. 8th, the same.

43. At Charleston, (S. C.) lat. 32° 42′, lon. 79° 56′, Oct. 4th, wind E., cloudy, barometer 30·15. Oct. 5th, N. E., cloudy, the weather giving indications of an approaching gale, barometer 30·20; and at the close of the day, it commenced blowing heavily from E. N. E., which continued during the night. Oct. 6th, in the course of the morning, the wind changed to N. E. and N. N. E., and continued to blow a gale throughout the day, with a very high tide; barometer 30 inches. Oct. 7th, 7 A. M., wind N., fair; barometer 30·15; P. M., N. E., cloudy. [The high state of the barometer at Charleston, shows a proximity to the border of the storm, and perhaps an unusual pressure on this border.]

44. At Wilmington, (N. C.) lat. 34° 18′, lon. 78° 2′, the steamers for Charleston were detained in port during the 6th, on account of the gale.

45. Brig *New Hanover*, two days from Savannah, for Philadelphia, had a tremendous gale from E. to N. E.; laid to 18 hours without canvass, and drifted 150 miles southward of Savannah.

46. Ship *Lucas* left Charleston for Boston on the 3d Oct., and on 6th and 7th, had a gale fron N. E., which blew a perfect hurricane: was blown from Cape Romain, [lat 33° 1′, lon. 79° 24′,] to lat. 31°.

47. Schr. *John Hughes*, from Newbern for Barbadoes, was capsized on the 8th, under a storm staysail; one man taken off the bottom on the 11th, in lat. 33° 1′, lon. 77° 40′.

48. Brig *Philura*, on 6th Oct., in a gale off Cape Fear, was knocked down on her beam ends, and partly dismasted.

49. Brig *Hector*, Oct. 8th, lat. 33°, lon. 76° 25′, in a gale from S. E., [?] sprung the mainmast, lost sails, bulwarks, &c.

50. Brig *Orray Taft*, from Charleston for Providence, on the 4th Oct., was in lat 32° 48′, lon. 77° 11′. On the 7th, 8th and 9th, experienced heavy gales from E. to N. N. E.

We have other reports of this gale "off Cape Hatteras," but otherwise indefinite as to location. At a greater distance from the American coast, we have the following observations.

51. Brig *Francis* reports the gale from N. E. on the 7th Oct., lat. 32° 15′, lon. 73° 20′.

52. Schr. *Currency*, at Philadelphia, Oct. 16th, *from Turks Island*, experienced a heavy gale on the 7th and 8th.

53. Brig *Forrest* sailed from Portland, Oct. 2d, for Havanna. Oct. 7th, had strong breezes from E. N. E., and cloudy; at noon began to take in sail, the wind increasing; at 9 P. M., was under close-reefed main-topsail and reefed foresail, wind E. S. E., with a heavy sea; kept before the wind, both pumps going. At midnight the wind backed to E. by N., and blew a perfect hurricane; lay under bare poles, nearly buried in the sea, until 2 A. M. of the 8th. At 2h. 15m. A. M., a heavy blast capsized the brig: cut away the rigging, when the masts broke and the vessel righted. The crew then lashed to the quarter deck, the sea breaking over them, and remained lashed to the wreck till the 9th, [naut. time?] when the wind shifted to the west, and were taken off on the 11th. The position of the brig is not given in this account, but the wreck was seen, Oct. 15th, in lat. 32° 15′, lon. 71° 50′; having probably drifted, in this time, a degree or more to the southward of her position in the gale.

54. Brig *Sally Ann*, Oct. 6th, lat. 30°, lon. 73°, experienced a violent gale from S. E.

55. Schr. *Betsey Richards*, lat. 30°, lon. 71°, Oct. 8th, experienced a heavy gale from S. E., which lasted 54 hours. On the 9th, shipped a heavy sea, and suffered damage. [The dates here are probably nautical time.]

56. This gale caused the final loss of the R. M. steam-ship *Isis*, near Bermuda, Oct. 9th, which had left New Providence, Oct. 3d, at 8 P. M., for Bermuda, in a leaky condition, caused by striking on the rocks at Porto Rico. In the afternoon of Oct. 6th, a breeze sprung up from E. N. E., which gradually freshened, and at noon of the 7th, it blew a gale, with a heavy sea. The gale was heavy on the 8th and 9th, and on the morning of the 10th, the fires stopped, owing to the strain and increased leaking of the ship, and signals of distress were made to the *Medway*, which ship succeeded in taking off the passengers and crew, about 40 miles from Bermuda. On the 10th, the gale had abated.

57. From Bermuda we have the following report, from the journal kept at the signal station, Mount Langton.

Oct. 3d,	9 A. M.	wind N. 1,	cloudy,	bar. 30·03	Oct. 9th, 1 A. M.	w'd S. E. 9,	c. m. r. q. br. 29·91
	1 P. M.	W.	drizzle,	30·02	9 A. M.	S. E. 7,	c. m. 29·92
4th,	6 A. M.	E. 1,	rain.		noon,	S. E. by S. 8,	c. m. r. 29·91
	9 A. M.	N. 3,	cloudy,	30·02	2 P. M.	S. S. E. 8,	c. m. d. 29·86
5th,	9 A. M.	N. 5,	"	29·99	4 P. M.	S. 7,	c. m. 29·84
6th,	9 A. M.	N. 4,	"	30·03	5 P. M.	S. W. b. W. 8,	c. m. 29·84
7th,	9 A. M.	N. E. 5,	c.	30·13	10th, 8 A. M.	S. W. 4,	c. m. d. 29·96
8th,	9 A. M.	S. E. 6,	b. c.	30·06	noon,	N. W. 3,	c. r. 29·98

[It appears from the above, that the right hand or southern side of the gale passed over Bermuda between the 7th and 10th, the gale being but moderately severe, its axis passing to the north of the island.]

58. The *Sylph*, from New York for Bermuda, encountered contrary winds and heavy weather off that island on the 8th.

59. Brig *James*, for Bermuda, was in lat. 30° 3′, about 270 miles E. S. E. of Bermuda, at 1 P. M. of the 8th, when she first felt the influence of the gale, which increased with strong breezes from S. S. E., and cloudy with passing squalls. Oct. 9th, the wind had veered to S. S. W., and at 4 P. M. the brig was brought to under close-reefed topsails and storm staysails; at 8 P. M. strong wind; at midnight wind W. S. W., squally. At 4 A. M. of the 10th, more moderate; at 6 A. M. made sail, and at 10 A. M. saw Bermuda, 8 miles distant.—(*Logbook.*)

We have no reports from the northern side of the storm at this period, nor any account of its further progress on the Atlantic, though doubtless it must have been met with by many navigators. We may now take a cursory view of the weather on the two borders of the path of the storm.

From the Caribbean sea, we have no accounts that afford the slightest indication of the presence of the storm, either before or after its appearance in the Gulf of Mexico. On the 2d of October, the Brig *Echo* sailed, with other vessels, from Kingston, Jamaica, for Philadelphia, and met with no storm in those seas. So also the *Effort*, from Jamaica, as we have seen, made her first acquaintance with the gale near the northern part of the strait of Florida. There is the same absence of any evidence with regard to the occurrence of this storm at the great chain of the Antilles, and vessels bound northward from these islands, first encountered the gale north of the islands, in its progress to the eastward.

In front of the gale, we find, that in Florida and elsewhere, a mild state of the winds preceded the arrival of the storm, at successive localities; and further eastward, in its route on the Atlantic, vessels were spoken in mild weather immediately before its arrival.

From the left margin of the storm, we have the following reports; some of which afford indications of the effects or influence of the storm.

60. New Orleans Barracks, Oct. 2d, wind N. E.—N. W., cloudy and light rain; 3d, N. W., light rain; 4th, N., cloudy; 5th, N. E., cloudy.

61. Fort Pike, [nearer the storm,] lat. 30° 10′, lon. 89° 38′, Oct. 2d, wind E., cloudy; 3d, E. and S. E., cloudy; 4th, E., fair; 5th, E. and S. E., fair; 6th, S. E., fair.

62. Fort Morgan, (Ala.) lat. 30° 16′, lon. 88° 10′, Oct. 3d, S. E., fair; 4th, N. E. and N., clouds and drizzly; 5th, N., cloudy; 6th, N. E., fair. [An approximation to the storm seems noticeable on the 4th and 5th.]

63. Mt. Vernon Arsenal, lat. 31° 12′, lon. 88° 15′, Oct. 3d, S. W., fair; 4th, N. E., fair, S. E., slight rain; 5th, S. E., cloudy; 6th, N.—S. W., fair.

64. Augusta Arsenal, (Geo.) lat. 33° 27′, lon. 81° 30′, Oct 3d, N. E. and E., fair; 5th, E., cloudy; 6th, N. E., fair; 7th, N. E., fair; 8th, N. W., fair.

65. Fort Monroe, (Va.) near Norfolk, lat. 36° 51′, lon. 76° 19′, Oct. 5th, N. E., fair; 6th N. E., fair; 7th, N. E., fair, E., cloudy; 8th, S. E., fair; 9th, E., fair.

66. Fort McHenry, Baltimore, lat. 39° 17′, lon. 76° 36′, Oct. 5th, N. W., fair; 6th and 7th, N. E., fair; 8th, N. W., fair; 9th, N. W., rainy.—(*Reports to Surgeon General.*)

At New York, from the 4th to 7th of October, inclusive, in which time the storm had passed this meridian, the winds were light and variable, *the sky perfectly cloudless*, with the barometer ranging from 30·10 to 30·46, averaging 30·289; and no stormy weather occurred till the 14th of the month.

At the magnetic observatory, Toronto, lat. 43° 39′, lon. 79° 21′, from the 3d to 7th, inclusive, calms and light winds prevailed, mostly with clear weather, the barometer averaging ·158 in. higher than in the preceding month, ·207 in. higher than for the succeeding part of October, and ·212 in. above the annual mean of Toronto.*

But at Bermuda, towards which the storm was moving, the average barometrical pressure during the approach of the storm from the coast of Mexico, was more than one-tenth inch *below* its annual mean. This shows an inequality of pressure of nearly three-tenths of an inch, favoring the route pursued by the storm.

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* In Sept. 1839, the index readings of my barometer were .015 in. higher than the mountain barometer (No. 33) taken to the Toronto observatory, by Lieut. Riddell, who, while in New York, kindly afforded me an opportunity for comparison. The mean of my barometer for that and the five previous years, at 6 and 10 A. M., 2, 6 and 10 P. M., unreduced, was 30·113 in.; elevation of cistern between ten and fifteen feet above the sea level. The interior of the tube is ·26 in. and my readings have been taken from a point between the summit and line of contact of the column, estimated as equal to a level surface. In 1842 my barometer was removed to another station, some six feet higher; and the later annual means induce a suspicion that the index readings may have slightly lessened since that period; perhaps ·010 or ·014:—but this is by no means certain.

The corrections made in this paper of the index readings of some ship barometers, are the results of rough comparisons made, in this port, with my own barometer.

N.B. The arrow-points in the several ship-tracks indicate only the general course of the vessel.

Engd by J.M. Atwood N.Y.

Remarks and Generalizations.

I. Our accounts of this storm are more complete for the northern or left hand side of its axis than on its opposite or southern side, till after it had crossed the Gulf Stream. This seems owing, in part to the course pursued by the gale, and its relations to the common routes of commerce. The less violence of the gale at Vera Cruz than in the heart of the Gulf of Mexico, is in conformity with the usual character of the Northers on that coast, and with the general fact that storms which pass from elevated lands, or even from low countries, do not often act with great force at the surface of the ocean, till at a considerable distance from the coast; this being especially the case with that side of the storm which exhibits an off-shore wind.

II. The rotative character of this gale is well made out by the observed winds as they appear in the several reports, and especially in those of the *Caroline*, *St. Mary*, *Mallory*, *Alabama*, *Samson*, *Betsey Richards*, and at Bermuda, as compared consecutively, and with other parts of the storm, in the proper relations of time and locality.

III. The course pursued by the storm, from its first appearance in the Mexican Gulf, appears to have been northeastward, changing more and more eastward, till on crossing the Florida peninsula, its course was near E. N. E.

IV. The length of its observed track, estimated from Vera Cruz to a point in lon. 62°, is nearly two thousand and five hundred miles. If we consider ten days and a half as the time occupied in passing over this distance, it shows an average rate of progress less than *ten miles* an hour. This will account for the extraordinary duration of this gale, which was not at any time remarkable for the extent of its area: and will account in like manner for the inequality of its observed duration, with the several vessels whose movements were different from each other in direction and velocity. In these respects, this gale contrasts very strongly with one which we have yet to consider.

V. This storm deserves notice as pursuing a more easterly course in the lower latitudes than any other storm which has been traced in the American seas. It shows us, so far as is yet known, the extreme southern route of those Atlantic storms which have a northerly and easterly progression from the Gulf of Mexico or its

borders. This peculiarity of the storm, viewed in connection with its previous course from the southwestern extremity of the Gulf of Mexico, has strong claims on our attention.

VI. This gale is alike remarkable for the very southern position which must be assigned to the major axis, or apex, of its semi-orbital path; if we suppose that like other storms, it had a previous westerly course, unreported, in still lower latitudes.

VII. A sufficient cause for the above mentioned course of progression, or for the deviation from a more northern and usual course, is found in the relative states of atmospheric pressure at the time northward of the Gulf of Mexico and in the direction of Bermuda, respectively.

VIII. On the Mexican coast, this storm was properly known as a *Norte* or Norther, and like the usual storms or Northers of that region, it blew from northern points of the horizon, veering towards the northwest before its close.

A Cotemporaneous Hurricane in the Atlantic.

There was a very violent hurricane of short duration, narrow limits and more rapid progress, which passed a little northward of Bermuda near the beginning of the same month. It was encountered, Oct. 2d, by the *Emma*, in lat. 31°, lon. 71°; also, by the *Neptune*, lat. 32° 12′; and by the *Sophia*, lat. 32° 30′, lon. 70°. Next by the *Rienzi*, on the morning of Oct. 3d, in lat. 33° 19′, lon. 67° 32′; and on the same day by the *Cora*, in lat. 34° 10′, lon. 66°. So great was its violence, that nearly all these vessels were dismasted. It is believed that this gale was northward of the Danish island of St. Thomas on the 30th of September, with its border touching this island; and that in its course from thence it curved rapidly northward, to the position of the *Emma*, Oct. 2d, pursuing its course from thence in a northeasterly direction.

Description of the Northers of the Mexican Seas.

The descriptions hitherto given of the storms of this region, seem to be founded chiefly upon phenomena which have been common to particular parts of storms, while moving in certain routes or localities; and hence, as in the case of former descriptions of the West India hurricanes and the storms of the coast

of the United States, they have failed to impart any satisfactory knowledge of the general history and progress of these storms.

Mr. MOONEY, an officer of H. M. S. *Thunder*, engaged in nautical surveys, made a passage to Honduras and Vera Cruz in the month of December, 1840, "the very acme of the Northers." He says, "When about 40 miles from Vera Cruz, our forebodings [of the Northers] were realized; we had one of the most severe gales, with the exception of a hurricane, that the West Indies produce, and arrived at Vera Cruz after three days hard battering." Sailing from thence to Tampico, he encountered another Norther, commencing suddenly at N. N. E. Again, on the 11th of January, he arrived in the middle of a heavy Norther at Vera Cruz. Sailed on the 15th, was set to the southeast, "*and thereby escaped a gale that blew to the northward of us.* We had the concomitant swell as long and heavy as usual, but had only light winds, and puffs, and dark lowering weather, with a cross sea, which effectually saved us the trouble of washing ourselves or the deck." Of the Norther he says, "just before it commences the scud can be perceived progressing at no small pace from southeast to northwest.....I think it better for a vessel to keep as near the land as possible on these occasions. The wind blows more along shore—if weather and sky is clear, observations can be obtained. *The gale first lulls in shore, and the heavy dense bank* [of clouds] *can be seen about* 20 *or* 25 *miles out*, and there it hangs till the gale breaks altogether, enveloping many a hapless vessel in darkness, *whilst their more in-shore neighbors enjoy comparatively fine weather.*" [I have italicised certain passages in these and subsequent extracts, as having some important bearing. The above is from the Nautical Magazine for 1841.]

Don BERNADA DE ORTA, captain in the Spanish navy, [who is quoted as authority by HUMBOLDT and others,] states that the season in which the *Norths* blow is from September to March, and that the first of the norths is regularly felt in the month of September. In the winter months, after they begin they increase fast, and in four hours or a little more obtain their utmost strength, with which they continue 48 hours; but afterwards, though they do not cease for some days, they are moderate. They come on so frequently that *there are in general not more than four or six days between them.* There are various signs by which the coming on of a Norther may be foreseen—*but the most certain of all is the barometer*, which at Vera Cruz, in the time of the Norths, varies eight tenths between its highest and lowest range. *The descent of the mercury predicts the Northers*; but they do not begin to blow [at Vera Cruz] the moment it sinks, which it always does a short time *before the North comes on.* Examples are not wanting of the norths happening in May, June, July and August, at which times they are most furious, *being violent hurricanes*, and are called *Nortes del Muero Colorado. They begin at the N. E.*, flying round the compass and *settling at N. N. W.* When the wind begins to veer again towards either the east or the west, the gale will soon be over.—(*See* HUMBOLDT'S *New Spain*; *American Coast Pilot*; *Penny Cyclopedia*, *&c.*)

According to HUMBOLDT, both the eastern and Pacific coasts of Mexico are rendered inaccessible for several months by severe tempests, the Norths prevailing in the Gulf of Mexico, while the navigation of the western [Pacific] coasts is very dangerous in July and August, when terrible hurricanes blow from the S. W. At that time, and even in September and October, the ports of San Blas and Acapulco are of very difficult access. Even in the fine season, from October to May, this coast is visited by impetuous winds from N. E. and N. N. E., known by the names of *papagallo* and *tehuantepec.*

It appears in like manner that the coast of Nicarugua and Guatimala, in the Pacific, is visited by violent southwest gales in the months of August and September, known by the name of *tapayaguas*, which are accompanied with thunder and excessive rains; while the *tehuantepec* and *papagallos* exert their violence during a clear sky.

This seems to show that the so called Papagallos, Tehuantepec, and Norther of Vera Cruz, severally, are but the clear weather side of a revolving gale, like the northwester of the coast of the United States; each in its turn being but part of a great vortical storm, which, in certain other portions of its area, or route, often exhibits an abundance of rain.

Humboldt suggested that these northerly winds may blow from the Atlantic and Gulf of Mexico to the Pacific, and that the Tehuantepec and Papagallo, may be merely the effect, or rather the continuation of the north wind of the Mexican Gulf and the *brizottes* of St. Martha. But the vortical character and determinate progression of violent gales was then unknown, and I cannot doubt that the Northers which visit the Pacific coast and the Gulf of Tehuantepec *precede*, in point of time, the same storms in the Gulf of Mexico, and are identical with them, having, commonly, in this region, a northerly progression.

Col. Reid says, "it is possible that the Spaniards may apply the term Nortes, or Northers, to more than one phenomenon; but the violent north winds in the neighborhood of Vera Cruz, are frequently no other than the left hand side of rotatory storms, in their northerly progress across the Gulf of Mexico."* In this remark I fully concur.

Identity of Mexican Northers with the Storms of the United States.

When I first ascertained that many of the hurricanes of the West Indies, had visited the Atlantic coast of the United States, and that here they had severally exhibited the common characters either of southeasters or northeasters, according as one or another part of the storm was presented to our observation, it became alike evident, that our storms were far more numerous

* Second edition of "Attempt to develop the Law of Storms," &c. London, 1841.

and frequent than the hurricanes of the West Indies. It was known, also, that the Mexican Northers were of very frequent occurrence, during our most stormy seasons of the year; while it seemed at least probable, that all great storms were governed by one and the same law, deriving their origin from the lower latitudes.

But the presumption naturally arose, that the courses of these Northers would be found generally parallel with the routes of the several storms which had been traced from the West Indies to our Atlantic coast, and that hence, they would, in most cases, prove to be identical with the storms that are found west of the Alleghanies, which sweep over the interior of the United States and the British provinces;—and to a large extent this is doubtless true. But the absence of sufficient observations from beyond the Mississippi, together with the inert character of many storms and the always more intangible or indistinct character of such as pursue their course overland, has hitherto prevented their direct identification with the Mexican Northers by consecutive observations. Nor was I sufficiently aware that the easterly progression of some of these Northers commenced in lower latitudes than in the previously observed cases of the West India hurricanes.

In October, 1837, the steamboat *Home* was wrecked near Cape Hatteras, and having afterwards occasion to investigate the causes of this disaster, I found that the catastrophe occurred toward the close of a northeast gale, that had previously visited the western and northern coasts of the Gulf of Mexico with great violence, and had passed from thence to the coast of North Carolina. In other words, this Norther of the Mexican coast had become, in due course of progression, an Atlantic storm.

Racer's Storm of Jamaica, Mexico and Hatteras, in September and October, 1837.

On receiving the second edition of Col. Reid's work, in Feb. 1842, I found that his attention had also been drawn to the "Northers," and that he had presented valuable data relating to two storms, the *Racer's* hurricane of 1837, and the storm in which Admiral Solano's fleet was dispersed in 1780, both of which he viewed as being related to the proper Northers of the Mexican sea. On recurring to my records of the *Home* storm

of Oct. 1837, for the purpose of completing these paragraphs, I perceive that this gale must have been identical with the *Racer's* storm of Col. Reid. This extension of its observed route serves to confirm the views which he then expressed; while it becomes important as connecting a Norther of the Mexican coast with first a westerly, then an easterly progression, actually observed, and analogous in character to the known progression of the West India hurricanes. (Chart I, track XV.)

Col. Reid's earliest account places this storm at Kingston, south side of Jamaica, on the 26th and 27th of Sept., where vessels were driven from their moorings in such manner as seems to show an easterly gale, veering southeasterly. H. M. S. *Racer* took the gale at E. N. E. near the Grand Cayman on the 28th, which increased to a full hurricane; noon of 29th, lat. 19° 43′, lon. 83° 23′; at 7 P. M. was hove on beam ends, dismasted, and righted with 5½ feet of water in the hold; 9·30 P. M. again hove on beam ends, but righted immediately; midnight, hurricane at its full height; at 2·30 A. M. of 30th had veered to E. S. E., still in full force; noon, lat. 20° 12′, lon. 84° 42′, wind E. S. E. but little abated. Oct. 1st, noon, lat. 22° 22′, lon. 85° 36′, in Gulf of Mexico near Cuba; gale abating. H. M. S. *Ringdove* took the gale early on the 28th, blowing from the eastward, on the south side of Cuba, eastward of Trinidad; 29th, increasing from the E.; lat. 21° 21′, lon. 82° 56′, scudding to the westward; 30th, hard gale from E.; lat. 23° 13′, lon. 86° 32′, in the Gulf of Mexico; 7·30 P. M. shipped a heavy sea, stove weather ports and washed away the binnacles. Oct. 1st, strong gales; 10 A. M. moderating, set close-reefed main-topsail; noon, lat. 23° 16′, lon. 87° 48′, wind E. S. E., under main-topsail, trysails, and fore-stay-sail; morning of 2d, fresh breeze and cloudy; breeze going down. On all this route the phases of the wind show the several observers to have been on the right hand side of the storm's axis.*

I find that the schr. *Active* encountered this hurricane on the 1st of Oct., 47 miles N. of Sisal, (about lat. 22° 10′, lon. 90° 12′,) which lasted thirty eight hours, or, probably, till the morning of the 3d. The schr. *Pomona* which left Sisal in company with the *Active*, was dismasted by it. On the 3d, the schr. *Unber*, from New Orleans, encountered this gale in the Gulf of

* For logs and diagram, see Reid on the Law of Storms, 2d edition, pp. 138–146.

Mexico and was driven by it to Galveston Island, where we shall find it on the 5th. The schr. *Cora* for Tampico, had the gale severe, in lat. 24°, lon. 93°, which lasted from the 1st to the 6th of Oct., and was greatly injured. On the 2d, 3d, and 4th, the storm was at Metamoras, on the Rio Grand del Norte, lat. 26°, lon. 97° 30′, and along the coast, where it drove the vessels on shore and prostrated all the buildings at the usual port of the Rio Grand. At Galveston, lat. 29° 20′, lon. 95°, the hurricane drove nearly all the vessels ashore on the 5th, where they were left high and dry, as in the neighborhood of Metamoras. The great influx of the sea on this coast, during the gale, is evidently due to the force and extent of the easterly winds on the right hand side of the storm; which, from the vicinity of Metamoras, was recurving eastwardly in its course.

That the storm did not proceed far into the interior in a northwesterly direction from the Gulf of Mexico, is shown by the meteorological reports to the Surgeon General, from Fort Towson and other western posts. In following its course eastwardly, we find that on the Sabine river, in lat. 30° 51′, lon. 93° 33′, the storm, from N. E. and E., was at its height on the night of the 5th, and continued through the 6th. At New Orleans the gale or hurricane was severe on the 6th, hardest at evening, blowing from S. E. to S., and extending to Baton Rouge and Natchez; at which places it was easterly, and E. N. E., veering north.* At Pensacola Bay it commenced on the afternoon of the 6th, from the eastward, and veered gradually to the S. on the morning of the 7th, and to the W. and N. W. during the day and evening.† At St. Joseph's, West Florida, the gale was severe on the 7th and 8th, from E. round by S., ultimately to N. W., driving all the vessels on shore except one. At Fort Cass, East Tennessee, and in the upper counties of South Carolina, the storm was violent from N. E., veering N., on the 7th and 8th. The gale was on the coast of North Carolina from the 8th to 10th, blowing from N. E. and extending N. of the Chesapeake; with the barometer, at New

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* I am indebted to Dr. Henry Tooley of Natchez, for regular files of his valuable meteorological observations, which I have found highly useful in these inquiries: also, to Professors Loomis and Nooney for their observations at Hudson, Ohio.

† Logbooks of the United States' Squadron at anchor in Pensacola Bay; on file in the Navy Department, Washington.

York, at a maximum of 30·73 in. on the 9th. From the Carolinas it continued its course on the Atlantic Ocean.

The recurvation of this storm to the eastward, from near lat. 26°, was even more sudden and abrupt than that of the Mexican and Bermuda gale, from a lower latitude, which we have already considered. A like cause also for its sudden deflection and unusually eastern course is found in a *plus* state of the barometric pressure in more northern latitudes, at this period. Thus, at New York during the last ten days of Sept., 1837, the mean of my barometer was 30·324 in., and for the first ten days of Oct. 30·279 in.;* being for the twenty days ·216 in. above the mean for that year.

When once the route of this storm from the Gulf of Mexico to the Atlantic Ocean had been ascertained, it was soon discovered that a similar course had pertained to many other storms from the same regions; but with great inequality as regards their frequency in different years. It was found, also, that this early recurvation of storms at some periods, and their easterly courses in lower latitudes, has an important influence on the weather and climate in the northern portion of the United States. This may be seen in the state of the barometer and weather, which we have shown in two important cases, cotemporaneously with the passage of storms over the southern states; and similar weather usually prevails whenever this peculiar course is pursued by the Mexican Northers. For the intervals between our storms, in the northern states, are thereby increased, in extent and duration; and hence it is that we enjoy those placid periods of autumn which are denominated *Indian summers*,—of which the cases alluded to are striking examples.

This peculiar course of a portion of the Northers was uncommonly frequent in 1837; a year remarkable for the number and severity of its hurricanes. The autumn of 1845 has also been strongly marked by this peculiarity; with fine weather generally prevailing in the northern states, while severe gales have swept the Gulf of Mexico and thence over the Atlantic Ocean, touching Bermuda in several cases, in one of which the body of the storm is announced to have passed to the southward of this island.

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* Or a mean of 30·256 in. for the twenty days, *as corrected and reduced to* 30° *Fahrenheit.*

In fact, storms of this class are found to occur, with variable frequency, at almost all seasons of the year.

New England Storm of December 15*th*, 1839.

This storm may here be noticed as one of the numerous class of overland storms, which appear to come to us from the interior of the United States and the Mexican territories. In the southwestern and western states this storm comprised the western division of a very extensive but not intense barometric depression, of some days continuance, and like many other storms, was but little distinguished for the development of its anterior winds. The fall of the barometer under these winds, in New York and the middle states, was only about half an inch below the mean of the year. The storm was chiefly remarkable for its violence in New England, on the left side of its axis,—for the extent of the moderate and variable winds about its axis,—for the short duration of the southeasterly and southerly winds of its right front, and for the great extent of westerly winds which were developed in the later part of the gale, which reached even to the border of the trade winds. The route of this storm is now placed on chart I, (track XVI,) in conformity with extensive observations, obtained from the meteorological returns from the military posts, marine reports and other sources.*

A number of storms, of greater intensity and more strongly marked outline, may be shown to have pursued a similar course over the interior of our continent and from thence to the Atlantic Ocean. But our attention must next be directed to Northers which come to the shores of the United States, not from Mexico, but from Central America, by a route more direct than has yet been considered.

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* The position of this storm at noon of Dec. 15th, with the directions of its winds, I have shown on a map published in the Transactions of the American Philosophical Society, Vol. VIII, Part 1, p. 81: for which see also this Journal, Vol. XLII, p. 117.

On this diagram, and a smaller one (ibid. p. 116) showing the direction of its winds at sunset of the 15th, I have assumed its progression to have been nearly northeast; but the more easterly course of the storm now shown on Chart I, accords equally with the rotatory character of its winds, as exhibited at sunset, except it be with the lighter winds in the region bordering on the place of its axis, near the southeastern coast of Massachusetts.

Hurricane of the Honduras Sea, Cuba, and the Western Atlantic, in October, 1844.

This remarkable storm, which I designate as the *Cuba Hurricane*, came from the direction of the Pacific Ocean and the regions of Central America. It appears to have entered upon the bay or sea of Honduras, which is the western arm of the Caribbean sea, directly from the countries of Honduras, Poyais and Yucatan, on the 3d and 4th of October. From the Honduras sea it passed over the island of Cuba, the southern part of Florida, and the Bahama Islands, and continued in a northeasterly course, to the Gulf of St. Lawrence and the island of Newfoundland, with a rapidity of progress hitherto unknown in American storms. It swept, in its progress, the salient portions of the North American continent on the one hand, and the eastern parts of Cuba and Newfoundland, together with Bermuda, on the other; while its pathway exhibited an amount of injury and destruction such as is rarely known in the annals of commerce.

Precursory Storm. On the 1st and 2d days of October, Cuba was visited with stormy weather, attended by an extensive and unusual fall of the barometer; and this depression of the barometer was mainly or partially continued after the gale had ceased, the weather remaining unsettled. I cannot trace, otherwise than barometrically, the progress of this prelusive storm on its departure from Cuba, except at Key West, and again in the higher latitudes; as will be seen hereafter. It was included, evidently, in a vast gyrative influence which comprised both storms; while the principal or most active vortex was developed in the subsequent hurricane. It will be found that the barometric depression of this earlier storm, continued to advance along the whole Atlantic coast of the United States, and over a wide extent of adjacent country. The probable influence of this advanced diminution of pressure, on the course and progression of the hurricane which followed, may be hereafter considered.

Preliminary Statements. A violent thunder-storm, attended with heavy rains, visited Barbadoes and other windward islands, on or about the 25th of September; but, so far as I can learn, this atmospheric disturbance did not move down the Caribbean

sea. On the contrary the weather was fine on the coast of Columbia, for the last ten days of September and the first week in October, with light westerly winds.*

A 'norther' of moderate force visited the eastern borders of Mexico during the latter days of September, of which I have found subsequent traces in the basin of the Mississippi. At Tampico and Vera Cruz two northers appeared between the 21st of September and the 1st of October, followed, at Vera Cruz and the southern part of the Gulf of Mexico, by a norther which was cotemporaneous and perhaps connected with the Cuba storm, prelusory to the great hurricane. An abridged extract from the logbook of the U. S. steamer *Union*, in the early part of October, from off Velasco to Pensacola, is given below, and her track will be found on chart IV, which illustrates this storm.† See also the abridged log of the R. M. steamer *Trent*.

Various accounts have been obtained from the tract of ocean lying east of the storm's path, by means of marine reports, vessels spoken, logbooks, &c.; and the positions of some vessels are marked on the chart. But we have no evidence of the prevalence of a storm in this region at that period, other than appears in our recitals.

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* Statements of shipmasters from that coast.

† U. S. steamer *Union*, Lieut. McBLAIR, at anchor off Velasco, Sept. 26th; P. M. fresh breeze from N. E. and squally; wind increasing with rain;—27th, increasing from southeastward till 8 A. M.; moderating till noon. Velasco W. by N. 6 miles. P. M. winds light and variable; from 4 P. M. fresh gales from northward and cloudy. Sept. 28th, A. M. fresh gales from northward with rain; P. M. fresh from northward and N. W. and cloudy, with a high sea. Sept. 29th, A. M. moderating and sea going down. Lat. obs. 28° 50′; P. M. at sea, moderate breeze from N. E. and pleasant. Sept. 30th, lat. 27° 48′, lon. (chr.) 94° 43′, moderate breeze E. N. E.; ends squally from N. E. Oct. 1st, moderate winds E. N. E. and pleasant; lat. 27° 53′, lon. 94° 15′, P. M. fresh breezes from N. E. by E., and E., pleasant. Oct. 2d, moderate and light winds E. N. E. and pleasant; lat. 28° 46′, lon. 94° 38′; P. M. same. Oct. 3d, light winds from N. E. and pleasant weather; lat. 28° 32′, lon. 94° 11′; P. M. light wind from N. and pleasant. Oct. 4th, moderate from N. E., clear and pleasant; 8 A. M. to noon fresh, N. N. E. and pleasant; lat. 27° 57′, lon. 92° 51′; P. M. moderate breeze from N. E. Oct. 5th, wind from N. E.; from 8 A. M. *a heavy swell from northeastward;* lat. 27° 22′, lon. 91° 30′; P. M. light winds from northward and pleasant. Oct. 6th, light winds N. W., N. and S. W. and pleasant; lat. 27° 50′, lon. 89° 40′; till 4 P. M. N. W. light and pleasant; evening, squally. Morning of 7th, N. W. pleasant; noon of 7th, lat. 28° 31′, lon. 87° 13′. [For a further account of the Northers on the coast of Mexico, near the close of September, see the report from R. M. steamer *Trent* in the recitals, case 2*c*.]

The accounts now to be exhibited will serve to determine the route, character, extent, and progression of this memorable hurricane, and of the barometric depression and the expanded storm which preceded it. The principal facts which these accounts afford, have been first duly noted geographically, upon a large marine chart; in process of which it became apparent that the chief violence of the gale was exhibited along the more central portions of the track. It was found, also, that a direct line drawn from the island of Ruatan, on the coast of Honduras, in the direction of N. 40° E., crossing Cuba, Sable Island and Newfoundland, would bisect the area of violence throughout this distance. It likewise appeared, on farther inspection, that by changing this line to one slightly curved, by bending its central portion slightly towards Cape Hatteras and its extremities in the opposite direction, it would be found to divide very nearly, that portion of the track in which the winds set in from the southeastern quarter and veered by the *south* to the westward, from that other portion of the storm's path in which its winds commenced from the eastern or northeastern quarter and veered by the *north* to the northwestern quarter. This line is therefore adopted on the annexed chart, (chart IV,) as indicating, with approximate accuracy, the route pursued by the axis of the gale, and will be called the *axis line.*

This axis line is supposed to intersect the 20th parallel of latitude near lon. 83°,—crosses Cuba to the eastward of Matanzas, passes near Orange Key,—near the west point of Abaco,—intersects parallel 30° near lon. 75° 15′,—par. 40° near lon. 65°,—par. 45° near lon. 58° 30′, and par. 50° near lon. 50° 40′. Lines are also drawn at the distance of sixty miles on each side of the axis line, as approximating a center path of one hundred and twenty miles in width; also at distances of two hundred and four hundred miles, on each side of the axis line, for the general purposes of reference, in scanning the observations. The supposed distances of the several vessels, or places of observation, from the axis of the gale, when nearest the same, will be stated in miles, sixty nine to a degree of the meridian,—with the initials, R. if to the right, and L. if to the left of the axis line.

Our limits do not allow the printing of the several logs and meteorological reports at full length and in their tabular forms; but in the necessary abridgments of these, and of written statements received from shipmasters, I have endeavored faithfully

to exhibit all that can serve to afford us any knowledge of the strength, extent and progress of the storm, and of the time and manner in which its winds were successively exhibited.

I will first submit such accounts of the storm as relate to the left hand side of the axis line, as far onward, in its course, as the south shore of Cuba, and including the adjacent portions of the Gulf of Mexico.

1. At Belize, British Honduras, lat. 17° 29′, lon. 88° 12′, [180 miles L. ?] the weather in the first week in October, as stated by the master of the *Gilbert Hatfield*, "was very bad;" with squalls and heavy rains; "very wild weather." The mate thinks the worst of the weather was between the 1st and 4th of October. [This position was in the Belize river, near the southeastern shore of the peninsula of Yucatan, and under the immediate shelter of the broadest if not the most elevated portion of Central America.]*

Mr. LONSWORTH, pilot at Belize, informed Capt. GOOD that the effects of the gale were experienced on all the Honduras coast. Capt. REED was informed at Belize, that the gale was heavy outside, and that several vessels drove from the anchorage.

2*a*. Logbook of brig *Maria L. Hill*, at anchor off Campeche, lat. 19° 51′, lon. 90° 33′, [380 miles L. ?] "Oct. 2d, pleasant. Oct. 3d, strong Norther this day; received no cargo. Friday, 4th, strong Norther all this twenty-four hours; received no cargo. Oct. 5th, more moderate; wind still to the north."—From this time the weather continued pleasant till the 13th. [This appears to show us the left border of the gale.]

2*b*. At Grand Suline, (Bouche de Silan,) N. coast of Yucatan, lat. 21° 25′, lon. 88° 42′, [360 miles L.,] the *Betsey Hall*, loaded with mahogany and ready for sea, went on shore Oct. 4th, during a heavy swell and imbedded in the sand. The *Alexander Petron* and *Artebonite* also dragged their anchors and went on shore; the former knocked her bottom out and sunk.—(*Shipping Lists.*)

2*c*. Royal Mail steamer *Trent*, at anchor off Tampico, took a Norther on the night of Sept. 21st, and was compelled to slip cables and proceed to sea; continued blowing from N. N. W. till 24th, with barometer from 29·80 to 29·82. Returned to the anchorage and had strong breezes between S. E. and E. N. E. till 27th, when the wind hauled to N. N. E. At 4 A. M. of the 28th, a violent northerly gale set in, with no indication beyond the rising of the barometer, which compelled us to slip a second time, blowing from N. N. W., with a heavy sea, through the 29th, and continued with strong breezes on the 30th,—and fresh breezes Oct. 1st, with fine weather; the barometer ranging throughout the Norther, from 30 in. to 30·14; thermometer from 82° to 78° Fahr.

Oct. 2d, fresh breezes with dark blue clouds to the N. W.; at 8 A. M anchored at Vera Cruz; bar. 30·15, wind increasing; noon, strong breezes, bar. 30·12; 4 P. M. fresh gales from N. N. W.; 6 P. M. proceeded to sea; 8 P. M. bar. 30·07, therm. 82°; midnight, heavy gales with much sea. Oct. 3d. A. M. fresh breezes from N. N. W., with thick rain and much sea; 8 A. M. bar. 30·02; noon, 30·00, lat. 20° 7′, lon. 94° 29′; 8 P. M. bar. 29·93, range of therm. 85° to 84°; towards midnight heavy gales from N. W. Oct. 4th, strong gales this day from N. to N. N. W. with heavy sea from northward, the bar. fell in half an hour from 29·98 to 29·90; 8 A. M. bar. 29·90; noon, bar. 29·92, lat. 20° 14′, lon. 92° 40′, *the swell became very high and came from N. E.;* [then 540 miles L. ?] weather hazy and sky of a copper-colored appearance, *small scud flying fast;* 8 P. M. bar. 29·92; therm. 84° to 83°. Oct. 5th, strong breezes and squally this day, from N. N. W. to N.; 8 A. M. bar. 30·02; noon, 30·02, lat. 21° 53′, lon. 90° 17′, [468 miles L. (?)] therm. 84° to 82°, atmosphere still hazy, air cooler to the sense, heavenly bodies much clearer. Oct. 6th, moderate breezes from N. by W. and fine, atmosphere clear and dry, bar. 30·02 to 30·05, lat. 22° 31′, lon. 87°,

* The profile elevation of this part of Central America, above the two oceans, is believed to be about five thousand feet. But both eastward, and westward, near the Lake of Nicaragua, and at the isthmus of Tehuantepec, the elevation is inconsiderable, say five hundred feet.

therm. 83° to 82°.—[Abridged from journal of J. F. BOXER, R. N., Commander, received from Col. REID, February, 1846.]

[From the time of reaching Vera Cruz, this steamer appears to have experienced bad weather almost simultaneously with that which visited Jamaica and the S. side of Cuba, which remitted on the 3d; and on the 4th, this vessel evidently had begun to encounter the swell and blow pertaining to the Cuba hurricane, which abated on the 5th.]

3. Ship *Clyde*, laden with mahogany, left Omoa, [south part of the bay of Honduras, lat. 15° 45′, lon. 88°,] and has not been heard of; but part of her cargo was found, after the gale, near the Northern Triangles, lat. 18° 40′, lon. 87° 15′, [170 miles L.]

The brig *Florida Banca*, which, as we have seen, encountered the two previous hurricanes, left Belize Oct. 1st, and has never been heard from since that date.

4. Ship *Gossypium*, from Liverpool for New Orleans, on the 4th and 5th Oct., lat. 20° 30′, lon. 85°, [130 miles L.,] experienced a hurricane, with the wind veering round the compass; on 5th lost fore and main masts and sprung the rudder. Oct. 7th, spoke a brig from Jamaica which had lost spars and sails in the hurricane. [The phrase "round the compass," is used somewhat vaguely by seamen. This ship being in the left center of the gale, probably had the same succession of winds as the *Angola* and *Openango*. (Nos. 6 and 7.)]

5. Brig *Majestic*; Friday, Oct. 4th, commences with heavy weather blowing from E. S. E. At noon both masts went over the side, carrying with them bulwarks, &c. At 1 P. M. shipped a heavy sea, which washed away quarter bulwarks, with the captain and one seaman; at 3 P. M. a little moderate; at 4 P. M. increased in a hurricane from N. W. At 8 A. M. of the 5th, blowing a moderate gale from W. N. W.; made sail, on jury-masts, for Jamaica or Grand Cayman; lat. at noon by obs. 20° 15′, lon. 82° 45′. [Probable position on the 4th when the gale shifted, lat. 20° 30′, lon. 83° 10′, or 30 miles left of axis line; the brig having been afterwards driven with a N. W. gale, and being on or near the axis line at noon of the 5th.]

6. Brig *Angola* was dismasted in the hurricane, about 50 miles off the west part of the Isle of Pines, [(?) lat. 20° 45′, lon. 83° 40′, 69 miles L., ?] on the night of Oct. 4th. At 8 A. M. of the 4th, the gale had become so violent that the brig was hove to, and so continued till dismasted, the wind from E. N. E., veering to N. N. E.; was heaviest from 6 to 11 P. M., and continued to veer from N. N. E. to N. W., after which it began to moderate. The brig's barometer in the gale, was observed at 29 inches.

7. Brig *Openango*, from Jamaica; on the morning of Oct. 4th, it commenced blowing from the eastward and increased during the day, hauling to the northward. Had the heaviest of the hurricane from N. N. E. to N. N. W., between the hours of 5 and 10 P. M. of the 4th, lat. 21° 15′, lon. 83° 30′, [74 miles L.] It continued blowing during the night and veering to the N. W., gradually abating. Lost spars, sprung a leak, &c. When it moderated the brig was judged to be in lat. 20°, lon. 82° 30′.

8. Ship *Hermann*, for New Orleans, was dismasted in the hurricane, Oct. 4th, on the S. side of Cuba. On the 5th, saw a brig 150 miles from the land, totally dismasted, [(?) lat. 19° 50′, lon. 84°. ?]

9. Ship *Elizabeth*, encountered the storm on the night of Oct. 4th, the wind blowing a terrible gale from the westward.(?)* On the 5th, the gale increased to a hurricane, and shortly the main and mizen-masts were carried overboard by its violence. In the succeeding night it was found that the ship had sprung a leak; all took to the boats, and the ship soon went down. The boats then *pulled to the westward* in a heavy sea; one boat reached Sisal on the coast of Campeche, in six days; another was picked up by a brig bound to Vera Cruz; the third, containing the officers and most of the passengers, was never heard of. [This account seems to show that the ship was near the W. end of Cuba, in the Yucatan channel or the adjacent borders of the Gulf of Mexico.]

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* The true solution of this, probably is, that the wind was blowing from the westward at the time when the ship was dismasted; unless we assume the word "westward" to be an error. The report evidently is from the suffering seamen who survived.

10. Ship *Dantzig*, for Havana, was spoken on the 11th in lat. 23° 30′, lon. 86° 30′, having been dismasted in the hurricane *on the 4th October*. [Must have met the hurricane on the south side, or off the west end of Cuba.]

11. Barque *Franklin*, Oct. 4th, off the west end of Cuba, experienced a tremendous hurricane; [(?) 235 miles L. ?] lay to 17 hours under bare poles, part of the time on her beam ends, expecting the masts to be blown out of her; suffered much damage, *and was driven 100 miles to the S. W.* With calms and currents, took 14 days to gain her former position. [This shows clearly the general direction of the gale off the W. end of Cuba.]

12. Schr. *H. Plantagenet*, for Havana, encountered the hurricane in the Gulf of Mexico about forty miles from Tortugas, the wind blowing strong from N. N. E. [(?) 230 miles L.] Was compelled to throw over part of the cargo, but suffered no other damage.

We now pass from the left to the right side of the storm.

13. Brig *Trojan*, from Kingston, S. side of Jamaica, sailed Oct. 2d, and took the hurricane off the Grand Cayman, blowing from S. S. E. From the 1st of Oct. clouds had been flying thick and fast from the southward; the weather in the western quarter looking dark and threatening. Oct. 3d, the barometer had fallen, and it continued to fall till 8 P. M. of the 4th. Morning of the 4th, strong breezes from S. E.; at 9 A. M. had commenced blowing hard from S. S. E. During the day and evening the gale veered from S. S. E. to S. S. W., from which last point, about 9 P. M., was the worst of the gale. [Then about 145 miles R.] At 10 P. M. the barometer had sensibly risen, the wind settling at S. W. as the gale abated.

14. On a subsequent date, Capt. DAVIS, in the *Trojan*, spoke the brig *Homer*, which had sailed from Kingston *two days before him*, for Laguna, on the S. coast of the Gulf of Mexico, and had been totally dismasted on the 4th of Oct. [The *Homer* was probably in the heart of the gale.]

15. Brig *Eastern Star*, at Falmouth, Jamaica, [N. side,] Sept. 30th, fine weather; at half past 9 P. M. a heavy squall of rain. Oct. 1st, fine, with land breeze through the day; at 2 P. M. sailed for Black river, [S. side of Jamaica;] wind southward. At 7 P. M. was off Montego Bay; at 8 P. M. took in top gt. sails; fresh breezes from S. S. W. with squalls; at midnight, reefed. Oct. 2d, at 2 A. M. took in mailsail and jib; [first gale, which appears to have been more severe in Cuba;] at 8 A. M. shook out reefs; set the mainsail. At noon, the W. end of Jamaica bore S. S. W.; P. M. fine weather and head sea, wind S. E. by S.; fine breezes; at midnight, Cape Negril bore E. by S.

Oct. 3d, winds S. E. to S. S. E. with squalls and rain; at 4 P. M. blowing a heavy tempest; at 6 P. M. Cape Negril, S. point, bore E. S. E. [This cape is in lat. 18° 15′, lon. 78° 25′, 305 miles R.] At night, strong gales with heavy squalls. Oct. 4th, gale continues; at 9 A. M. bore up to make a harbor; at 11 A. M. ran into Orange Bay; [315 miles R.;] at noon, parted the best bower; P. M. and night strong gale and heavy squalls from S. S. E. with rain, thunder and lightning. Oct. 5th, at 4 A. M. parted the small bower and went to sea; bore up for the N. side, wind S. S. E. with squalls; at noon was off Falmouth. The wind veered during this day from S. S. E. to S. W.; fresh breezes and squally weather. Oct. 6th, calms and squalls.*

16. Capt. RAY, of brig *Com. Hull*, states that there was no blow at Falmouth, Ja.,; but on the night of the 4th and day following, a heavy sea hove in from the northwestward. [Lat. 18° 28′, lon. 77° 41′, 345 miles R., and under the shelter of the mountains or highlands of Jamaica, the wind being southward.]

17. At Montego Bay, Ja., [lat 18° 28′, lon. 77° 57′, 330 miles R., and under like shelter as Falmouth,] Oct. 4th, after threatening weather it commenced blowing hard from S. between 9 and 10 P. M. A strong ground swell had heaved into the bay from about 3 P. M., and before 2 A. M. of the 5th, it had acquired a terrific force. During the 5th there was

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* Perhaps the early appearance of the second storm or hurricane at Jamaica, indicates for it a more eastern origin than would be apparent from a mere inspection of Chart IV. There seems, however, to have been but little separation in the two storms in the latitude of Jamaica.

comparatively little wind, but the sea raged in the most dreadful manner.* This swell occasioned the loss of twenty one vessels in the bay, chiefly droggers and other small craft.

18. At St. Jago de Cuba the gale of Oct. passed over without any damage, as stated by Capt. CROWELL, of the *Curlew*. [St. Jago is on the S. side of Cuba, lat. 20°, lon. 76° 7′, 365 miles R.; is N. E. from the center of Jamaica and more exposed than the latter to the storm from off the Caribbean Sea; but the harbor is sheltered.]

19. Ship *Norman*, for New Orleans, Oct. 1st, course W. by S., 4 to 7 knots, thick squally weather with showers of rain. No obs.; [lat. D. R. 18° 54′, lon. 75° 05′;] P. M. wind S. S. E. courses N. W. to W. S. W., 8 to 9 knots. Oct. 2d, strong gales from S. E. and thick cloudy weather; running down the island of Jamaica. No obs.; [lat. D. R. 18° 51′, lon. 77° 15′;] P. M. strong winds from S. and squally; at 6 P. M. S. end of Jamaica bore S. S. W. 30 miles. Through the night strong gales and thick blowing weather. Oct. 3d, at 3 A. M. double reefed the three topsails; [latter part of the precursory gale;] at 10 A. M. more moderate; set main-topsail and top gt. sail; no obs.; [lat. D. R. 18° 54′, lon. 80° 10′, 200 miles R.;] P. M. had strong gales from S. E. and S. S. E. and thick cloudy weather. Course W. by S. and W. S. W.; at 11 P. M. gale increasing.

Oct. 4th, at midnight double reefed topsails and furled mainsail, gale increasing; 2 A. M. wind S. S. E.; 4 A. M. took in jib and spanker; 6 A. M. close reefed the three topsails, furled fore-sail and mizen-topsail; at 7 A. M. gale increasing to a hurricane, furled the fore-topsail; at 9 A. M. hove the ship to with her head to westward, under close-reefed main-topsail and fore-topmast-staysail; wind S.; set balance-reefed spanker and mizen-staystail; hurricane increasing. Noon, lat. by bad obs. 19° 06′, [lon. D. R. 81° 40′, 140 miles R.] P. M. blowing a tremendous gale from S. which continued throughout the night with heavy gusts of rain; ship laboring heavy and masts in great danger. Oct. 5th, at 6 A. M. wind had veered to S. W., wore ship to S. E.; at 8 A. M. the gale abated a little; set close reefed fore-topsail. Lat. obs. at noon 19° 57′, [lon. D. R. 81° 28′.] P. M. blowing a heavy gale from W. S. W. and a heavy sea; set close-reefed mizen-topsail. At 11 P. M. wind W. Oct. 6th, at 4 A. M. set whole topsails and top gt. sails; at 6 A. M. saw the Grand Cayman bearing E. N. E. about 8 miles. [Drift and run since noon of 5th, 44 miles, courses S. by E., S. by W. and S. W.] At noon, light winds, in lat. 19° 15′, lon. D. R. 81° 42′.

The ship's barometer, when the gale hauled to S. W., was observed at 28·40. [Add 0·10 for its error of adjustment, as since compared with mine in New York, gives 28·50 inches. It is not certain that this was its lowest point. The nearest approximation of the ship's track to the axis *line* I estimate at 85 miles R.; which was *after* the axis of the gale had passed the ship. It will be perceived that the ship was constantly running or drifting towards the axis line, till after the axis and the heart of the gale had passed.]

20. Brig *Rebecca*, at St. Cruz, south side of Cuba, lat. 20° 44′, lon. 78°, [225 miles R.] Oct. 1st, had a heavy gale from S. W. with a heavy sea; in which a barque named the *Barker* was driven on shore. [First gale.]—Oct. 4th, it blew a hurricane from the southward, and the *Barker*, which had been got off, again went on shore. The sea now made a fair breach through the houses in the town, which is built on a single street, parallel to the shore. The heaviest part of the hurricane varied 3 or 4 points in direction, blowing in tremendous squalls, from S. S. E. to S. S. W.; and was attended with lightning and rain for 12 hours without intermission.—(*Mate of Rebecca and logbook.*)

21. Schr. *Arab*, was lost on Point San Juan, between Trinidad and Cienfuegos, on the morning of October 4th, and all but the mate perished. [Lat. 21° 44′, lon. 80° 32′, 65 miles R.] The schooner was prevented from getting into St. Jago by the violence of the [first] gale, and was carried to leeward and lost as above stated. [It appears from this case that the wind at Point Juan blew *on* shore, showing the right side of the gale.]

22. Brig *Levant*, from Kingston, Ja., for Campeche, was reported as having encountered the hurricane on the 2d of October, from E. and S. E., and at 5 P. M. was thrown on her beam ends, lost mainmast, and other damage. Next day spoke brig *Homer*, totally

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* Nautical Magazine, February, 1845.

dismasted. [As it is known from several sources that the Homer was dismasted on the 4th of October, there must be an error of two days in the date above reported. This account may serve, however, to show the direction of the wind in the first part of the gale and the probable position of the Homer, as being near the path pursued by the axis of the storm.]

23. At Trinidad, south side of Cuba, [lat. 21° 42′, lon. 80° 11′, 83 miles R.,] the hurricane was peculiarly severe, as also in its vicinity, blowing down houses in the town and destroying the plantations.

24. At Cienfuegos, [Xagua, lat. 22° 6′, lon. 80° 42′, 45 miles R.] the gale, though very severe, did less damage than at Trinidad. [Owing, probably, to the deeply sheltered position of the place.]

25. On the right border of the storm we find that the master of the Schr. *Ermina*, (at Nassau, N. P.) reports the loss of three vessels on the west coast of St. Domingo [Hayti] near Gonaives, in this gale. [Say in lat. 19° 38′, lon. 73°, 550 miles R. Vessels in this great bight or bay, were peculiarly exposed to being driven on shore by the S. W. winds under this border of the storm.]

26. At Turks Island, as reported by Capt. VARNEY, the gale blew hard from the southward; but not a hurricane. [Lat. 21° 22′, lon. 71° 8′, 565 miles R.]

We take now the accounts from Cuba and other reports, from the left side of the gale, as far onward as will include the peninsula of Florida and the Bahama Bank.

27. At Santiago de la Vegas, 50 miles westward of Havana, [lat. 22° 57′, lon. 83° 5′, 112 miles L. (?)] the hurricane began at 9 A. M. of Oct. 4th, and continued 14 hours.*

28. At San Christobal, on the southern slope of Cuba, about 60 miles S. W. by W. from Havana, [say 105 miles L.] Oct. 2d, it began to blow from the N. and every body supposed that the rains were going to cease. The wind continued to increase, and on the afternoon and night of the 3d it began to cause damage to the cornfields.

But it was reserved for the night of the 4th to consummate the destruction, and in every hour the wind seemed to increase. The gale continued till about 10 o'clock in the morning of the 5th, though the wind had begun slowly to subside.

29. At San Antonio de los Baños, [about 30 miles S. W. from Havana and 92 miles L.] Oct. 1st, a light dry wind from N. E., which by the morning of the 2d was quite strong; at noon it was more violent, changing during the evening and night to the East, and by the morning of the 3d had finished at South.

At midnight of the 3d there was rain, which increased and continued all the day and night of the 4th. About 5 P. M. of the 4th, the wind had begun to blow from the S. E. and it gradually increased till 10 P. M., when it had passed to the East. At 4 A. M. of the 5th, the wind was at E. N. E. and blew with inconceivable fury, and the rain fell in torrents. At 5 A. M. it blew from due North, and from that time till 10 A. M. or more properly 12, no human pen can paint its effects.

30. At Batabano, [south shore of Cuba, 32 miles S. by W. from Havana and 76 miles left of the axis line,] at 5 A. M. Oct. 1st, it began to blow from the N., and on the 2d at the same hour, hauling towards the N. W., it increased to a hurricane until the 3d, when it had subsided at the same time that some rain began to fall.

The 4th of October was rainy, and the wind blew from N. E. until 8 P. M., when the hurricane began; at 3 P. M. [?] of the 5th it became calm, the wind changing to N. W., whence it again blew strongly for two hours and then ceased.

31. At Guatao, five leagues from Havana, Oct. 2d, at 4 A. M., wind E. N. E., strong, in successive gusts and rain in transient squalls. At 7 A. M. wind stronger at E. N. E.; at noon, feeble from E. N. E.; at 6 P. M. wind hardly sensible, direction the same. Oct. 3d, all day a slight drizzling of rain with a light breeze.

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* The accounts from the island of Cuba are chiefly taken from the Diario de la Habana, as translated by Mr. John H. Redfield. The distances are estimated in a direct line.

Oct. 4th, wind N. E., hardly sensible; cloudy; noon, wind E. N. E., fresh, drizzling rain with intermissions; 8 P. M. wind N. E., strong and constant; continued rain; at 10 P. M. less rain and more wind. Oct. 5th, 1 A. M., no longer wind—it is a destructive hurricane; 4 A. M., some rain, wind N. N. E., frightful; 6 A. M., houses falling, roofs blowing off, &c. &c.; some rain; 9 A. M., wind N., more furious; noon, rain ceased; wind N. N. E., relaxing; at 6 P. M. the sun shone a quarter of an hour; wind N. W., light.

32. At Havana, [lat. 23° 9′, lon. 82° 19′, about 85 miles L.] as per Capt. FOSTER, ship *St. Mary*, Oct. 2d, it blew a gale from E. N. E., sufficiently strong to require the aid of the best bower anchor; atmosphere continued dry, but enveloped by a fine haze. Toward sunset the wind moderated, and during the night veered to E. S. E., with an overcast sky. This state of weather continued during the 3d, and in the evening there was much lightning in the S. E. quarter.

Early on the 4th, the wind was moderate from S. E., and cloudy, weather apparently unsettled. About 9 A. M. the wind veered gradually to E. S. E., E. N. E., and finally settled at N. E. by E., with squalls of wind and rain, and dense masses of clouds came swiftly from that quarter, but no lightning was seen. The squalls increased in violence with torrents of rain, continuing so through the night till early on the morning of the 5th, when it blew a terrific hurricane. As day dawned on the 5th, vessels in all directions were drifting their anchors, coming in collision, dismasting and sinking each other. The St. Mary [which we have seen was roughly handled in the two former hurricanes] was the only American vessel that rode out the gale without damage. At 10 A. M. the wind veered to North, and thence gradually to N. W. Even then the gusts were not exceeded in violence. By 5 P. M. the wind subsided to a moderate gale, with streaks of clear sky in the West. By 9 P. M. the wind became nearly calm, with a brilliant starry sky.

Sunday, Oct. 6th, ushered in most delightful weather. The extent of damage to the shipping was very great. Many were dismasted, numbers were sunk, and several had overset, remaining bottom up. The southwestern shores of the harbor were strewed with wrecks, and this in a port unrivalled for its secure anchorage.*

33. A barque and a brig arrived at Havana on the 6th, which had encountered the gale of the previous day *to the N. W. of the Tortugas*, where they experienced only an ordinary gale of wind, reducing them to reefed topsails. [(?) 260 miles L.]

34. At Matanzas, [lat. 23° 3′, lon. 81° 41′, about 50 miles L.] during September, the barometer exhibited few remarkable variations; but on the 1st of October it was 29·60 inches. In a few hours appeared a strong N. E. wind, which continued without change till the 4th, when the wind ceased and it began to rain abundantly.

But the barometer, *which generally stood at 30 inches*, notwithstanding the calm remained at 29 inches on the 4th, which gave reason to suspect that we should have heavy N. E. winds. In fact on the morning of October 5th it fell to 28 inches, thus indicating the terrible hurricane which almost immediately made its appearance. The wind, which at 10 P. M. of the 4th had begun to increase by degrees, at 2 A. M. on the 5th blew with such violence that no doubt could remain of the immense destruction which it threatened. When the day dawned it continued to blow from the N. E. with unheard of fury, and it was not till 10 or half past 10 A. M. that it began at all to abate. Shortly afterwards it veered continually and finally settled at West, whence it again began to blow with the same violence as in the morning. But at 2 P. M. the barometer began to rise, promising the cessation of the gale, which soon after took place. In fact, at three o'clock the storm

* Capt. BOXER, of R. M. steamer *Trent*, says in his journal:—On arriving at Havana [Oct. 7th] we found the shores of the port strewed with wrecks—some bottom up, others with their masts out of water, and others washed partly on the wharves. From the consul's statement it appeared they had a heavy gale on the 2d of October, which lasted 24 hours. The weather then became hazy, (unusually so,) with light rain, rapidly driven. On the 4th, the sympiesometer and barometer gave indication of some awful change, particularly the former: and shortly after this warning, a furious hurricane set in from N. E., such as the oldest inhabitants have never before witnessed. Seventy two ships were either upset or driven on shore, and others dismasted. Houses were unroofed, windows blown in, and the crops seriously injured; damage computed at a million sterling. I tried to obtain the particulars of the fall of the barometer, but singular to say, no one could give me an exact account. All they stated was, they had never seen it lower.

had entirely yielded; and on the 6th at 9 A. M., the barometer stood at 29·80, and the weather was tranquil.

35. At Cardenas, 26 miles eastward of Matanzas, [lat. 23° 2′, lon. 81° 15′, about 27 miles L.] at half past 11 of the 4th, after a heavy shower it began to blow a violent hurricane. The wind first prevailed at East, and went about to S. W. and N. with continual rain. The wind [hurricane] lasted for 24 hours.*

[I have no accounts from Port Cabayrien, Neuvitas, and other ports on the north coast of Cuba, in the right side of the gale, where the wind would be found blowing off the shore and therefore less violent in its effects. For the character of the precursory storm off the N. side of Cuba, near lon. 77°, see 45*b*.]

36. Schr. *Tasso*, off Havana, bound northward through the gulf of Florida. Capt. Hows says: The gale commenced with me Oct. 1st, in lat. 23° 30′, lon. 82° 40′, the Mariel Tables bearing nearly S., wind E. S. E. On the 5th at 2 A. M., it increased to a perfect hurricane; at 4 A. M. lost boat and sixty bales of cotton by the boarding of a sea, wind at this time E. N. E.; at 6 A. M. wind N. E.; at 8 A. M., N. N. E.; at 10 A. M., North, and the heaviest of the hurricane; at 2 P. M. of Saturday the 5th it had abated considerably, then blowing N. N. W. to N. W. and so continued till 4 P. M. when it changed to N. W., and at midnight I once more made the land, bore up for Havana, and arrived at 10 A. M. Sunday the 6th.

37. Ship *Columbo*, for New Orleans, took the gale at 11 P. M. of Oct. 4, near Cat Keys, (west edge of Bahama Bank,) which increased to a severe hurricane on the 5th from S. E., [shipping report of the time says E. S. E.] which suddenly abated at about 5 P. M. when off the Double Shots, between Salt Key Bank and Florida Reef, [? lat. 24° 15′, lon. 80° 30′, about 30 m. L.?] and in twenty minutes came out from N. N. W. and N. W., and finally abated at 2 A. M. of Sunday, Oct. 6th. Lost sails, bulwarks, &c. [These winds, with the lull and shift to the opposite quarter, prove the ship to have been in the axis path and not far from its center.]

38. From the military post at Key West [lat. 24° 27′, lon. 81° 50′, about 118 miles L.] we have the following observations.

Date.	Barometer, (average.)	Wind.	Rain.	Thermometer at 3 P. M.	Wet bulb thermometer.
Oct. 1st.	30·10	E. N. E. to N. N. E.; a gale.		83°	80°
2d.	30·01	southeasterly; strong.	0·17 in.	78	76
3d.	29·94	N. E.; light.	1·96	78	76
4th.	29·84	E. to N. E. increasing; strong.	1·75	75	75
5th.	29·42	E. N. E. to W.; severe gale.	9·62	72	72
6th.	30·00	N. W. strong; moderate.		79	73
7th.	30·17	E. to N.; light.		84	77
8th	at 9 A. M. 30·26	N.; moderate.		84	79

The following hourly observations made during the hurricane are added by the medical officer, commencing at 1 A. M. Oct. 5th. These are highly valuable.†

Hours.	Barometer.	Winds and strength.		Hours.	Barometer.	Winds and strength.	
1 A. M.	29·768	E. N. E.	7	12, noon.	29·217	N. E. by N.	9
2	·729	E. N. E.	7	1 P. M.	·166	N. E. by N.	9
3	·516	E. by N.	8	2	·134	N. by E.	9
4	·457	E. N. E.	8	3	·185	N.	9
5	·433	E. N. E.	8	4	·264	N. by W.	9
6	·402	E. N. E.	8	5	·410	N. N. W.	8
7	·335	N. E. by E.	7	6	·455	N. W.	8
8	·418	N. E.	7	7	·520	N. W. by W.	6
9	·536	N. E.	8	8	·551	W. N. W.	8
10	·331	N. E. by N.	9	9	·587	W.	7
11	·272	N. E. by N.	9	10	·642	W.	6

The gale was blowing in strength, from E. N. E., at 9 P. M. of the 4th. Sky wholly obscured from 1 A. M. to 5 P. M. of 5th. Rain from 1 A. M. 7·97 in. [Crisis of the gale about 2 P. M of the 5th, according to the barometer.]

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* The order of changes, here appears like a typographical error. Possibly it may have been written S. W. by the N.; or, S. W. and W.

† The scale of the wind's force adopted for the meteorological returns from the military posts, is from 0 to 10. No. 4 denotes a brisk wind and 9 a hurricane.

In an account printed at Key West, it is stated that the unequalled fury of the gale when at its height can scarce be conceived. It swept every thing before it—houses, fences, trees, vessels—and almost every thing in its course was levelled with the earth or borne off with frightful velocity.

39. At Indian Key, off the S. point of Florida, [lat. 24° 47′, lon. 80° 48′, about 75 miles L.,] most of the houses remaining there were blown down and all the wharves destroyed.

40. Brig *Ventrosa*, was lost on the Bimini Islands in the hurricane. [W. edge of the Bahama Bank, lat. 25° 40′, lon. 79° 12′, about 35 miles L.]

41. At Jupiter Inlet, St. Louis Sound and Indian river, on the E. shore of Florida, between lat. 26° 30′, and 28°, the gale was severe on the 5th, causing a great influx of the sea. [This part of the coast is 112 to 150 miles L. of the axis line.]

42. At Fort Brooke, head of Tampa Bay, Florida, [lat. 27° 57′, lon. 82° 35′, about 300 miles L.,] there was no rain, except light showers on the afternoon of Oct. 2d. The lowest observations of the barometer were made on the evening of the 5th and morning of the 6th, 29·79 in. It may have been lower in the night. The daily *averages* of the barometer and state of the winds, were as follows, viz.—Oct. 1st, bar. 30·50, wind, E., 3; Oct. 2d, bar. 30·16, winds N. E. and E., 1 and 4; 3d, bar. 30·06, wind E., 1; 4th, bar. 29·94, wind N. E., 1; on the 5th, bar. 29·84, wind E., 2, 4, 6, 4;* 6th, bar. 29 88, winds N. E., 3, 2, 1; 7th, bar. 30·07, calm. [Fort Brooke is not more advanced in the track of the storm than the island of New Providence, Bahamas; and its deeply embayed position, on the west side of the Florida peninsula, doubtless contributed to its shelter from the force of the gale.]

43.† At Charlotte Harbor, [west coast of Florida, lat. 26° 48′, lon. 82° 5′, 228 miles L., and less advanced in the track than Fort Brooke,] the gale blew from N. E. and was much stronger than at Tampa Bay. Its violence greatly increased, on that coast, as we go S. toward Key West, as I am informed by Capt. PARKER; this being in fact a nearer approximation to the center path of the gale.

44.† At Apalachicola, [lat. 29° 43′, lon 85° 05′, near 475 miles L. of axis line,] there was no gale; the winds were moderate from the N. E., with clouds flying somewhat briskly from that quarter.

45*a*. At St. Augustine, [Fort Marion, E. coast of Florida, lat. 29° 40′, lon. 81° 35′, 305 miles L.,] Oct. 1, bar. (average) 30·18, winds N., 4 to 8; 2d, bar. 30·18, wind E., 6; 3d, bar. 30·07, wind E., 3, 2; 4th, bar. 29·90, wind N. E, 1. On the 5th, bar. 29·99, 29·82, winds N. E., 3, N., 4, 7, N. E., 8, drizzling rain at 2 P. M.; violent wind at 10 P. M. equal to 9. [Heaviest of gale in the night.] 6th, bar. 29·75, 30·01, winds N. W. 5, 6, N. E. 3, 0; 7th, bar. 30·13, wind W. 1, 0. The gale set in brisk A. M. on the 5th. [Distance from the axis line greater than at Tampa Bay, but the position of St. Augustine, on the E. coast, was far more exposed to the gale. The state of the barometer and winds show that both these places were toward the left border of the gale, which in passing onward did not fully extend its force to Savannah and Charleston.]

45*b*. Brig *Demarara*, at and from Neuvitas, N. side of Cuba, Sept. 28th, fair, light breeze from N. N. E.; 29th, fair, strong breeze from N. N. E.; 30th, begins calm, cloudy and hazy, 8 A. M. light breeze from N. N. W. Put to sea. Noon, lat. 21° 46′, lon. 77° 08′; [Bahama Old Channel;] 1 P. M. wind S. W., thick and hazy, looking squally in the S. E.; 5 P. M. wind N. N. W., took in sail; 10 P. M. wind S., furled the courses, close-reefed foretopsail, and double-reefed main-topsail. [Reefs on edge of Great Bahama Bank bearing northerly.] Oct. 1st, at 2 A. M. wore ship to westward and close-reefed the main-topsail; 4 A. M. wore ship; 8 A. M. kept off, and ran on to the edge of the Bank and then hove to, head to westward—continues blowing with a dangerous sea; noon, lat. 22° 22′, lon. 77°, wind S., a perfect gale, wore ship to the eastward; lying to under close-reefed topsails; 6 P. M. wore ship to westward; 8 P. M. wind S. E. by E. Oct. 2d, at 2 A. M. wore ship, head

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* Where successive entries for the same date are given for the military posts, they refer to the successive daily periods of observation, which are respectively, sunrise, 9 A. M, 3 P. M. and 9 P. M.

† 43 and 44 are given on the authority of Capt. PARKER, who was then at Apalachicola, and afterwards acted as a commissioner at Key West, on vessels damaged in this gale.

to E. N. E., a little more moderate; 3·30 A. M. wore ship to westward and then kept off and made sail; 7 A. M. wind E. S. E., shook out all reefs and set top gt. sails; [end of first gale;] 9·30 A. M. run off the Bank and then followed the edge down; 11 A. M. wind E. by S.; 11·30 A. M. made Ginger Key; noon, lat. 22° 43′, lon. 78° 11′; P. M. overcast, and fresh breeze from E. to E. N. E. Oct. 3d, 2 A. M. set stud. sails; 8 A. M. took in lower stud. sails; fresh breezes and flying clouds; noon, lat. 25° 05′, lon. 79° 32′; light breeze E. by N., weather thick and overcast; 4 P. M. wind E. N. E.; 8 P. M. E. by N.; ends light breezes and flying clouds.

Oct. 4th, 4 A. M. wind E. S. E., rainy and squally; 7 A. M. wind S. E.; 10 A. M. wind light from S. S. E. and rainy; noon, lat. 27° 09′, lon. 79° 32′, thick rainy weather, wind E. N. E.; 3 P. M. took in stud. sails, looking very squally; 6 P. M. heavy rain, ends thick and hazy. Oct. 5th, 1. A. M. wind E. N. E., strong; 6 A. M. in top gt. sails; 8 A. M. wind N. E. by E., single-reefed the topsails; rainy and squally; noon, lat. D. R. 28° 56′, lon. 79° 43′, squally, rainy and winds baffling; 2 P. M. wind N. E.; 5 P. M. a heavy squall from N. E.; at 6 P. M. hove to, under close-reefed topsails, head to eastward; blowing a heavy gale and a bad sea; 9 P. M. up E., off E. S. E. Oct. 6th, first part more clear, but a constant gale and very dangerous sea; 9 A. M. gale had veered to N. N. W.; noon, lat. obs. 29° 59′, lon. 79° 20′, clear weather and strong gale from N. N. W.; 1 P. M. set single-reefed topsail and fore-topmast staysail; 6 P. M. shook out all reefs and set jib; midnight calm and cloudy. [Distance from axis line at the height of the gale, 187 miles L.]

We will now look toward the axis of the storm near the Bahamas, and then follow the accounts which relate to the right side of its axis, as far onward as Bermuda on that side.

46. Brig *Rebecca*, [second of this name,] from Cienfuegos, on the 5th of Oct. encountered a tremendous gale from S. E., which shifted part of the cargo, but did no other damage. [This route and date, with the direction of the wind given, place this brig in the gulf of Florida, probably near the Salt Key Bank.]

47.* Brig *Saratoga* was crossing the Bahama Bank, Oct. 5th, when it began to blow, at 10 or 11 A M., from E. S. E. or S. E. by E. At noon saw Orange Key ahead; split close reefed fore-topsail and set reefed foresail, in attempting to weather it. Kept away and run to the N. of the Key; struck in passing off the Bank, about 2 P. M. and sprung a leak; gale increasing from S. E.; wore ship and stood back for the Bank, intending to run under Orange Key. The gale now hauled southward, and the brig having no after sails, fell off and drifted on the Riding Rocks, under fore-topmast staysail and reefed foresail, which were blown away when she struck, about 3 P. M., [lat. 25° 15′, lon. 79° 4′.] Thumped on the rocks till about half past 4 P. M., when she had worked over into deeper water. Both anchors were then dropped, which failed to hold her, when the stays were cut and the masts blew over; the wind now southerly; the sea was breaking over the vessel and sweeping off every thing movable. Kept the pumps going till about 7 P. M., when the brig sunk in about 4½ fathoms. At this time the narrator was entangled with the poop deck, which had separated from the vessel. He held on for a short time, was washed off, and floated on different articles, he thinks, for an hour; was then thrown again in contact with the poop deck, on which was a passenger, and to which, by a small rope providentially attached, he kept fast during the night.

Towards morning of the 6th, the gale began to abate, and about 4 A. M. the wind-spray had so far ceased that the stars were visible. At sunrise the wind was strong from the southwestern quarter and the two survivors were drifting eastward over the Bank. By 9 A. M. the gale so abated as to allow them to stand up. At noon it was nearly calm, and till about 10 P. M., when the wind came out from the eastward. This wind, during the night of the 6th, drove them off the Bank into the Gulf Stream, where they floated at the mercy of the waves, without food or drink, till Oct. 11th, when they were taken off, in a perishing state, by the barque *Zida*, in lat. 25° 40′, [(?) 28° 40′,] lon. 79° 45′. [Mr. S. was

* From Mr. SIMONSON, 2d mate and survivor.

below at the commencement of the gale, and was called to reef the foresail at half past 11 A. M. I deem it proper to present the above details, but in estimating them, allowance may be made for the position and condition of this suffering observer. Orange Key and Riding Rocks are near the line given for the route of the storm's axis, but its actual course may have been a little devious from a direct line, and here more westward.]

48. Ship *Chester*, passed Stirrup Key, [Berry Islands,] Oct. 11th, was boarded by the keeper of the light on Abaco, [Hole in the Wall, lat. 25° 51′, lon. 77° 09′, about 70 miles R.,] who reported that the hurricane had blown down all the houses. The wind was heaviest from S. E., on the morning of the 6th.

49. Schr. *Magnet*, Oct. 5th, 6th, near E. side of Abaco, [lat. 26°, lon. 77°, about 70 miles R.,] had a heavy gale of wind from E. S. E. to S. S. E., during which lost sails and spars, was thrown on beam ends, &c. [Latter part of gale not mentioned.] Saw Schr. *Chase* about one mile from Abaco, wind blowing on shore. Brig *Partridge* was also dismasted near Abaco.

50. Barque *Reform*, for Mobile, at noon Oct. 5th, fresh breezes from S. E. and cloudy; double reefed the topsails; at 2 P. M. made sail, and stood in W. S. W. for Abaco. At 5 P. M. made the land ahead and hauled the ship to the wind; at 6 P. M. tacked ship to the eastward, the wind increasing, with a heavy sea from S. E.; close reefed fore and main-topsails, furled courses, jib, and spanker; at 9 P. M. wind still increasing from S. E.; at 11 P. M. fore-topmast staysail blew out; took in fore-topsail and hove to under close reefed main-topsail, blowing heavy. Oct. 6th, at 1 A. M. the gale increased to a hurricane and blew away the furled sails from the gaskets. At 2 A. M. the gale suddenly subsided and the wind changed to S. W. [N. of Abaco, a few miles R.] In 30 minutes it was again blowing a hurricane from S. W., as hard or harder than before. About daylight it began to moderate, and at 11 A. M. the wind had veered to W. Lat. at noon 27° 31′.

51. Ship *Star Republic*, took the gale Oct. 5th, lat. 26° 46′, lon. 76° 58′, in company with *Reform*. Increased to a hurricane from E. S. E. till about 2h. 30m. A. M. of the 6th, when it died away, and in about 30 minutes shifted from E. S. E. to W. and came out from that quarter with great fury. At the time of the lull the barometer stood at 28·10, [or as corrected 0·14 for its adjustment, 28·24,] when it rose rapidly 3–10ths in 30 minutes, *and then remained stationary for two hours*; rising again as the gale abated. Lat. at noon of 6th, 27° 25′, lon. 77° 15′ by computation. [A few miles R. of our axis line.]

52. Brig *Josephine*, encountered the hurricane on the evening of Oct. 5th, 21 miles N. E. of the Hole in the Wall, [or S. E. point of Abaco,] blowing from S. E.; cleared the E. point of Abaco, and scudded before the gale till 3 A. M. of the 6th, when it lulled, and then came out from N. W., blowing a hurricane for four hours, which dismasted the brig. Lat. at noon 27° 30′, lon. 76° 30′. (?) [The brig's position at the time of the lull is supposed to be at the axis of the gale, which may have been to the right of our axis line.]

53. Nassau, N. P. [lat. 25° 04′, lon. 77° 18′, about 90 miles R.] We experienced a severe hurricane on the Banks on the night of Oct. 5th, and the loss of lives and property has been greater than that of any previous gale for some years. In this harbor, from the quarter we had the wind, S. E., all was protected, and no damage of consequence.—(*Bermuda Gazette.*)

A letter from an officer at Nassau, states that the gale commenced with the wind from S. E., and gradually drew round to S., ending about S. W.—(*Nautical Magazine.*)

54. Letters from Long Island, Bahamas, [lat. 23° 20′, lon. 75° 15′, about 275 miles R.,] state that the gale was by no means severe there, blowing only in squalls attended with torrents of rain. Rum Key has also suffered little from its fury.—*Ber. Gaz.* [Lat. 23° 41′, lon. 74° 43′, about 280 miles R.] These two islands are on the S. E. border of the Bahama group, and opposite the eastern part of Cuba, the highlands of which would afford some degree of protection, under the R. side of the storm.]

55. Ship *Berlin*, Oct. 5th–6th, lat. 26°, lon. 75°, [175 miles R.,] experienced a hurricane from S. E., veering S. W., with a heavy sea.

56. Barque *Lagrange*, Oct. 5th–6th, lat. 26° 30′, lon. 75° 30′, [127 miles R.,] experienced a very severe gale from S. S. E. to S.; which increased to a hurricane at 3 A. M. Lost bulwarks, deck load, &c.

57. Brig *Herald*, Oct. 6th, lat. 30°, lon. 73° 30′, [75 miles R.,] had a heavy gale from S. E.; hove to; cut away fore-topmast; gale still increased and hove the brig on her beam ends, and did not right again till the mainmast was cut away.

58. Ship *Sea Lion*, Oct. 6th, lat. 28°, lon. 70°, [330 miles R.,] experienced a heavy gale from S. E., which veered round to W. Lost foresail and fore and main-topsails.

59. Ship *Charlotte*, experienced the hurricane Oct. 6th, from S. E. to N. W., lat. 32°, lon. 73°, [about 15 miles R.] Lost every thing above the tops, with lower sails, yards, &c.

60. Ship *Russell Glover*, had the hurricane Oct. 6th, lat. 31° 32′, lon. 71° 45′, [95 miles R.] Lost spars, &c. &c.

61. Schr. *Victoria*, left New York Oct. 1st, with fine westerly winds, bound for Cuba. Oct. 5th, winds became eastward with thick weather and moderate, till 9 A. M. of 6th, when it commenced blowing in strong puffs from S. E., with thick mists or sprays, clouds flying very swiftly. The gale increased in violence and fury, and the vessel was reduced to balance-reefed mainsail and kept to the wind. At 11 A. M. it became so violent that the vessel was blown completely over upon her beam ends, her decks swept of every thing, and lay with no prospect of righting till the masts were cut away, when she came up, a hêlpless wreck. It was afterwards found that the wind was gradually shifting round to the southward, and from that to the westward. At 6 P. M. the gale had much abated, and at 10 P. M. had fine clear weather. Position at noon reckoned to be in lat. 32°, lon. 72° 30′, [38 miles R.] Had during the next day the heaviest cross sea Capt. BUNCE had ever witnessed.

62. U. S. brig *Pioneer*, Lieut. SHAW. Oct. 1st, 4 P. M. winds moderate from eastward, air 83°, water 84°, barometer 29·91. Midnight, wind S. E., air 80°, water 84°, barometer 29·83. Oct. 2d, A. M. moderate southeasterly breezes, rainy and cloudy; at noon air 68°, water 85°, barometer, 29·87; lat. obs. 25° 51′ 30″, lon. chr. 64° 38′ 30″; current S. half E. 20 miles. P. M. light southeasterly and variable winds; midnight air 80°, water 83°, barometer 29·78; ends squally with thunder, lightning, and rain,

Oct. 3d, A. M. winds moderate and variable, from N. E. to S. S. E., with frequent and heavy rains; ends pleasant; passed large quantities of sea-weed; noon, air 84°, water 82°, barometer 29·76; lat 26° 48′, lon. 65° 44′ 30″; current S. E. by S., 18 miles. P. M. moderate and variable breezes, between S. E. and S. W. and squally; ends cloudy with occasional heavy showers; air 79°, water 80°, barometer 29·70. Oct. 4th, A. M. moderate to fresh breeze from S. W.; 8–12, cloudy with passing squalls; air 82°, water 82°, barometer 29·70; lat. D. R. 28° 34′, lon. 67° 39′. P. M. moderate and variable southwesterly breezes, with squalls and showers, barometer at 4 P. M. 29·67. Midnight, air 79°, water 82°, barometer 29·75.

Oct. 5th, light breeze S. W. to N. W. and southwesterly, squally at 4 A. M., pleasant. Noon, air 83°, water 83°, barometer 29·80; lat. obs. 29°, lon. chr. 67° 58′. P. M. light and moderate breezes from S. W. to S. E. and S. S. E.; at 8 P. M. barometer 29·80; from 8 to midnight wind settling at S. S. E., with occasional squalls of wind and rain; barometer falling; air 81°, water 82°, barometer 29·78.

Oct. 6th, A. M. begins moderate, with passing squalls of rain, wind S.; 4 A. M. barometer 29·70, wind S. hazy; 8 A. M. barometer 29·65, fresh gales and hazy weather, with heavy squalls; at 10h. 30m. passed a schr. hove to; at 11h. 40m. gale still increasing. Noon, air 82°, water 78°, barometer 29·49; lat. obs. 30° 30′, lon. chr. 69° 52′. P. M. commences with fresh gales from S. and heavy squalls with thunder and rain; at 1h. 30m. was struck by a violent hurricane from S. S. W. while under close reefed foresail, single reefed fore-spencer, and fore-topmast staysail. The hurricane continued with nearly unabated violence during the watch, and barometer fell to 29·45, but rose again to 29·49 at 4 P. M. From 4 to 5 P. M. gale from S. W. and S. S. W. with a very heavy sea; from 5 to 6, wind moderated, but the sea the same; at 5h. 30m. hove to; from 6 to 8 P. M. moderate gale and very heavy sea; weather clear; lying to; 8 P. M. wind W. S. W. and from 8 to midnight high winds and passing clouds; sharp lightning all round the horizon; air 80°, water 82°, barometer 29·74. Oct. 7th, from midnight to 4 A. M. moderate breezes, varying between W. S. W. and W. by N, with a heavy swell and passing clouds. At 4 A. M. barometer 29·77; at 8 A. M. 29·82; noon, 29·87; winds W. by S. with a heavy swell. Noon, lat. obs.

31° 24′, lon. chr. 70° 06′. [Had run 40 miles to the northward since 3 P. M. of 6th, besides drift in lying to. Probable position at minimum of barometer, 213 miles R.]

63. Ship *Potomac*, Oct. 6th, at 4 A. M., reefed down the sails with the wind blowing at E.; at 6 A. M. took in foretopsail, gale S. S. E.; at 10 A. M. took in maintopsail, gale S. S. E.; 11 A. M. hurricane from S. S. E., lying under bare poles; at 11h. 30m. was hove on beam ends; cut away the mizenmast, then the mainmast, when she paid off and righted: Wind veering to all points of the compass. Lat. 32° 30′, lon. 71° 30′. [60 miles R.—I infer that the gale blew from the western quarter after these shiftings near the center, but the close of the gale is not mentioned.]

64. Ship *St. Cloud*, Oct. 4th, lat. 33° 01′, lon. 70° 40′, cloudy and light breeze from S. S. E.; night dark and squally, barometer low, and appearance of an approaching storm. Oct. 5th, A. M., wind S. S. E. to E. and calm; lat. 32° 13′, lon. 70° 55′; P. M., light breeze from W. and W. S. W., gradually veering to N. E.; barometer falling till midnight, when it blew a reefed topsail gale. Oct. 6th, gale still increasing, from E. N. E. to S. E.; barometer 28·70, and falling. At 6 A. M. the hurricane had commenced; furled all sail, ship's head to the southward; wind, apparently, nearly steady. At 9 A. M. barometer 28·40, and at a stand; at 11h. 30m. wind had veered to S. E.; noon, no abatement; lat. D. R. 32° 20′, lon. 70° 25′, (?) P. M. commences wind hauling more S., barometer steady at 28·35 to 28·40; 1 P. M. wind S. by E.; 2 P. M. S. S. W. and still blowing as hard as ever, and veering westward; about 3 P. M. the clouds began to break in the S. W., and the gale to abate; 4 P. M. wind S. W. by W., got ship's head to S. S. E. and set a little sail, wind moderating, and veered N. W. and N. N. W. in 12 hours; then in lat. 31° 53′, lon. 71° 40′. [The dead reckoning position on the 6th, seems not to accord with the observed positions on the 5th and 7th. Probable position at noon of 6th about 105 miles R.]

65. Brig *Brothers*, Oct. 6th, lat. 32°, lon. 70°, [150 miles R.,] was thrown on her beam ends and totally dismasted.

66. Barque *H. W. Tyler*, Oct. 6th, lat. 31° 30′, lon. 68°, [265 miles R.,] experienced a severe gale from the S. which blew away the reefed topsails and foresail, and did other damage.

67. The *Clara and Emma* was dismasted in this gale in lat. 32° 23′, lon. 68° 49′, [195 miles R.] and was abandoned in lat. 32°, lon. 76°.

68. Brig *Falcon*, encountered the gale Oct. 6th, in lat. 32° 50′, lon. 65° 40′, [315 miles R.] commencing from S. S. E. Was hove to from 4 P. M. till midnight. Two hours after its commencement, the gale began to veer gradually round to S. and S. W., and abated at W. It commenced blowing with a clear sky, but the clouds thickened up in the evening. A very heavy and irregular sea was running on the 7th.

69. At Bermuda, lat. 32° 15′, lon. 64° 40′, [380 miles R.] the following observations were made by JAMES IRWIN, signal director at Mt. Langton.

Date.	Hour.	Winds.	Force.	Weather.	Ther.	Barom.
Oct. 1,	9 A. M.	S. W.	4	c.	77	30·12
" 2,	9 A. M.	S. S. W.	5	c. m.	75·5	30·11
" 3,	9 A. M.	S.	3	c. m. p.	77	30·19
" 4,	6 A. M.	S. by W.	5	c. m. d.	70	30.07
" 4,	9 A. M.	S. W.	4	c.	76·5	30·04
" 6,	9 P. M.	S.	8	c. m.	76·5	29·86
" 7,	9 A. M.	S. W.	2	b.	76	29·94
" 7,	2 P. M.	N. W.	3	c.	78	30·02

An interruption occurs in these observations, Oct. 5th and 6th, but a daily series by an officer at the naval station, sent me by Col. REID, shows that the barometer at 10 A. M., of both 5th and 6th, was but little below the mean for October, and the wind is given, on the 6th, as S. S. E., 6; rain, 0·27 in. on the 5th, and 0·28 in. on the 7th or the night previous.

The roaring of a heavy sea on the reefs in the morning of the 7th, was generally noticed; and attentive observers at Bermuda promptly announced that a great gale had passed to the westward of the island, in the direction of Newfoundland.

Having followed the gale thus far, on the right side of its path, we may now return and trace its progress and character on

the left side of its axis and along the American coast, from Florida towards the gulf of St. Lawrence.

70. Brig *Leonora*, bound southward, encountered the gale Oct 5th, between 5 and 6 P. M., preceded by a very heavy rain. During the night it blew heavy from E. S. E., with increasing force. At midnight hove to with head to southward, and so continued till the height of the gale, when, although under bare poles and an exceedingly stiff vessel, she was gradually blown over upon her beam ends by the force of the winds upon her spars and rigging, and lay buried in the sea, till, no hope appearing, the rigging was cut, when the masts instantly went over, and she righted with six feet water in the hold. The sails had been previously blown away, after being furled with strong additional lashings. About 9 A. M. of the 6th, the wind hauled suddenly to the northward, without any abatement, and continued blowing a severe hurricane, for about three hours longer, when it abated with the wind at N. W., and we judged ourselves then in lat 39° 40′, lon. 74° 45′. [Being a few miles L., and nearer the axis line than at the shift of the wind at 9 A. M. Capt. COLLINS had no chronometer, and the position may have been more westward than is here given.]

71. Ship *Arkansaw*, from New York for Mobile, had the storm commence gradually on the night of Oct. 5th, and at 3 A. M. on the 6th was blowing a full gale from E. S. E., which at 8 A. M. had increased to a terrific hurricane, from the same quarter. At half past 9 A. M. the wind suddenly abated, hauling at the same time by the N., and in fifteen minutes from the first lull, had set in again in full fury from W. N. W., which soon dismasted the ship. Capt. BUNKER, in 32 years service, had never seen any thing like it in violence and strength. After blowing from this quarter for near two hours, the hurricane began to relax in force till reduced to a common gale of wind. At midnight the gale subsided. Position at the shift of the gale about lat. 31° 30′, lon. 75°. [55 miles L.]

72. Brig *Sterling*, for New York, Oct. 5th, at noon in the Gulf Stream, lat. 32° 31′, lon. 78°, [233 miles L.,] fresh breezes from N. E. and cloudy, heading E. S. E., all sail set; 3 P. M. took in light sails; 5 P. M. single reefed topsails and trysail; 6 P. M. tacked again to E. S. E. and at 8 to N. N. W.; took in mainsail and jib and tacked to E. by S., the gale increasing and hauling northerly; at midnight close reefed topsail and trysail and furled the foresail. Oct. 6th, at 4 A. M., wind N.; at 8 A. M. took in foretopsail. At noon heavy gales from N. N. W. and squally, with a high sea; lat. 33° 04′, near the outer edge of the Gulf Stream, [about 150 miles L.,] at 2 P. M., wind N. W., strong gales and rainy, lying to under close reefed main-topsail. At 5 P. M. began to make sail; at midnight light airs and cloudy.

73. Savannah barracks, Geo., lat. 32° 05′, lon. 81° 07′, [370 miles L. of axis line.] Oct. 5th, winds N. to E., 1; 6th, W. (?), 1 to 3; 7th, W. 1 to 2. No rain nor gale reported.

74. Augusta arsenal, [470 miles L. and 100 miles N. W. of Savannah,] daily average of barometer: Oct. 1st, 29·843; Oct. 2d, 29·823; 3d, 29·736; 4th, 29·564; 5th, 29·546; 6th, 29·488; 7th, 29·592. Winds from 2d to 5th light, chiefly S. W.; 6th A. M. N. E. 3; P. M N. W. 1.

75. Charleston, (Ft. Moultrie,) lat. 32° 46′, lon. 79° 46′, [335 miles L.] Oct. 1st, barometer, (AV.) 30·375; 2d, 30·310; 3d, 30·054; 4th, 29·875; 5th, 29·975; 6th, 29 803; 7th, 30·10. Winds, 5th, N. 3, 4, E. 4, N. N. E. 4; 6th, sunrise, N. N. E. 4; during day, N. W. 4; 9 P. M. W. 3; 7th, variable, 2. [The last three places appear to have been little exposed to the gale, as a surface wind, but were all quite within its barometrical influence.]

76. Fort Johnson, near Cape Fear, N. C., lat. 33° 54′, lon. 78° 01′, [300 miles L.] Oct. 6th, A. M., wind E. 6, N. E. 6; P. M., N. E. 5; 9 P. M., W. 2. No rain noticed.

77. Fort Macon, near Beaufort, N. C. lat. 34° 41′, lon. 76° 30′, [270 miles L.] Oct. 6th, A. M., wind N. 3; P. M., N. 6. No rain. [At the last two posts we have the gale blowing in considerable strength, without rain.]

78. Brig *Capt. John*, had the gale in lat. 34° 22′, lon. 76° 20′, [near Cape Lookout, 240 miles L. of axis line.] Shipped a heavy sea, which stove the galley and killed the cook.

79. Barque *Bashaw*, Oct. 6th, lat. 33° 10′, lon. 75° 15′, [140 miles L.] experienced a gale from N. E. which blew away main-topsail yard, top-gallant mast, &c.

80. Brig *Pennsylvania*, Oct. 6th, lat. 32° 40′, lon. 74°, [57 miles L.] was thrown on her beam ends in the hurricane, and totally dismasted.

81. Brig *Emeline*, Oct. 6th, lat. 33° 30′, on the southern edge of the Gulf Stream, [(?) lon. 74° 30′, 117 miles L. (?)] had the gale come on gradually, with a fine small rain, from N. E. to N. N. E., ending N. and N. N. W.; barometer fell to 28 in. [28·15 in. as corrected for index error;] lay at the mercy of the waves with all hands lashed to the weather rail; gale lasted from 4 A. M. to 4 P. M., and continued fresh till 8 or 10 P. M. The gale began to shift northward about noon.

82. Brig *Republic*, Oct 6th, at 6 A. M. was 85 miles east from Cape Hatteras, lon. 74°, [148 miles L.,] where the gale commenced blowing in the morning from E. N. E., gradually increasing and veering to the northward; vessel scudding at the rate of ten knots. At noon the gale was nearly N., blowing exceedingly heavy. Continued to scud through the gale, and the Captain believes the brig could not have stood an hour if brought to the wind. At 3 P. M. run out of the southern edge of the Gulf Stream. The gale ended about 6 P. M. in tremendous squalls from N. W.

83. The Captain and crew of schooner *Evelina* were taken off the wreck, Oct. 7th, in lat. 34° 50′, lon. 74° 30′, having been dismasted the previous day, [about 160 miles L.]

84. Schooner *Rochambeau*, Oct. 6th, lat. 33° 58′, lon. 73° 15′, [72 miles L.] experienced a severe gale, lost head of foremast and received other damage.

85. Brig *Wm. Nelson*, from Hayti, lat. 35°, lon. 74°, encountered a severe gale from N. E. to N. W., which lasted 24 hours, [162 miles L., and subject to the drift of the Gulf Stream.]

86. Schr. *Tioga*, Oct. 6th, A. M. begins with a light breeze from N. E.; at daylight wind increasing, took in topgallant sails and flying jib; 8 A M. double reefed foresail and mainsail, and took bonnet off the jib; thick rainy weather and heavy gale; hove to under two reefed foresail, head to southward, about lat. 35° 10′, lon. 75°, on the inner edge of Gulf Stream, 200 miles L.] P. M. gale increasing from N. E., set storm staysail; from 4 to 5 P. M. gale exceeding heavy and veering northward; 8 P. M. wind N. less severe; midnight, gale had veered to N. W. and continued to moderate; at 7 A. M. of the 7th, made sail on the wind.

87. Ship *Cotton Plant*, was dismasted Oct. 6th, near lat. 35°, lon. 74°, [about 162 miles L.] in a gale from N. E. and N. N. E., which for a time blew a hurricane, and veered to N. N. W. Hurricane abated at 5 P. M., but gale continued violent during the night.

88. Ship *B. F. Lamar*, Oct. 6th, wind N. E., cloudy; 6 A. M. wind increases with rain; noon, lat. 35° 30′, on inner edge of Gulf Stream, [about 200 miles L.,] wind strong from N. E.; P. M. heavy gale from N. E. by N., inclining northerly, with heavy rain; 4 P. M. blew a tremendous hurricane; 6 P. M. the clouds were clearing away; midnight more moderate. set foresail; morning of 7th pleasant.

89. Brig *Clara*, Oct. 6th, experienced a hurricane from N. N. E. to N.; at 5 A. M. broached to, was hove on her beam ends and dismasted; lat. 34° 30′, lon. 73° 30′, [about 120 miles L. Only the *hurricane* part of the gale appears to be reported.]

90. Schr. *Magnet*, [second of this name,] was totally dismasted Oct. 6th, lat. 33° 45′, lon. 72° 30′; Captain and crew taken off the wreck. [About 35 miles L. of axis line.]

91. Ship *Rienzi*, from Rio Janeiro, experienced a tremendous gale, Oct. 6th, from N. E. and E., [(?) E. and N. E. ?] veering by N. to N. W.; lat. 34° 30′, lon. 73° 15′, [100 miles L.]

92. Brig *Growler*, Oct. 6th, lat. 35°, lon. 73° 30′, (?) [138 miles L. ?] encountered a severe gale from E. N. E., and while scudding under-close reefed topsail, the gale abated to a dead calm, and on a sudden shifted to N. W., which hove the brig on her beam ends. [A comparison of this report of the winds with the numerous accounts from this part of the ocean, shows an apparent error in the Growler's position, as above given. Doubtless it must have been much nearer the axis line. Such errors of figures occasionally occur in marine reports; and these should therefore be verified, when practicable.]

93. Barque *Hebe*, Oct. 6th, lat. 35°, lon. 73°, [105 miles L.,] experienced a severe gale from N. E.; shifted the cargo, lost spars, &c.

94. Ship *Europe*, lost sails, &c., Oct. 6th, in a hurricane from E. S. E., [E. N. E. ?] in lat. 35° 25′, lon. 73°. [118 miles L. There seems to be an error here, either in direction of wind or locality, when compared with the other observations.]

95. Barque *Montpelier*, Oct. 5th, wind W., 8 P. M. wind N.; Oct. 6th, wind N., light breezes; 4 A. M. wind increasing from N. E.; at 7 A. M. took in jib and mainsail—wind not stated; 9 A. M. double reefed the topsails; noon, wind E., took in foresail and close reefed the topsails, heavy gale and rough sea; 4 P. M. took in fore-topsail and hove to with head to southward; 5 P. M. took in main-topsail; 6 P. M. wind N. N. E.; 7 P. M. cut away the topmasts, vessel lying rail under and would not right; 10 P. M. wind N. N. W.; 11 P. M. gale abating. Oct. 7th, moderate breeze from N. N. W. and a heavy sea; noon, lat. 35° 50′, lon. 72° 15′, [about 108 miles L.]

96. Brig *John R. Gardner*, left New York Oct. 4th, with westerly winds, which on night of 5th hauled to N. N. E. and increased, the vessel scudding before it, till it became one of the most terrible hurricanes that ever swept over the Gulf Stream. [Direction at height of gale not given.] We were now, Oct. 6th, in about lat. 35° 25′, lon. 73° 30′, [about 140 miles L.,] when the vessel broached to and lay on her beam ends; cut away mainmast, with which went the head of foremast, when she righted. Completed the voyage to Honduras under jury masts.

Capt. Good, who was then mate of the *J. R. G.*, informs me that the gale commenced at N. E., and that in its last stages it veered to N. and N. N. W.

97. Fort Monroe, near Norfolk, Va., lat. 37°, lon. 77° 40′, [345 miles L.] average of barometer, Oct. 1st, 30·57; 2d, 30·465; 3d. 30·129; 4th, 29·844; 5th, 30·052. On the 6th, A. M. 30·014, P. M. 29·842; 7th, 30·187. Winds, 1st to 5th moderate; 6th, A. M. E. N. E. and N. E. 3, P. M. N. E. 6, 9 P. M. N. W. 2. No rain reported in the seven days. [These observations indicate the presence of the gale in some strength on the 6th, and the barometric depression on the 4th appears connected with the advance of the first Cuba storm.]

98. Fort Severn, Annapolis, Md., Oct. 6th, winds N. E., 2 to 4, [440 miles L.]

99. Fort McHenry, Baltimore, Md., [465 miles L.] Oct 6th, winds N. 1; N. E. 3; N. E. 4; E. 1.

100. Schr. *Orozimbo*, left Delaware bay for Boston on the evening of Oct. 5th, wind W. N. W.; 9 P. M. Cape Henlopen bore W.; before midnight wind hauled to N. N. E. Oct. 6th, at daylight wind N. E., cloudy, breeze increasing; 11 A. M. near Five Fathom Bank, reefed topsails and mainsail; noon, 25 or 30 miles E. by S., or E. S. E., of Cape May, wind N. E., increasing; 3 P. M. took in topsail; 5 P. M. blowing heavy gale from N. E., took bonnet off jib, three reefed and handed the mainsail, and hove to under foresail; 11 P. M. lost boat from the davits; from midnight gale moderating and veering northward. Oct. 7th, at daylight wind N. N. W., more moderate, set three reefed mainsail and head of jib; noon, strong breezes N. N. W. and cloudy. [About 320 miles L.]

101. At Lewes, Del. [south shore Delaware bay, 360 miles L.] there was "a strong N. E. gale."

102. Fort Mifflin, Delaware river, lat. 39° 51′, lon. 75° 12′, [408 miles L.] There was no rain nor gale, but a strong breeze on the night of 6th from N. E. Oct. 6th, sunrise, wind N. E. 1; 9 A. M. N. 1; 3 P. M. N. 3; 9 P. M. N. E. 4. Oct. 7th, sunrise, N. 1; day, N. W. 1.

103. Ship *Orleans*, near to the coast of New Jersey, between Egg Harbor and Sandy Hook, [about 350 miles L.,] had the hardest of the gale on the night of Oct. 6th, from N. E. to N. W.; was reduced to three reefed topsails for three hours, in carrying sail upon the wind.

104. Barque *Washington*, sailed from Thomaston, Me. for St. Kitts, Oct. 3d. On the 6th, in lat. 37° 55′, lon. 70° 43′, encountered a severe gale from N. E. to E. S. E.; lost topsails and deck load, stove bulwarks, &c. [128 miles L. In this case, as in 91, the report of the hurricane-wind seems to have been taken down by the news collectors without regard to the order of time. On collating the surrounding observations, it appears certain that the E. S. E. wind preceded that from E. N. E. As frequently happens, the direction of the later part of the gale is not mentioned.]

105. Schr. *St. Pierre*, encountered the gale Oct. 6th, in lat. 37°, lon. 69° 36′, [56 miles L.,] which commenced from E. S. E. at 4 P. M., and lasted 14 hours, during which it changed to N. W.

106. At New York, lat. 40° 42′ 40″, lon. 74° 01′, 400 miles L. of axis line; Oct. 1st, 10 A. M. barometer 30·53; during the day winds light, chiefly from S.; cirrous clouds from W.

N. W., cloudiness 0 to 5. Oct 2d, 10 A. M. barometer 30·49; winds E. N. E. to S. 2; cloudiness 10 to 4; upper clouds (cirri) from W. S. W. and W., lower do. (cum.) from S. Oct. 3d, 10 A. M. barometer 30·17, 10 P. M. 29·94; winds chiefly S. S, E. 2 and 3; upper clouds (cir. strat.) from S. W., lower do. (cum.) from S. S. E., cloudiness 4 to 9; slight rain in the night. Oct. 4th, 7 A. M., barometer 29·75, 6 P. M. 29·66, 10 P. M. 29·69; winds N. N. E., W. S. W. and W., 2 and 3; cloudiness, A. M., 10 to 4, being cum. strat. from S. W; P. M. cloudiness 10 to 0, upper clouds from S. W., lower from W. by S. Oct. 5th, barometer 29·78, to 29·99; winds W. to N. W., 4–3; cloudiness 0 to 1, being scattered cumuli from N. W.

Oct. 6th, 7 A. M., barometer 30·05, winds N. N. W. 2, clouds (cum. strat.) from S. W. cloudiness 9 with a clear horizon at N. W.; 10 A. M. barometer 30·06; winds (to 2 P. M.) N. by W. to N. E., 2; clouds, cum. strat. from S. W., cloudiness 8, still clear at N. W.; 2 P. M. barometer 29·96; wind N. N. E., 3; upper clouds from S. W, as before, with a lower stratum of cumulus or storm scud flying from N. E. with increasing speed, cloudiness 9½ or 10, with a bright streak or band still at N. W.; 6 P. M. barometer 29·90; wind and clouds much as before; 10 P. M. barometer 29·84; winds and clouds without visible alteration. The observer's position is on the west side of the city, and it is probable that the force of wind on the *east* side, at 6 and 10 P. M. was 4 to 6. Strength of wind in the night greater, but not known. Oct. 7th, 7 A. M. barometer 30·02, wind N. by W. 3; upper clouds (stratus) from S. W., lower clouds (cum.) from N. by W., cloudiness 9½, with open horizon at W. N. W.; 10 A. M. barometer 30·05, winds N. N. W., 4; upper clouds from S. W., lower clouds from N. N. W., cloudiness 6 and clearness in the N. W. greatly enlarged; 2 P. M. barometer 30·06; winds N. W. 3, with cum. clouds flying from W. N. W., cloudiness P. M. 9 to 6; 10 P. M. barometer 30·18; winds N. W. 3; cum. clouds from W. N. W., cloudiness 2.*

The value of observations near the border of the *gale*, and through its whole barometrical period, may justify this last recital. No rain was noticed at New York, on the night of the 6th, but at Jamaica, L. I., eleven miles east, the rain-gauge showed 0·06 in., which probably marks the boundary of rain on this side of the gale. At Goshen, N. Y., and other places in the great valley of the Blue Ridge, which ranges about forty miles N. W. of New York city, the weather continued "fair" during both the 6th and 7th of October, winds chiefly northeasterly.

107. At North Salem, N.Y., lat. 41° 20′, [389 miles L.,] Oct. 6th, winds N. rainy in night.

108. At West Point, on the Hudson, lat. 41° 23½′, lon. 74°, [427 miles L.,] Oct. 6th, A. M. winds N. W., 1; P. M. N., 2; 10 P. M. N, 3. No rain. Oct. 7th, winds N. A. M.; N. W. P. M.

109. At New Haven, Ct., lat. 41° 18′, lon. 72° 57′, [330 miles L.,] Oct. 2d. A. M. bar. 30·40, winds N. W. and N. E., 1; P. M. bar. 30·30, winds S. E., 1, 2. Oct. 3d, half past 6 A. M. bar. 30·10; 9 P. M. 29·89; winds A. M. S. E., 2, 4; P. M. E. S. E., 4, rainy. Oct. 4th, A. M. bar. 29·70, 29·63, winds E. S. E., 6, S. W. by W., 3, rainy; P. M. bar. 29·58, 29·56, winds N. W. to S. W., 1. Oct. 5th, bar. 29·60, 29 86, winds W. and W. by N. Oct. 6th, A. M. bar. 29·92, winds N., 3; P. M. winds N. by E., 2; 9 P. M. bar. 29·72, wind N. E., 4; some rain in night. Oct. 7th, half past 6 A. M. drizzling rain, bar. 29·80, wind N. by W.; P. M. N. W.; 9 P. M. N. W., bar. 30·02.

110. At Fort Trumbull, Ct., lat. 41° 20′, lon. 72° 08′, [359 miles L.,] Oct. 6th, A. M. wind W., 1, N. W., 2; P. M. N. E., 3; 10 P. M. N. E., 5. Oct. 7th, A. M. N., 2, 3; P. M. W. 3. Rain, from 9h. 30m. P. M. of 6th to 10 A. M. of 7th, 0·57 in.

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* The facts in this report are from my own journal. The scale of *cloudiness* is from 0 to 10, the latter indicating the total obscuration of the horizon. Scale of winds, 0 to 12.

111. Ship *Hottinguer*, for New York, Oct. 6th, noon, lat. 40°, lon. 70°. Had the gale from N. E., veering by N.; carried light sails till dark, in lon. 71½°, running 10 knots. At 8 P. M. close-reefed topsails, furled mainsail, jib, spanker, and mizen-topsail, and run before the gale. Oct. 7th, at 8 A. M. moderate, out reefs and made sail; lat. at noon 39° 17′, lon. 73°. [At height of gale, about 265 miles L.]

112. Ship *Isabella*, Oct. 6th, it commenced blowing hard from N. E. at 6 P. M., and blew very hard for five hours, from N. E. to N. N. W., ending at N. W. Lat. 40° 30′, lon. 72°. [306 miles L.]

113. Ship *Columbiana*, experienced the gale on the night of the 6th, lat. 39° 40′, lon. 70°. [185 miles L.] Lost fore-topmast, and otherwise disabled; had all sails furled at the time.

114. At Fort Adams, R. I., lat. 41° 28′, lon. 71° 23′, [324 miles L. of axis line,] Oct. 1st, av. of bar. 30·401; Oct. 2d, 30·439; Oct. 3d, 30·143, A. M. wind S. E. and S., 3; P. M. S. E., 3, 4, rain from half past 1 P. M. Oct. 4th, bar. 29·784 to 29·595, wind S., 3, E., 4, heavy rain till noon, (2·1 inches,) clearing up with a sudden change from S. E. to W.; P. M. wind S. W. and N. W., 3. [This shows distinctly the first Cuba gale.] Oct. 5th, bar. 29·682 to 29·843, winds W., 4, 5; 10 P. M. W. 3. Oct. 6th, bar. A. M. 29·921, 29·984; P. M. 29·945, 29·972, winds A. M. N. W., 3, 2; P. M. S. E., 1, N. E., 5; heavy rain with high wind in the night; (rain 1 in.) Oct. 7th, bar. 29·776 to 30 in.; wind A. M. N., 5, 4; P. M. N. W., 3, 2.

115.* At Amherst College, Mass., [lat. 42° 22′, lon. 72° 28′, about 412 miles L.] Oct. 2d, bar. 30·15, 30·03, winds S. and S. W., 1, 2. Oct. 3d, bar. 29·91, 29·78, winds S. E., 1, 3, very rainy night. Oct. 4th, bar. 29·52, 29·30, winds E., 1, S., 2, S. W., 1, rainy morning. Oct. 5th, bar. 29·31, 29·51, winds S. E., 1, N. W., 3, 2, blustering. Oct. 6th, bar. 29·70, winds S. E., 1, N. by W., 2; clouds, stratus from S. W.; P. M. from N. E.; [probably lower scud clouds;] fair—lowering and chilly. Oct. 7th, bar. 29·60, 29·78; a little sprinkle in morning; cloudy and chilly day; winds, sun r., N. by W., N. W.; fair at 6 P. M.; 8th, bar. 29·90, winds N. W. and W., 1; fair, fine.

116. State Lunatic Hospital, Worcester, Mass, elevation 483 feet, lat. 42° 16′, [lon. 71° 47′, 376 miles L.] Oct. 2d, bar. *sunrise* 29·83, *sunset* 29·74, winds S. W., fair. Oct. 3d, bar. 29·59, 29·45; winds S. W., S. E., fair, cloudy, rain from 3 P. M., 0·83 in. Oct. 4th, bar. 29·18, 28·93, winds S. E., N. W., S. W.; rain 1·66 in., fair, cloudy. Oct. 5th, bar. 28·95, 29·13, winds S. W., N. W., fair, cloudy. Oct. 6th, bar. 29·35, 29·30, winds W. and N. W., fair, cloudy. Oct. 7th, bar. 29·19, 29·40, winds N. W.; raining at sunrise, (0·21 in.,) cloudy.

117. In the Vineyard Sound, S. coast of Mass., lat. 41° 27′, lon. noon, 70° 45′, [300 miles L.,] the Schrs. *Henry* and *Cambridge* were dismasted at their anchors, in the gale from N. E., on the night of Oct. 6th.

118.† At Nantucket, lat. 41° 15′, lon. 70° 06′, [260 miles L.,] Oct. 4th, bar. 29·55, 29·50; winds S. E., 2, S. W., 1, cloudy and showers, fair. Oct. 5th, bar. 29·56, 29·58; winds W. S. W. 3, 2, clear. Oct. 6th, 9 A. M. bar. 29·85, wind N., 1, fair, slightly overcast with cirri; 3 P. M. bar. 29·85, E., 1, cloudy, grows thick and looks threatening, wind increasing; 6 P. M. bar. 29·80, N. E., 2, cloudy, every indication of a storm; 8 P. M. bar. 29·66, N. E., 3, rain, wind increasing; 10 P. M. bar. 29·60, N. E., 4, rain, gale increasing; 12 P. M. bar. 29·50, wind 6, and rain, gale extremely heavy. Oct. 7th, 9 A. M. bar. 29·70, wind N. N. W., 4½, slight rain; (whole rain 1·50 in.;) 3 P. M. bar. 29·80, N. N. W., 2, clearing. Oct. 8th, 9 A. M. bar. 30·04, wind N. N. W., and N. W., 1, weather delightful.

119. Schr. *Mogul*, Oct. 6th, 7th, lat. 40° 35′, lon. 69° 09′, [195 miles L.,] took a heavy gale from eastward, which blew a hurricane for about 4 hours; split balance reefed mainsail, was hove on beam ends and dismasted.

120*a*. Ship *Unicorn*, from Boston for New Orleans, Oct. 5th, at 9 A. M. got under way, with a fine breeze from W. S. W. and pleasant; at 10·30 A. M. Boston light-house bore N. W. by N. by compass, 2 miles. Noon, fresh breezes and passing clouds, course

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* Observations of Prof. SNELL, scale of strength of wind 0 to 6. The storm of 6th, 7th appears hardly to have reached Amherst, as regards the surface wind.

† WILLIAM MITCHELL's observations; scale of wind's force 0 to 6.

E. S. E., wind W. S. W.; 3 P. M. Cape Cod light-house bore S. W. ½ S., distant 5 miles; night, wind moderate.

Oct. 6th, begins moderate; 5 A. M. wind W. N. W., course S. by E. ½ E., set studding-sails. Noon, moderate and cloudy, lat. (D. R.) 40° 34′, lon. 69° 6′. P. M. commences light breezes from E. N. E. and cloudy; took in studding-sails and braced on larboard tack, course S. by E.; 4 P. M. wind freshening, took in m. royal and miz. top gt. sail; 6 P. M. in fore and main top gt. sail, sent down m. royal yard and close-reefed the mizen-topsail; 6·30 P. M. gale suddenly increasing, took in jib, spanker, fore and main-courses and mizen-topsail; 7 P. M. gale N. E.; 8 P. M. close-reefed fore and mizen-topsails. At 9 P. M. it was a complete hurricane, blowing the topsails to pieces before we could get them in; also blew the jib from the boom and the staysail from the hanks. At 11 P. M. a heavy sea making and ship rolling heavily, lost quarter boat and shifted the ballast; hove the ship to, head to southeastward. [Midnight, lat. computed, 39° 47′, lon. 68° 56′.]

Oct. 7th, wind commences hauling towards N. W. and blowing a hurricane with a heavy cross sea, ship hove to under a tarpaulin in the mizen rigging; tried to bend mizen-staysail, but found it impossible; forenoon more moderate; at 10 A. M. kept off S.; set reefed courses, bent and set staysails. [Noon, computed lat. 39° 33′, lon. 69° 3′.] P. M. commences with wind settling at N. W.; unbent fragments of topsails, bent new ones and set them double-reefed; course S. by W. Night more moderate; made sail accordingly. [Next 12 hours pleasant, wind W.]

120 *b*. Brig *Corvo*, took the gale at 11 P. M. of the 6th, in lat. 39° 40′, lon. 68°; was on her beam ends two hours; main-topsail and foresail blown away when furled snug in the yards. [103 miles L. of axis line.]

121. Ship *Sarah & Arsilia*, for Havre, Oct. 6, A. M., moderate; noon, heavy rain in squalls from S., lat. D. R. 39° 20′, lon. D. R. 67° 38′; [103 miles L.;] P. M. begins wind S. E.; at 2 P. M. freshening, double-reefed the topsails; 4 P. M. blowing a gale from E. S. E., close-reefed the topsails and reefed the foresail; at 7 P. M. the gale had veered to E. N. E., and at 8 P. M. hove the ship to, blowing violently; at 11 P. M. blowing a hurricane. Oct. 7th, at 2 A. M. the hurricane shifted rather suddenly to N. E.; at 2·30, shipped a heavy sea, stove bulwarks, &c.; [(?) 50 miles L.;] 8 A. M. gale still heavy from N. E.; 10 A. M. N. N. E., commenced scudding; at 1 P. M. wind had veered to N. W., strong gales and clear weather with a high sea, set close-reefed fore-topsail and reefed foresail; 6 P. M. more moderate, shook out one reef; midnight, still moderating, set top gt. sails over single reefs. Oct. 8th, moderate breezes from W. N. W., lat. 40° 34′, lon. D. R. 64° 32′. [12 miles L. This vessel was in the Gulf Stream, which, with her general course eastward, prolonged the duration of the gale.]

122. Ship *Zurich*, Oct. 6th, lat. 40° 27′, lon. near 67°, [140 miles L.,] calm; 2 P. M. N. E., moderate; 4 P. M. E., freshening; 8 P. M. gale N. E., scudding, double-reefed top-sails, took in jib and mainsail. Oct. 7th, 3 A. M. gale still increasing, split the foresail; 4 A. M. hove to; 8 A. M. gale had veered to N. W.; 11 A. M. bent a new foresail and made sail, winds more moderate with heavy sea; noon, lat 39° 30′, lon. 68° 30′, [115 miles L.]

123. Ship *Courier*, for Gibraltar, Oct. 6th, A. M. wind W. to E. N. E., light, lat. 39° 43′, lon. 67° 19′, [80 miles L.] P. M. commences with fresh gales from E. N. E.; 2 P. M. in top gt. sails; 3 P. M. double-reefed the topsails; 4 P. M. close-reefed, gale still increasing, course S. E. by S. upon the wind; 6 P. M. reefed the foresail and hove to; heavy sea breaking over the ship; latter part heading E., gale having veered to N. E. and N. N. E. and increased to a full hurricane. [(?) 40 miles L.] Oct. 7th, a tremendous hurricane; at 4 A. M. wind was N. W. with rain, having hauled from N. E. during the night; 8 A. M. gale abating; 10 A. M. bore away and set reefed foresail, a heavy sea on; noon, lat. 39° 25′, lon. 66° 25′, [29 miles L.] At 1 P. M. gale N. W., set mainsail; 5 P. M. out one reef of main-topsail; 8 P. M. set jib and spanker, blowing in squalls, with a heavy sea; latter part moderate. At 2 A. M. Oct. 8th, out reefs and set topsails.

124. Ship *Nathaniel Hooper*, sailed from Boston Oct. 5th; noon of 6th, lat. obs. 40° 58′, lon. (chr.) 68° 21′, calm; P. M. course S. W., winds N. E., increasing; 5 P. M. in all light sails; 7 P. M. wind increasing to a gale, shortened sail and close-reefed topsail; 10·30 P. M. gale increasing, with rain in torrents, took in mizen-topsail, and while handing fore-top-

sail gale increased to a tornado and caused the ship to broach to; it blowing a perfect hurricane which tore all the sails into ribbons, blowing them from the gaskets; a tremendous sea, occasionally breaking over the ship. Oct. 7th, [about 152 miles L.,] blowing a hurricane, ship lying to; up N. E., off E.; at 11 A. M. gale abating, still lying to, with a N. N. W. gale; at noon wore ship to S. W.; lat. (D. R.) 39° 54′, lon. 68° 48′; P. M. strong gales N. N. W. and cloudy; ends with light winds from N. W. Oct. 8th, noon, lat. 38° 44′, lon. (chr.) 69° 35′. Capt. CHURCHILL states that his barometer fell to 28·40, [add index error ·20=28·60,] and that three of the ships which left Boston in company with the *N. H.* returned to port dismasted.

125. In Boston Bay [about 318 miles L.] the gale was severe at N. E., and several vessels were driven on shore during the night of the 6th, near Point Alderton, at Scituate, &c.

126. Watertown Arsenal, Mass., lat. 41° 21′, lon. 71° 12′, [352 miles L.,] Oct. 3d, winds S. E., 2; 9 P. M. S. E., 3, and clouds from S. E. Oct. 4th, A. M. S. E.; 3 P. M. S. W., 2; 9 P. M. N. W. 2; (rain from 3 P. M. 3d, to 1 P. M. 4th.) Oct. 5th, sunrise, W., 2; 9 A. M. S. W., 3; 3 P. M. S. W., 5; 9 P. M. N. W., 1. Oct. 6th, A. M. W., 2; 3 P. M. N., 2; 9 P. M. N. E., 3. Oct. 7th, sunrise, N. E., 1; 9 A. M. N. W., 2; 3 P. M. W., 1; 9 P. M. N. W., 2; rain from 10 P. M. 6th to quarter past 1 P. M. 7th, 0·74 in.

To this may be added the following barometrical observations of R. T. PAINE, Esq., at Boston, made at sunrise, half past 2 P. M., and 10 P. M. Oct. 1st, 30·23, 30·37, 30·38. Oct. 2d, 30·40, 30·39, 30·34; 3d, 30·24, 30·08, 29·96; 4th, 29·80, 29·47, 29·48; 5th, 29·48, 29·60, 29·79; 6th, 29·92, 29·90, 29·79; 7th, 29·82, 29·86, 30·03; 8th, 30·05, 30·05, 30·06.

127. Fort Constitution, Portsmouth, N. H., lat. 43° 03½′, lon. 70° 43, [364 miles L.,] Oct. 6th, A. M. winds N., 2, N. W., 1, halo; P. M. E., 2, N. E., 5. Oct. 7th, winds N., 3; rain 0·38 in.

At Saco, Me., about 30 miles N. of Portsmouth, the barometrical observations of J. M. BATCHELDER, taken at 7 A. M., 2 P. M., and 7 P. M., at 65 feet above high water, were as follows, viz.—Oct. 1st, 30·31, 30·32, 30·37. Oct. 2d, 30·39, 30·26, 30·34; 3d, 30·32, 30·17, 30·12; 4th, 29·84, 29·59, 29·57; 5th, 29·56, 29·56, 30·14; 6th, 29·93, 29·96, 29·97; 7th, 29·86, 29·93, 29·94; 8th, 30·06, 30·07, 30·04.

128. At Hanover, N. H., on the Connecticut, lat. 43° 41′, lon. 72° 22′, [460 miles L.,] Oct. 2d, bar. 30·08 to 29·88, winds N. W., S. W., S. E. Oct. 3d, bar. 29·76, 29·60, winds S. E., rain from 8 P. M. Oct. 4th, bar. 29·40, 29·11, winds S. E. at sunrise, S. W. at half past 1 and half past 9 P. M., (rain to 3 P. M., in all 2·85 in.) Oct. 5th, bar. 29·10, 29·44, winds S. W., N. W., (bar. 29·09 at 9 A. M. and sprinkling of rain 10 A. M.) Oct. 6th, bar. 29·59, 29·52, winds N. W.; N. at half past 9 P. M. 7th, sunrise, bar. 29·45, half past 1 P. M. 29·59, half past 9 P. M. 29·71, winds N., rain from 3 P. M. 0·02 in. Oct. 8th, A. M. bar. 29·70, 29·72, winds N.; half past 9 P. M. winds S. W., barometer falling. [From these observations of Prof. YOUNG and those of Prof. SNELL at Amherst, it appears that the strength of this second storm, as one either of wind or rain, did not reach the valley of the Connecticut, although barometrically, its influence was more widely extended.]

129. Ship *Mediator*, for London, Oct. 6th, noon, lat. obs. 40° 20′, lon. (chr.) 65° 36′, [40 miles L.,] wind N. E.; commenced blowing at 2 P. M.; at 4 P. M. blowing hard; 6 P. M. under close-reefed topsails; 10 P. M. very heavy gale, hove the ship to, with head still to southward; midnight, wind E. S. E. Oct. 7th, commences with gale still increasing; 3 A. M. wind had hauled to S. E.; [ship now near the axis line of the gale;] 4 A. M. gale, S. S. W.; 6 A. M. gale S. W. by W., still blowing hard; 8 A. M. wind W.; 9 A. M. N. W. by N.; 11 A. M. N. W., and continued to blow in that quarter; noon, lat. 40° 32′, lon. 61° 36′. [98 miles R. of axis line; having crossed the same during the gale. This accounts for the veering of the wind by the S., as the gale passed over, instead of by the N. as on the L. side.] Capt. CHADWICK states that his barometer fell as low as 28·20, of which he is certain, and he thinks lower, previously to 4 A. M. [This barometer reads 0·08 in. lower than my own, giving 28·28 in. for the above observation.]

130. Ship *St. Nicholas*, for Havre, Oct. 6th, lat. 40° 30′, lon. 66° 20′, wind E., cloudy, course S. S. E.; 5 P. M. [25 miles L.] commences blowing strong from E. N. E. with rain; 6 P. M. double-reefed; 7 P. M. in fore and main-topsail and mainsail; 8 P. M. blows tremendously, hove the ship to under close-reefed main-topsail, head S. S. E., [wind about

E.;] 11 P. M. gale S. E. Oct. 7th, at 2 A. M. wore ship to N. E.; about 3 P. M. *wind abated at S. E. and came out light from N. W.*, which suddenly increased to a tremendous gale; hove the ship to, sea running high from the old quarters and making a clear breach over the ship; 8 A. M. kept away before the wind; noon, weather moderated and all sail set, lat. 39° 40′, lon. 64° 45′, [31 miles R.] Oct. 8th, lat. 40° 40′, lon. 62° 40′, Capt. PELL states that between 1 and 4 A. M. his barometer had fallen to or below 28·20; the lowest he had seen it, except in the gale in which the steam-ship *President* was lost. [Its error being 0·17 in. gives 28·37 in., corrected.]

The *Cambridge*, for Liverpool, was in company with the *Mediator* before the gale, and in like manner with that ship and the *St. Nicholas*, crossed the axis line during the gale and had the wind veer by the South, as follows:

131. Ship *Cambridge*, Oct. 6, P. M., wind freshening from E. N. E., veering to E. S. E., ship's course S. E. to S.; at 4 P. M. topsails were double reefed; 6 P. M. close reefed; furled foresail; gale increasing. October 7th begins by wearing ship to the E. under close reefed main-topsail and main spenser; wind increasing; at 2 A. M. a complete hurricane; blew away the main-topsail; wind hauling gradually from S. S. E. to westward; at 7 A. M. bore away* under close reefed fore-topsail; 10 A. M. set the foresail; at 6 P. M. more moderate. The mate states that the wind hauled gradually from S. S. E. to S. W. and the westward.

132. Brig *Mentor*, for Guadaloupe, Oct. 6, lat. 40° 30′, lon. 65°, [24 miles R.] light winds from N. and E. and heavy sea. Towards evening wind increased, and before 10 P. M. a heavy gale set in blowing from S. E.; 11 P. M. hove to. October 7th, gale increasing, and before 4 A. M. blew a hurricane; by 6 A. M. every mast and spar was blown from the wreck.

133. Ship *Roscius*, for New York, took the gale off N. E. end of George's Shoal, near lat. 41° 10′, lon. 65° 50′, [about 85 miles L.] on the 6th, about 6 or 7 P. M., from E. N. E. The gale was heaviest about 1 A. M. of the 7th, when the barometer stood somewhat below 28 inches, but soon rose, and the gale veered suddenly to N., and thence gradually to the northwestward. At the commencement of the gale on the evening of the 6th, the barometer stood at about 29·70. [Its index error, I am told, was two or three tenths; corrected minimum, say 28·25 inches.]

134. Ship *Rochester*, Oct. 7th, lat. 42°, lon. 67°, [182 miles L.] experienced a severe gale from N. E.; lost main-topsail, foresail, &c., and sprung fore and main masts.

135*a*. Fort Preble, near Portland, Me., lat. 43° 30′, lon. 70° 20½′, [368 miles L.] Oct. 2d, average of barometer, 30·249; Oct. 3d, 30·155; Oct. 4th, 29·739, wind S. E., 6 to 8, rain from 7 P. M. of 3d to 4 P. M. of 4th, 0·90 inches; Oct. 5th, bar. 29.535, 9 P. M. 29·717, winds, A. M., S. W., 3, 4; P. M., W., 6, 4, 1. Oct. 6th, sunrise, bar. 29.937, wind S. W., 2; 9 A. M. bar. 30·059, wind S. W., 1; 3 P. M. bar. 30·055, wind S. W., 1; 9 P. M. bar. 29·977, wind, S. E. (?) 6. Oct. 7th, sunrise, bar. 29·736, wind N., 6; 9 A. M. bar. 29·862, wind N. W., 4; 3 P. M. bar. 29·961, wind N., 4; 9 P. M. bar. 30·032, wind N. E., 1; light rain 7th, from 6 A. M. to 6 P. M., 0·14 inches.

135*b*. The following observations were made at Hampden, Me., on the Penobscot River, 180 feet above tide, lat. 44° 42′, lon. 68° 56′. From journal of J. HERRICK.

Oct.	Barometer.				Ther.	Wind, and its force.†				Clouds, velocity and course from.			
	S. R.	9 A. M.	3 P. M.	9 P. M.	Mean.	S. R.	9 A. M.	3 P. M.	9 P. M.	S. R.	9 A. M.	3 P. M.	9 P. M.
2	30·24	30·29	30 24	30 40	38 75	N. W. 1	S. W. 1	S.S.E. 2	S.W. 2				
3	30·26	30·23	30·10	30 10	47·75	S. E. 1	S. E. 2	S. E. 3	S. E. 2		Smoky. S. E. 2	Hazy. S. E. 3	S.S.E. 2
4	29·88	29·88	29 54	29 30	55·75	S.S.E. 6	S.S.E. 6	E. 6	E. 1	E. 6	S. E. 8	E. 8	
5	29·29	29·30	29·27	29·48	54·75	S. 1	S. 3	N. W. 3	W. 2		S. 3	N.W. 3	
6	29·80	29·83	29·83	29·84	49·75	S. W. 1	N. W 2	N. W 2	W. 1		N. W. 2	S. E 3‡	
7	29·65	29·70	29·87	29·94	42·25	N. W. 6	N. W. 4	N. W. 3	N 2	N. E. 6	N.N.E. 4	N.W. 3	W. 2
8	30	30 03	29·90	29 90	43·75	N. W. 1	S. W. 1	S. W. 1	S.W. 1	N.W. 1	N. W. 3	N.W. 2	N. W. 1

* The sea terms, "*bear up*" and "*bear away*," have but one meaning among our seamen. The latter term, though not accordant with authority, seems best to express the idea of sailing off from the wind; the former refers to the act by which the result is produced.

† Formulary of the Surgeon General's office. ‡ High current.

Oct. 4th, at 5 A. M., wet; frequent showers with violent wind in short gusts; continued to blow hard with slight rain to 11 A. M, when the storm commenced with great violence; from 11 A. M. to 8 P. M. there fell 0·95 inches of rain; 2 P. M. thunder shower N. W. Oct. 6th, high current from S. S. E. all day; low clouds from N. W. Oct. 7th, at 6 P. M. a pause; from 9 A. M. to 9 P. M. 0·54 inches of rain fell. During the progress of this storm [night of 6th and 7th] the low wind has been from N. W. with a rising barometer, and a higher current from S. S. E. [The lower or *scud cloud*, however, has shown here the true course of the wind in the *storm stratum*, and conformably to the barometric changes; see table. Both here and in Massachusetts, the old N. W. surface wind of the 5th appears to have intruded beneath the storm stratum, nearly or quite to the sea coast.]

136. At Yarmouth, Nova Scotia, lat. 43° 51′, lon. 66° 05′, [28 miles N. W. from Cape Sable, and 225 miles L.] a heavy gale commenced at 11 P. M. Oct. 6th, from N. E., and at 11 A. M. of the 7th, veered to N. W. Vessels in port damaged and driven on shore.

137. Ship *St. Petersburg*, Oct. 6th and 7th, Cape Sable N. W. 25 miles, [lat 43° 05′, lon. 65° 14′, about 152 miles L.] experienced a gale from E., lost topmasts and mainsail. [It must be inferred that this position, west of the ship's proper track, was at the close of the easterly part of the gale, and that the vessel was much nearer the axis line in the early part of the storm. Close of the gale not mentioned.]

138. Fort Sullivan, Eastport, Me., lat. 44° 53′, lon. 67°, [310 miles L.] Oct. 4th, winds E., 4, 5; 9 P. M., N. E., 6; 5th, S. E., 1, S. W., 3, 4, W., 2; rain from 1 P. M. of 4th, with high winds—rain, ending 2 A. M. of 5th, 2·10 inches. Oct. 6th, A. M., winds W. 2.; P. M., N. W., 1, 0. Oct. 7th, sunrise, wind N. E., 6; 9 A. M., N., 4; 3 P. M., N. W., 3; 9 P. M., N. W., 3; rain from 2 A. M. to 10 P. M., 0·55 inches.

139. At Hancock Barracks, Holton, Me., lat. 46° 5′, lon. 67° 40′, [390 miles L.] Oct. 2d, average of bar. 29·593: 3d, 29·68: 4th, A. M., 29·576, wind E, 4, 5; 2 P. M. 29·209, wind E., 6; 9 P. M. 29·075, wind E., 6; rain from 1½ P. M. ending in night, 0·54 inches: 5th, A. M., 28·862, wind S. E., 3, S., 4; P. M. 28·835, wind S., 5, 3, showery. Oct. 6th, sunrise, bar. 29·063, wind S. W., 3; 10 A. M. 29·099, wind N. W., 3; 2 P. M. 29·205, wind W., 2; 9 P. M. 29·205, W., 2: 7th, sunrise, 29·142, N. E. 4; 9 A. M. 29·177, N. E. 4; 2 P. M. 29·142, N. W., 3; 9 P. M. 29·236, N. W., 3; rain from 11 A. M. to 4 A. M. of 8th, 0·70 inches, [apparently within the range of the two storms.]

140. At Fort Kent, Me., lat. 47°? lon. 68° 20′? [about 460 miles L.] Oct. 4th, wind S. E., 1, 2; 5th, N. E., 1, 2, W. 2; rain from 3 P. M. of 4th to 11 A. M. of 5th, 0·84 inches; 6th, N. W., 3, 2, 1, showers in night, 0·03 inches. Oct. 7th, A. M., N. E., 2; 2 P. M., N., 2; 9 P. M., N., 1; rainy from 3 P. M. to 5 P. M., 0·02 inches. Aurora in the evening. [No gale here, but the more moderate influence of both storms is distinctly seen.]

141. H. M. ship *Illustrious*, Ad. Sir CHARLES ADAM, in Halifax harbor, lat. 44° 36′, lon. 63° 28′, [168 miles L.] Oct. 4th, A. M., (first 12 hours,) bar. 30·29 to 30·05; winds from E. S. E., 4, 5, c., to S. by E., 6, c. q.; P. M. bar. 30·01, to 29·80 at 10 P. M.; winds S. by E., 6, S. E., 7, E. S. E., 8, E. by S. 9, 7; rain from 6 P. M. Oct. 5th, bar. 2 A. M. 29·50; 10 A. M. 29·54, noon, 29·60; winds, 2 A. M., S. E., 5, o. c. q.; 4 A. M., W., c. o.; 6th A. M., S. W., 3, o. t.; 10 A. M., S. W., 2; 2 P. M. bar. 29·51, 10 P. M., 29·56; winds, W. S. W., 3, 4 o. c.; 6 P. M., S. W., 4, 2, c. Oct. 6th, A. M. bar. 29·59 to 29·75, P. M. 29·78 to 29·83; winds A. M., S. W., N. W., 3, 2, b. c., c. f.; P. M., N. W. to N. N. W., 3, 2; ends calm. Oct. 7th, bar. 2 A. M. 29·76; 4 A. m., 29·76; 6 A. M. 29·56; 8 A. M. 29·50; 10 A. M. 29·40; noon 29·23; 2 P. M. 29·38; 4 P. M. 29·38; 6 P. M. 29·40; 8 P. M. 29·48; 10 P. M. 29·59; 12 P. M. 29·73: winds, 2 A. M., N. Easterly, 4, c.; 4 A. M., N. E., 5, c. r.; 6 A. M., E. N. E., 6, q. r.; 8 A. M., E. N. E., 7, q. r.; 10 A. M., N. E., (northeasterly,) 8, q. r.; noon, N. Easterly, 8, q. r.; 2 P. M., N., 6, o. q. r; 4 P. M., N., 6, o. q. r.; 6 P. M., N. Westerly, 5, c. q., and the same to midnight. Oct. 8th, A. M., bar. 29·74 to 29·88; winds N. W., W. N. W., N. W., 6, 5, 2, 4, c. o., b. c,; P. M., bar. 29·88; winds W. N. W., 4, 2, 1. [According to the barometer, the axis of the gale appears to have been opposite to or S. E. of Halifax about noon of 7th, or soon after.]

142. H. M. ship *Scylla*, at and from Prince Edward's Island, Gulf of St. Lawrence, Oct. 2, A. M., winds N. W. to W. N. W., 4, c., bar. 30·20; P. M., running for Pictou and anchored under Pictou islands; winds W. N. W., S. W., 4, 3, 2. Oct. 3d, running for

Cape St. George; A. M., winds W., S.W., S., S.S.E., 2, b. c., bar. 30·40: P. M., winds S. by W., 3, S.S.E. and S.E., 4, b. c.; anchored under shelter of Cape St. George. Oct. 4th, weighed for Gut of Canso; 2 A. M., winds S.E. by S., 5, 6, b. c.; 6 A. M., S.E. by E., 6, 7, b. c. q.; 11 A. M., S.E., 6, b. c.; bar. 30·20: P. M., winds S.S.E., 7, c. g. q.; 5 P. M., S.S.E., 7; ends S.S.E., 7, c. g. r.; strong gales and heavy rain. Oct. 5th—for and in Gut of Canso; 1 A. M., winds S.E. by S., 8, c. q. r.; 4 A. M., S.S.E., 6, q.; 6 A. M., S., 5, c. b.; 8 A. M. S.W. 4, b. c.; noon, W. by S., 3, bar. 29·30: P. M. winds W., 1 to 5, b. c.; anchored in Ship Harbor, Gut of Canso. Oct. 6th, A. M., winds W., 2, 5, bar. 29·75: P. M., winds W., 4, 3, 2; calm, easterly, 2, b. c.; ends off Cape Canso.

Oct. 7th, running from Cape Canso for Halifax, wind easterly, 4, b. c.; lost sight of light at 1·15 A. M.; 4 A. M. wind 6, b. c.–c. r.; at 6·30 double reefed fore and three reefed main-topsail; 6 A. M., E. by N., 6—9, o. r. c.; at 9·30 furled topsail, down top-gallant yards and housed top-gallant masts; 10 A. M., gale 10, q. r. c.; at 11 gale E.N.E., 10; hove to on larboard tack; course from 4 to 11, W., 8 to 11 knots; noon, gale 10; bar. 28·90; Sambro Light, N. 82, W. 25 miles. [Lat. 44° 21′, lon. 63°, 132 miles L. The westward run from off Cape Canso increased the distance from the axis line, and appears to have produced a change of one or two points in the direction of the gale.] P. M., lying to, struck mizen-topmast; 2 P. M., gale N.E., 9, o. g. r.; 4 P. M., 9, 8, o. g. r.; 6 P. M., N.W. by N., 8, o. g.; from 9 to 12, N.W. by W., 8, 7, o. g. Oct. 8th, A. M., winds N.W., 6, 6, 5, W.N.W., 4, c. g., c.; at 5 A. M. began to make sail; noon, bar. 29·90: P. M., winds W.N.W. to W., 4, 3, 4, b. c.; ends with Sambro Light 8 miles distant.

143. Schr. *Actress*, in Little Canso Harbor, S.E. point of Nova Scotia, lat. 45° 20′, lon. 60° 53′, [about 98 miles L.] gale commenced nearly at S.E., and after blowing near 12 hours hauled steadily by the N. to N.W.

144. H. M. ship *Pique*, Capt. M. Stopford, Gulf of St. Lawrence, Oct. 6th, 4 A. M., bar. 29·36, wind N.W. by N. 4; noon, lat. 47° 59′, lon. 63° 18′, bar. 29·65, winds N.W. by N., 5; 3 P. M., W., 4, b. c., bar. 29·75; 8 P. M., N.W., 4, bar. 29·90; 10 P. M., N.E., 2; midnight, E., 3. Oct. 7th, 3 A. M., wind E. by S.; daylight, land of Cape Breton Island on the weather bow; 7·20 A. M., single reefed; 8 A. M. bar. 29·63, wind S.E. by E. (magnetic) 5, c. r. m.; 9. A. M., bar. 29·54; in top-gallant sails, close reefed the spanker, down jib; 9·30, island of Justicoe bore E.S.E. one mile, in 2d reefs; 10·30, tacked; run for and at 11 A. M. anchored under the island, wind E. by N. 7, c. r. g.; [Justicoe, or Just au Corps, is in lat. 46°, lon. 61° 37′, about 135 miles L.] noon, bar. 29·40; 1 P. M., wind E.N.E., 7, o. g. r. f; bar. 29·29; 2·15 P. M., wind 8, weighed anchor and run for Gut of Canso under courses, staysail, and close reefed spanker; 3 P. M., bar. 29·19, wind N.E., 10, o. m. d. q.; [at or near crisis of gale, about 120 miles L.] 3·15, split and blew away part of the foresail; 4 P. M., wind N.E., 9, o. q., split main-staysail; 4·30, came to anchor 4 miles within the Gut of Canso, [say lat. 45° 39′, lon. 61° 23′, about 120 miles L.]; 5 P. M., bar. 29·29, wind N.E., 8, q. m.; 6 P. M., wind N., 7; 7 P. M., N., 6, c. q.; 8 P. M., N. by W.; 9 P. M., N. by W., 5, m., bar. 29·48; 10 P. M., N.W., 6, m. r. q.; midnight, N.W., 6, b. q. m. Oct. 8th, 2 A. M., wind N. by W., 5, c. q. r.; 4 A. M., bar. 29·77; 6 A. M., N.W., 6, c. q. r.; 8 A. M., W.N.W., 5, b. c. q., bar. 29·87, weighed anchor and made sail out of the Gut; 10·30, anchored in Inhabitants Bay [lat. 45° 34′, lon. 61° 16′;] noon, bar. 29·85, wind N.N.W., 5, b. c. q. r.; P. M., wind N.N.W. to W.

The *Pique* also encountered the gale of the 4th and 5th, in the St. Lawrence, but I have no copy of the log for this period.

145. Schr. *Normal*, sailed from the Labrador Coast, Oct. 6th, with a fresh breeze from N., bound for St. Johns, N.F. The wind freshened during the following night, and hauled to E.N.E. October 7th, it increased gradually to a gale from E.S.E. Could not weather Cape Bonavista, and having split the sails, bore away for shelter among the islands in the bay and repaired damages, [about lat. 48° 45′, lon. 53° 45′, 36 miles L.? Mag. var. about 25° W.] At this anchorage the gale is said to have changed by the N. to N.W.

Having thus followed the gale on the left side of its axis to the extent of our reports, we now resume the accounts from the right side of the storm, from Bermuda onward.

146. Ship *J. N. Cooper*, bound for Gulf of Mexico, Oct. 6th, about 1 P. M. the gale had commenced blowing hard from S. E. by E., which in hauling to S. S. E. increased to a furious hurricane, in which all the spars were blown off the ship except the lower masts. The wind had continued hauling to S. S. W., at which point the force of the hurricane began to abate, and the gale continued hauling to S. W. and thence to N. W., ending about midnight. The greatest force of the hurricane lasted about five hours. Position near the close of the hurricane lat. 35° 50′, lon. 69°, [25 miles right of axis line; ship further from this line in the earlier part of the gale.]

148. Brig *Wakulla*, for New York, Oct. 6th, 3 A. M. wind S. S. E., light, freshening in the forenoon, with clear weather; noon, lat. 35° 36′, lon. 66°, [148 miles R.;] P. M. begins with strong gales from S. S. E., took in light sails; 3 P. M. gale increasing, double-reefed topsails, barometer rapidly falling; 6 P. M. heavy gale, close-reefed topsails, took in mainsail and jib; 9 P. M. blowing a hurricane from S., took in fore-topsail and foresail, and hove to at 10 P. M. head to eastward. Oct. 7th, at 1 A. M. the vessel was forced on her beam ends, yards broke and sails blew to pieces, hurricane still blowing with inconceivable fury; soon after 2 A. M. it began to abate a little in its force, till at half past 3 A. M. it suddenly changed and came in its full strength from N. W., [20 miles R. (?)] In about 2 hours afterwards it began slowly to abate, so that at 8 A. M. we set a reefed foresail and close-reefed fore-topsail. The gale lasted till noon, when we observed in lat. 36° 41′, lon. 67° 30′. [47 miles R. At the change of the gale the vessel must have been further to the N. W.]

Near midnight on the 6th, Capt. MULFORD saw that his barometer had fallen to about 27·50. [Add adjustment error 0·15, and for assumed error of observation say 0·10=27·75 in.] The weather was not cloudy in the commencement of the gale, nor so long as the spray blown from the sea permitted observation. Nor at this time was the sea heavy, being blown off comparatively smooth by the violence of the wind, which blew with a force surpassing previous belief or conception.

149. Brig *St. Lawrence* was dismasted in a hurricane Oct. 6th, lat. 36° 50′, lon. 67° 2′. [65 miles R.]

150. Brig *Charles*, took the gale Oct. 6th, in lat. 37° 50′, lon. 67°, [35 miles R.,] was hove on beam ends, lost mainmast, fore-topmast, &c.

151. Barque *Elvira*, for Philadelphia, Oct. 6th, in lat. 38° 10′, lon. 66° 30′, [22 miles R.,] experienced a tremendous hurricane from S. to S. S. W. [This vessel was bound to the N. W., and the position is probably that of noon after the gale. Like the *Wakulla*, on the same course, she probably took the gale at a much greater distance from the axis line, and seems to have reported only the hurricane portion of the gale.]

152. Whaling ship *Nye*, for the Pacific Ocean, took the gale of Oct. 6th, in lat. 38° 58′, lon. 65°, [47 miles R.,] from S. E., with rain, lay to heading S. W.; 8 P. M. took in storm-staysail; gale increasing till 1 A. M. of Oct. 7th, when the ship became disabled, and sails blown in tatters; at 8 A. M. gale abated.

153. Whaling ship *Mt. Vernon*, for the Pacific, Oct. 6th, lat. 39°, lon. 66°, [6 miles R.;] 6 P. M. wind E., stormy indications; bar. fell and wind increased during the evening. From midnight till 4 A. M. of the 7th it blew a perfect hurricane, when it suddenly shifted to S. and S. W. and settled at W., blowing if possible harder than before; at 8 A. M. of the 7th it was moderate; lost all her masts and otherwise injured. [The sudden shift of the wind shows the ship to have been near the axis of the gale.]

It has been seen that three ships, cases 129 to 131, first took the gale on the left side of its axis path, and crossed the same in front of the axis, which brought them into the right side of the gale where it veered by the S. to the W. Our next three cases on this side, will be nearer the right border of the gale.

154. Brig *Lowell*, from Tobasco to Marseilles, Oct. 5th, lat. 33° 46′, lon. 64° 40′; P. M. good breeze from S. W., overcast; midnight, moderate breezes and passing clouds. Oct.

6th, 5 A. M. wind S., increasing; 9 A. M. veered to S. E. quarter, took in top gt. sails, brisk winds and clear weather; noon, lat. 34° 18′, lon. 62° 30′, [372 miles R.,] going 8½ knots. P. M. wind S., strong, with clear weather, all drawing sails set; 8 P. M. wind increasing, in top gt. sails; 9 P. M., wind S. S. W.; midnight, strong wind and clear weather, sea making fast and had caused the brig to spring a leak. Oct. 7th, 1 A. M. wind S. W., very strong; 1·30 A. M. split the jib and took in the topsail, wind blowing a gale, which continued till 7 A. M., [then about 443 miles R.,] when it began to moderate; wind S. W., set fore and main-topsails; noon, strong winds and passing clouds, lat. obs. 35° 33′, lon. 58° 40′, [462 miles R.] P. M. more moderate, with appearance of rain; 5 P. M. winds baffling, brig laboring heavily in a very high sea; 7 P. M. wind W.; 11 P. M. moderate, at W. N. W. and cloudy weather. [The full extent of the gale on this side, from the axis line, probably exceeded 500 miles.]

155. Barque *Wm. Engs*, for New York, Oct. 1st, lat. 37° 20′, lon. 48° 44′; P. M. brisk breeze from N. N. E. and squally. Oct. 2d, lat. 36° 47′, lon. 52° 30′, brisk breeze from N. N. E.; midnight, N. E. Oct. 3d, lat. 37° 01′, lon. 56° 30′; P. M. N. E., fair; 4 P. M. wind E.; midnight, E. S. E. Oct. 4th, A. M. wind hauling S. E.; noon, lat. 37° 21′, lon. 59° 51′; P. M. wind increasing; at 8 P. M. obliged us to double-reef; midnight, close-reefed, wind hauling gradually to S. with an unusual heavy sea from S. Oct. 5th, at 6 A. M. wind had hauled to S. W., and blew a smart gale of wind; carried storm spensers, close-reefed main-topsail and reefed foresail, by the wind; noon, lat. 37° 18′, lon. 60° 11′, blowing in squalls from S. W.; 4 P. M. more moderate, made sail; midnight, calm, and light airs from S. W.

Oct. 6th, noon, lat. 37° 10′, lon. 60° 29′, [316 miles R.,] winds S. W., fair; 8 P. M. strong from S. W., took in sail; midnight, heavy gales from S. W., with heavy sea from S. Oct. 7th, 3 A. M. gale so increased as to compel us to heave to, after which it gradually hauled to W. and N. W., blowing a heavy gale; P. M. gale continues with a heavy sea, had veered to W. N. W.; at 6 P. M. began to moderate, and at midnight fell calm.

156. Barque *Charleston*, for New York, Oct. 4th, lat. 38° 1′, lon. 51° 42′; 4 P. M. wind S. E., single-reefed topsails; 6 P. M. double-reefed, furled foresail, mainsail and jib, gale S. E., and rain. Oct. 5th, wind S. S. E., moderating, lat. 36° 55′, lon. 55° 28′. Oct. 6th, noon, lat. 37° 38′, lon. 57° 55′, [391 miles R.,] winds S. W., moderate; 5 P. M. increasing; 8 P. M. S. W., do.; double-reefed topsails, furled mainsail and jib; 10 P. M. gale at S. S. W., increasing, close-reefed topsails and furled foresail. Oct. 7th, gale continues; 6 A. M. S. W. by S., furled fore-topsail; 9 A. M. W. S. W.; noon, lat. 37° 54′, lon. 59° 57′, [304 miles R.,] gale continues from W., lying to under close-reefed main-topsail; 6 P. M. moderating; 7 P. M. set fore-topsail; 10 P. M. set foresail and mainsail. [This vessel was two days behind the *Wm. Engs*, on a more northern track, and at noon of 6th was 150 miles more eastward than the latter.]

Capt. CATERMOLE states that in the night of the 6th, his barometer had fallen to 28·10,* attended by a continued roar in the air; soon after, the hurricane struck the ship with tremendous force from a point E. of S.; afterwards veering gradually to S. S. W., W. and W. N. W.

157. Sloop *Hellespont* encountered the hurricane lat. 40°, lon. 63° 30′, and was thrown on her beam ends. The wind veered from S. S. E. towards S. W., and the sympiesometer fell to 28·50 in., [57 miles R.]

158. Ship *Sheridan*, for Liverpool, Oct. 6th, lat. 42°, lon. 62°; P. M. wind W., 6 knots; 6 P. M. N., 5 knots, course E. by S.; 11 P. M. wind E.; midnight, tacked ship, wind increasing, [75 miles R.] Oct. 7th, double-reefed topsails; 4 A. M. fresh breezes from S. and rain; 6 A. M. out one reef; 7 A. M. wind S. S. W., continues fresh gale and high sea; noon, lat. 42° 40′, lon. 58° 30′, 116 miles R.;] P. M. blowing strong from S. W.; [probably opposite the axis of the gale about 3·30 P. M., then 140 miles distant;] 9 P. M. wind W.; midnight blowing strong from W. Oct. 8th, daylight, strong gale and heavy sea; 9 A. M.

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* This barometer was left in Europe on the return voyage and could not be examined, but I infer, from the ship's position, that its index error must have been uncommonly large. Capt. C. states, however, that the effect on his sympiesometer was also very great.

wind W. N. W.; noon, moderating, lat. 44°, lon. 53° 30′; [270 miles R.;] P. M. strong breeze from W. N. W. and a high sea running; midnight, same. Next day, wind W. S. W. steady.

159. Ship *Memphis*, for New York, Oct. 4th, lat. 42° 38′, lon. 54°, ends with fresh gales from S. E. and heavy rain; in double reefs. Oct. 5th, gale S. E., strong; noon, moderate and a large sea, lat. 42° 48′, lon. 58° 58′; P. M. winds W. S. W. and W. Oct. 6th, A. M. winds W. N. W. and W., lat. 43° 20′, lon 58° 50′; P. M. winds W. and W. by N., fine weather, with a large swell from southward; 10 P. M. a shift of wind to eastward; 11 P. M. E., light airs with rain. Oct. 7th, wind E. S. E., increasing, double-reefed topsail, took in jib and mainsail; 5 A. M. gale S. E., reefed foresail, took in fore and mizen-topsail, heavy gale; 11 A. M. E.; noon, S. E., lat. 43° 16′, lon. 60°, [34 miles R;] 1 P. M. *violent gale from S. W.*, with a tremendous sea; 4 P. M. wore ship, took in foresail and hove to; boarded heavily by the sea; 6 P. M. gale had veered to W., moderating; 9 P. M. W. N. W.; midnight, gale blowing strong from W. Oct. 8th, at daylight, out double-reefs, set whole courses and jib, wind S. W. by W., with a large sea on, lat. 42° 43′, lon. 60° 20′; P. M. winds W. N. W. and N. W., set top gt. sails.

160. Ship *Europe*,* for New York, Oct. 6th, lat. 44° 57′, lon. 56° 30′, winds S. W. to N. W. Oct. 7th, 4 A. M. wind S. E., light; 8 A. M. strong at S. S. E., took in top gt. sails; 10 A. M. gale increasing, close-reefed topsails, furled jib and mainsail, hard squalls of wind and rain; noon, gale had veered to S., lat. 44° 19′, lon. 58°, [51 miles R.,] gale increasing and at 2 P. M. had backed to S. E., took in main-topsail and foresail; [3·03 P. M. axis of gale perhaps 45 miles distant;] 4 P. M. the gale was heavy from W. S. W., split fore-topsail; 6 P. M. hard gales and tremendous squalls, with a heavy sea, lying to; midnight, gale continues, having veered to W. Oct. 8th, 4 A. M. gale W. N. W; 6 A. M. split the fore-topmast-staysail; 10 A. M. gale abating, set close-reefed fore and mizen-topsails; noon, moderating, a high swell from W. N. W., lat. 43° 35′, lon. 56° 30′; P. M. moderating; at midnight made all sail. The barometer fell very low, both previous to and during the gale.

161. St. Johns, N. F., lat. 47° 34′, lon. 52° 38′, [85 miles, R. (?)] by Mr. TEMPLEMAN, barometric observations taken at 9 A. M. and 9 P. M., the barometer 140 feet above tide. Oct. 3d, bar. 30·25, 30·28; light variable winds and cloudy; P. M. light winds S. E. to S. W. 4th, bar. 30·30, 30·23, light breeze S. S. W. overcast and gloomy; P. M. frequent showers. 5th, bar. 30·05, 29·46, fresh breeze S. S. E., overcast and gloomy; P. M. strong breeze and driving rain; [first Cuba storm;] 9 P. M. fine. 6th, bar. 29·38, 29·60, fresh breeze S. W., cloudy; fine evening. 7th, bar. 29·78, 29·40; light variable winds, overcast and gloomy; 10 A. M. wind E., rain; P. M. wind E. S. E., rain. 8th, bar. 29·33, 29·41, light variable winds, dark and gloomy; P. M. wind fresh from S. W. to W. 9th, bar. 29·48, 29·43, moderate breeze N. W. and cloudy.

The logbook of H. M. S. *Eurydice*, then in the harbor, gives the wind easterly, 5, at the beginning of the 8th; in the second watch [4h. to 8h.] a calm; 3d watch, W. S. W., 2; P. M. W. by S., 3, and W. by N., 4, 5, and 6. Oct. 9th, A. M. W. to N. W., 5; bar., at noon, 29·56. [The harbor of St. Johns, on the E. coast, is deeply sheltered, with a narrow entrance.]

162. Ship *Independence*, for New York, Oct. 5th, lat. 47° 17′; P. M. winds N. W., and W. by N., light; 8 P. M. S. W., ends S. S. W. Oct. 6th, wind strong from S. W.; 2 A. M. furled top gt. sails; 5 A. M. W. S. W., increasing; 6 A. M. close-reefed fore-topsails and courses; 8 A. M. furled fore and main-topsails and mainsail; 10 A. M gale still W. S. W.; noon, heavy gale with rain, lat. 47° 40′, lon. 42° 41′; [first Cuba gale;] 1 P. M. W. blowing heavy; 5 P. M. more moderate, set fore and mizen-topsails.

Oct. 7th, at 7 A. M. wind N. W.; noon, sun obscured, lat. 48° 26′, lon. 43°; P. M. commences blowing fresh from N. W.; 4 P. M. passed steamer *Britannia* from Halifax; wind moderating, made all sail; midnight, wind E. Oct. 8th, *commences with easterly winds*; noon, calm and rainy, lat. 47° 26′, lon. 45° 37′; [280 miles R. (?)] P. M. strong gale from N. W. and W. N. W., double-reefed. Oct. 9th, strong gales from N. W. and W. N. W.; noon, lat. 45° 20′, lon. 46°.

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* Liverpool packet: second ship of this name.

163. Ship *Adirondack*, Oct. 5th, P. M. wind W. by S., light and pleasant; midnight, light winds and clear weather. Oct. 6th, 4 A. M. cloudy, took in top gt. sails; 8 A. M. thick weather with rain, wind S. W., double-reefed the topsails; 10 A. M. reefed, and set mainsail and jib; at noon heavy gales, sail reduced to close-reefed main-topsail, spanker, and main spencer; no observation; P. M. heavy gale from S. W. and thick weather; at 4 P. M. set reefed foresail. [This was the prelusive gale, which in this region was stronger than the succeeding one.]

Oct. 7th, at 1 A. M. wind W. N. W.; 3 A. M. set close-reefed fore and mizen-topsails; 5 A. M. set double-reefed mainsail and jib; 11 A. M. turned close-reefs out of fore and main-topsail, and first reef out of mainsail, lat. obs. 46° 56′, lon. 41° 08′; P. M. wind N. W. by N., under double-reefed topsails and courses; from 2 to 4 P. M. turned out reefs; 7 P. M. set top gt. sails. [End of first Cuba gale.] Night, calm and light airs, with thick, dark and rainy weather. Oct. 8th, 2 A. M. wind at S. E.; 4 A. M. E.; 6 A. M. N. E., and E.; set main top gt. sail; 8 A. M. baffling and squally, wind hauling to southward with rain; double-reefed the courses and spanker and stowed the jib; noon, cloudy, no observation; [about 415 miles R. of axis line;] P. M. wind N. W. by W., fresh gales and cloudy weather; 3 P. M. out reefs; from 3 to 7 P. M. wind went round to S. and E.; 8 P. M. W. N. W.; through the night dark and squally. Oct. 9th, wind W., fresh gales and squally; at 4 P. M. heavy squalls, close-reefed the topsails; 8 P. M. set the main-topsail; through the night clear and cold, with a heavy sea. Oct. 10th, lat. 46° 18′, lon. 47° 44′.

164. Ship *Prince Albert*, for New York, Oct. 4th, A. M. strong breeze N. E. to N., 10 knots; squally and large head sea, pitching heavily and carrying all sail. *Passed large quantities of gulf weed;* noon, lat. 46° 32′, lon. (chr.) 38° 30′; *bar.* 30·24, [its adjustment correct,] air 57°, water 66°; P. M. wind N. moderate, clear and pleasant; 9 P. M. N. N. W. Oct. 5th, wind N., 6 knots; 5 A. M. N. N. W.; 10 A. M. N. N. E., moderate and pleasant; noon, light airs N. N. E., lat. 45° 40′, lon. 41° 36′; 2 P. M. S., 2 knots; 4 P. M. S. S. W., 3 knots; 6 P. M. S. W., 8 knots; 9 P. M. S. W. by S., still increasing; ends strong and squally, double-reefed fore and mizen-topsails. Oct. 6th, begins S. S. W., 9 knots; 2 A. M. S. W., strong, squally, and a large sea; 4 A. M. double-reefed main-topsail and reefed mainsail; at 7 P. M. furled jib and mizen-topsail; noon, strong winds, large sea, and constant rain, lat. 45°, lon. 45° 41′; P. M. wind W. S. W., moderating and constant rain; set single-reefed topsails, jib and top gt. sails; 6 P. M. wind W., latter part fresh breezes and cloudy.

Oct. 7th, A. M. fresh breeze and cloudy, *with large swell from S. W.;* after 4 A. M. out all reefs; [end of first Cuba gale;] noon, W., lat. obs. 45° 30′, lon. 46° 50′; 1 P. M. E., light; at 4, S. S. E., light; at 6 W. by S.; 7 P. M. fresh; in light sails; ends with strong wind, constant rain, and thick fog. Oct. 8th, [325 miles R. from supposed axis line,] wind W., strong, small rain and thick fog; 3 A. M. heavy squalls; in two reefs; 5 A. M. W. by N.; 7 A. M. out one reef and set main top gt. sail; 8 P. M. W. N. W.; 10 A. M. took in top gt. sail; noon, strong winds and heavy sea, ship laboring hard; lat. obs. 45° 6′, lon. chr. 49°; P. M. W. N. W., weather unchanged; 5 P. M. W. by N.; 8 P. M. out all reefs; latter part brisk breeze and clear pleasant weather. Oct. 9th, brisk wind from W. and large westerly swell, ship laboring heavy; 9 A. M. exchanged signals with English ship *Wallace*, steering S. under close-reefed topsails, reefed courses and jib furled; at 11 increasing wind, squally, in top gt. sails; noon, lat. 44° 21′, on the Banks; P. M. fresh wind from W., clear and pleasant, and heavy swell from W. N. W.; latter part light and pleasant.

[The *Prince Albert* is one of the many New York packet ships that are found in the foregoing recitals. Capt. SEBOR's logbook is always kept in civil time; as is the case with some others, also, of these fine vessels. It is hoped that the practice will become universal.]

Further trace of the first storm and also of the progress of the right limb of the second or great gale, is afforded by the log of the R. M. steamer *Britannia*, in her voyage from Halifax for Liverpool, which, on account of the importance of pursuing the

inquiry in the higher latitudes and towards Europe, is here subjoined.

165. R. M. steamer *Britannia*, Oct. 3d, 1844, at 12h. 15m. received the mails at Halifax and proceeded to sea; wind S. S. E., increasing; midnight, strong breeze and cloudy.

Oct. 4th, wind S. S. E., strong breeze and cloudy; 9 A. M. strong breeze and weather fine; noon, same, lat. 44° 54′, lon. 59° 10′. Distance run, 196 miles. 1 P. M. strong breeze and clear weather; 3 P. M. wind S. E., increasing; cloudy; 8 P. M. fresh gale and squally, sea getting up; midnight, strong gales and squally with rain.

Oct. 5th, begins strong gales from S. S. E. and heavy squalls with a high sea; 4 A. M. the same; 8 A. M. gale increasing, ship laboring and shipping much water over all, reefed the fore and aft-sails; 10 A. M. hard gale and heavy sea, with thick hazy weather. [First Cuba gale.] Noon, wind and weather the same; lat. 45° 58′, lon. 55° 30′. Distance 168 miles. P. M. strong gales from S. S. W., and squally weather with a heavy beam sea and constant rain; 4 P. M. more moderate, set the topsail and shook out reefs; 6 P. M. wind increasing again, in first reef of topsail; 10.30 P. M. out reefs and set foresail; more moderate, and clear. [Remission, and approaching westerly change of the first Cuba gale.]

Oct. 6th, wind S. W. moderate, and clear weather, with a heavy beam sea; 7 A. M. wind W. S. W., set topmast and lower studding-sails; 8 A. M. light breeze and fine clear weather *with a heavy beam sea;* noon, lat. 46° 44′, lon. 51° 3′. Distance 198 miles. Cape Race, N. F., bearing W. ½ S. 78 miles; P. M. moderate breeze from W. S. W. and clear weather; 4 P. M. increasing breeze and hazy weather; 8 P. M. blowing strong breeze; midnight, wind W., more moderate. [Rear side of first gale not strongly developed, as a surface wind.]

Oct. 7th, moderate and hazy, wind W., inclining to N. W.; 2 A. M. wind W. N. W.; 8 A. M. wind N. N. W.; 9 A. M. breeze increasing, cloudy; 10 A. M. wind N.; noon, fresh breeze and cloudy, lat. 48° 5′, lon. 45° 41′. Distance 233 miles. [330 miles R. of supposed axis line.] P. M. moderate breeze and cloudy weather, *with a heavy N. E. swell;* 2 P. M. wind N. N. W.; 5 P. M. passed packet ship *Independence*, standing S. W.; 7 A. M. light variable winds and rain; in all fore and aft-sails; midnight, light breeze and dark rainy weather. [This N. E. swell shows the strength of the gale to have been on the *left* of the axis, in a higher latitude.]

Oct. 8th, light breeze from E., *dark and rainy with a heavy N. E. swell;* [second Cuba storm;] 4 A. M. same; 7 A. M. increasing breeze from E. by S., down top gt. yard and mast and fore-yard; 11, set the fore and aft-sails; noon, moderate and cloudy; lat. 48° 43′, lon. 40° 28′. Distance 213 miles. [350 miles R. of supposed axis line.] 1 P. M. wind E. by S., cloudy, with a *heavy N. E. swell;* 8 P. M. light wind and clear; ends the same. [The easterly winds of second storm had taken effect but moderately this day.]

Oct. 9th, light winds from S. S. E. with a *heavy N. E. swell;* 8 A. M. light airs from S. W.; noon, light winds and cloudy; lat. 49° 14′, lon. 35° 6′. Distance 212 miles. [448 miles R. of supposed axis line.] P. M. light breeze from S. W. and clear weather, with a *heavy N. E. swell;* 6 P. M. wind S. S. E.; 8 P. M. light wind and rain; 9 P. M. wind S. W.; 10 P. M. wind shifted to N. W.; ends moderate and clear. [Easterly part of gale lightly felt, and westerly part but just commenced.]

Oct. 10th, moderate breeze from N. W. and clear; 6 A. M. increasing breeze and cloudy, with *a very heavy cross swell;* noon, lat. 49° 46′, lon. 29°. Distance 237 miles. P. M. fresh breeze from N. W. and fine clear weather; 8 P. M. wind dying away; midnight, light breeze and dark cloudy weather. [Apparent end of the observations on the second Cuba gale; unless viewed as a remission, with a renewal on the 11th.]

Oct. 11th, light winds from S. W. and cloudy, with heavy showers of rain; 4 A. M. increasing breeze and a heavy sea; 7, in first reef of fore-topsail; 8, strong gales and cloudy, close-reefed fore-topsail, and furled fore and aft-sails; noon, strong gales and a heavy cross sea; lat. 50° 26′, lon. 22° 50′. Distance 240 miles. P. M. strong gales and dark weather with frequent showers of rain and a cross sea, sent down top gt. mast; 5, set reefed foresail; 8 P. M. more moderate, with heavy rain; 10 P. M. wind hauling forward, in foresail, dark and threatening weather. [A third storm approaching, probably from the lower latitudes of the Atlantic.]

Oct. 12th, begins moderate breeze from S. by W., and dark cloudy weather; 8 A. M. the same; noon, light breeze and cloudy; lat. 50° 46′, lon. 17° 20′. Distance 225 miles. At 1 P. M. a heavy squall from N. W. which ended in a strong gale; 2 P. M. set close-reefed fore-topsail; 4 P. M. strong gales and squally; 6 P. M. in second reef of foresail; 8 P. M. dark weather, heavy sea running; midnight, same, with a very heavy sea.

Oct. 13th, strong gales from W. N. W. and squally, with a high sea; 3 A. M. wind W.; 8 A. M. wind W. N. W., more moderate; 9 A. M. strong breeze and cloudy; noon, the same; lat. 51° 6′, lon. 11° 5′. Distance 260 miles. Cape Clear bearing E. by N. 63 miles. P. M. wind W., squally, with rain and a high sea; 6 P. M. wind S. W. [*End of Log.*]

We may notice in the log of the *Britannia*, that the length of the observed intervals between the several storm-winds, as well as the duration of these winds, was greatly prolonged by the rapid progress of the vessel in a northeasterly direction. Thus, the change of the first gale to the western board was not observed till past noon of Oct. 5th; although it took place at Halifax previous to 4 A. M. The westerly winds of this gale did not cease with the steamer till P. M. of the 7th; while they had ended at Halifax in the evening of the 6th. The easterly winds of the second gale set in, near Cape Canso, early on the 7th, but did not *overtake* the steamer till near 24 hours later and were but lightly exhibited; while the heavy swell from N. E. seems connected with the more active portion of the gale, which was in a more northerly and advanced position. The *westerly* winds of the second storm, which took effect off Halifax in the afternoon of the 7th, appear not to have reached the steamer till late on the 9th, in lon. 32° W. and then with greatly diminished force. The steamer kept company, for a long time, with the "beam sea" from S. S. E., of the first gale; and, subsequently, with the "N. E. swell" from the active and more advanced portion of the second storm:—showing the progression of these great disturbances to have been in different directions from that of the waves themselves.

It is much to be regretted that no entries of the state of the barometer are found in the Britannia's log, although a column had been provided for this purpose in the logbook.

The northwesterly wind of the second Cuba gale seems finally to have left the Britannia on the 10th or 11th of October. What had then become of this storm and its predecessor does not clearly appear; but it is probable that they were continued, in some unknown condition, in the region lying between Iceland and the European continent.

The three sets of circles serve to represent the successive positions of the storm, at or near noon on the 5th, 6th and 7th days of Oct. respectively. The wind arrows show the direction of the wind at those periods at various points as derived directly or approximately from the printed observations.
N.B. The arrow points in the several ship tracks indicate the general course of the wind.

We may notice that the first of these Cuba storms, which from Florida to New York could scarcely be traced, except barometrically, has appeared the most active of the two after it passed beyond Newfoundland. These latter observations, however, appear to have been made in positions which were much exterior to the most active portions of the two gales; which could not have coincided with each other in their axis-routes, through any known portion of their progression.

On the 11th or 12th of October the steamer took another storm, which we do not recognize as of American origin; which, at 1 P. M. on the 12th, changed to N. W. and blew a strong gale, and accompanied the steamer on the 13th, to the coast of Ireland.

Gales of the European Seas at this period.

So far as relates to the more immediate objects of this inquiry, the foregoing recitals may suffice. But the relations of the American storms to those of the European seas and coasts are of much importance in meteorology; and we may take, therefore, a hasty glance at the phenomena exhibited by the storms of this period, on the eastern borders of the North Atlantic; as consecutive with the foregoing recitals.

At Lerwick, Shetland, near lat. 60° N., lon. 1° 30′ W., "a heavy gale of wind commenced at South at 5 A. M. Oct. 8th, and veered on the morning of the 11th to E. S. E." "At 7 A. M. of the 10th, during a heavy gale from E. S. E., the *Jesmond*, from Archangel for Hull, drove ashore near Lerwick."—*Shipping Reports.* May not this storm have been identical with one, if not both of the Cuba gales? For we have seen that both these gales were comprised in one extensive barometric depression. For my own part, I am somewhat inclined to this opinion; which may be verified, perhaps, by observations from Iceland or the Ferro Islands, and by logbooks of ships then in the northern portions of the Atlantic. "The *Jane Pope*, from Dundee for Riga, on the 10th October, in lat. 57° 50′ N., lon. 1° 30′ E., experienced a tremendous gale from S. by E., and shipped a heavy sea, which swept five of the crew off the decks." This was doubtless the same gale that visited Shetland.

Oporto, [lat. 41° 11′, lon. 8° 38′ W.] Oct. 14th. "It blew very fresh here on the 9th. The *Ostsee*, from Lisbon, was driven on shore six miles southward of the bar." Two other vessels were also wrecked at Oporto. At the Scilly Islands, entrance of

the English channel, "it blew a terrific hurricane" on the 9th. Foway, (Cornwall,) Oct. 12th: The *Julia*, from Venice for London, experienced a dreadful gale on the 9th inst. at W. N. W.— This storm was generally heavy on the coasts of England and Ireland, and had increased to a hurricane from southeast, at Dublin, on the afternoon and night of the 9th. Several vessels were driven on shore by the gale, at the same period, on the east coast of England. At Elsineur, entrance of the Baltic, (lat 56° 2′, lon. 12° 37′ E.) on the 10th and 11th October, a strong gale from S. E.: the wind had been S. E. on the 9th. This was probably the same as the above gale of the 9th. On the coast of Cornwall it was also blowing a gale from S. S. W. on the 12th and 13th; apparently, another storm.

In the interior portions of England, the storms of this period do not appear to have attracted notice. The register of Mr. Rogerson, of the Royal Observatory at Greenwich, shows that the barometer attained a maximum of 30·37 Sept. 30th; and, after strong S. W. winds a second maximum of 30·01 on the morning of Oct. 4th, which last could hardly have coincided with the advancing front of the great American wave, the summit of which was then not greatly advanced from Newfoundland.* On the 5th, 6th, and 7th, the winds were S. W. and thence to N. W.; on the 8th, S. E. and S. W., and on the 9th *the barometer had fallen to* 29·23 *at* 9 A. M., and 29·17 *at* 3 P. M., with the winds strong at S.; and the bar. was but little higher on the 10th, with the wind at S. and S. W. Perhaps this depression may have been identical with the first Cuba gale, as it doubtless was with that of Shetland.

Col. Reid has favored me with a valuable account of the gale of Oct. 9th and following days, as found in the log of H. M. S. *Windsor*, bound outward from the English channel; of which the subjoined is an abstract.

Oct. 7th, A. M. wind N. N. W. moderate; noon, lat. 49° 47′, lon. 4° 23′ W. *bar.* 30 in.; P. M. wind S. S. W., increasing. Oct. 8th, noon, lat. 49° 20′, lon. 7°, *bar.* 29·50; the whole 24 hours very unsettled weather and barometer falling; wind S. W., unsteady, and increasing. Oct. 9th, wind had veered to N. N. W., coming in hard gusts with sudden intermissions *and barometer had fallen to* 28·60; sent down small spars, double-reefed, &c.; at 8 A. M. *bar.* 28·50, and weather clearing up to the eastward; thought of making sail notwithstanding the low state of the barometer. Saw a schooner close to us with a good spread of canvass. But the wind suddenly flew out from N. E. and back to E. S. E., then E., and we observed the water blown up like clouds of dust and the sea in frightful commotion. This took place at 1·30 P. M.; the *barometer* having been 28·44 at noon, 28·35 at 0·30 P. M., and lowest at 1 P. M. 28·12. It was now (1·30 P. M.) at 28·14, and before the can-

* See bar. obs. at St. Johns, and on board the *Prince Albert*, lon. 38° 30′.

vass could be got in, the hurricane had struck the ship from the northward with extreme violence, driving her *forecastle under*; at 2 P. M. *bar.* 28·40; at 3 P. M. with great difficulty brought the ship to, on starboard tack; 3 P. M. *bar.* 28·60; at 5 P. M. hurricane less violent, and settled into a heavy gale, veering to N. W. and W. N. W.; at 8 P. M. severe gale, with sleet, hail, rain and vivid lightning; at midnight, *bar.* 28·99; gale blowing with unabated violence.—The schooner which was close to us disappeared suddenly, and there is little doubt that she foundered. Oct. 10th, heavy gale from N. N. W. with a high sea; noon, lat. 48° 51′, lon. 8° 4′ W., *bar.* 29·40; midnight, no alteration.

The steamer *Britannia*, at noon of the 10th, was 927 English miles W. by N. of the *Windsor*, and was then running in the N. W. wind or rearward portion of the *second* Cuba storm. This is not incompatible with the idea that these storms may all have pertained to the general area of a great barometrical depression, though divisible, at the earth's surface, into two or three stormy vortices, which may have continued more or less distinct from each other, in successive localities.

It appears, also, that the *Severn* for Liverpool, Oct. 13th, in lat. 48° 49′, lon. 16° 4′ W., encountered "a perfect hurricane," with a tremendous sea. Likewise, the barque *Providence*, Oct. 13th, lat. 49°, lon. 13°, had a severe gale, lost spars, &c. This was the gale which the *Britannia* experienced, less severely, near the coast of Ireland.

From the courses which we have seen pursued by the two associated storms in the Western Atlantic, I have supposed their further progress to have been on lines somewhat curvilinear, towards Iceland or that part of the Atlantic which lies between Iceland and the British islands. Their direct identity or immediate connexion with the European storms already noticed, may be considered as doubtful. If we suppose the Cuba storms to have acquired, gradually, a southeastern progression in higher latitudes, before reaching the British islands, the difficulties of allowing a partial identity might be lessened; and, possibly, the wave-like propagation of the barometric oscillations, from different parts of the line of progress, may have induced some of the complications of the barometric waves which serve to embarrass the inquiry:—complications which are not uncommon in northern Europe. Such southeastern progression might serve to explain the veering of the wind *from the southern or southwestern quarter to the northeastern*, which appears in some of the above European reports, and was also found in the *extremely* violent hurricane of Dec. 12th, 1844, in the Eastern Atlantic, in which two of the New York packet ships were lost by foundering; a fact unexampled in the history of our navigation. But such southeastern course

in a great storm of the northern hemisphere, so far as I know, has not yet been established.

It has been shown by MILNE and others that several of the British storms have pursued a northeasterly course, in their progress from lower latitudes, and that their rotative action was from right to left, ↺, as in the North American gales. In order to obtain a more definite and correct estimate of the progression and extended relations of the European storms above noticed, it would be proper to examine observations made at Madeira and the Azores, in connexion with such other geographical data as might be obtained by patient inquiry.*

We next proceed to a review of the phenomena of the Cuba hurricane and its prelusive storm, while in progress from the shores of Central America to the Gulf of St. Lawrence and Newfoundland.

Review of the Phenomena and Characteristics of the Cuba Hurricane.

The detailed observations and accounts which have now been submitted, afford us a comprehensive view of the two Cuba storms, in their daily progress, and may serve for enabling other inquirers to make a more complete analysis and generalization of the several phenomena than can be attempted on the present occasion. It will be my province to elucidate some of the more prominent facts and characteristics which pertained to these gales, and especially to the great hurricane.

TRACK OF THE STORM.—From what primary sources, or in what particular region this hurricane had its origin, or on what portion of the earth's surface it first took effect as an observable gale of wind, does not appear. Its observed route, as indicated by the foregoing recitals, appears nearly direct from the shores of Central America, crossing the islands of Cuba and Newfoundland, and may fairly be estimated as extending from Cape Honduras, lat. 16°, lon. 86°, to a point on the axis line opposite to the posi-

* T. C. HUNT, Esq., the British Consul at the Azores, has been indefatigable in his endeavors to secure good observations at these islands and Madeira; where the meteorological phenomena may sometimes have important relations to those of the coasts of western Europe, or other parts of the Atlantic basin. I am indebted to Col. REID and to Consul General HUNT for valuable records and communications on the meteorology of those islands, of an earlier date than the storms now under consideration.

tion of the *Independence* at noon of Oct. 8th, near lat. 50° 25′, lon. 49° 45′; which, following the axis route, exceeds *three thousand statute miles.* To what further extent this storm might be traced, does not distinctly appear.*

Rate of Progression.—This may be approximately shown by the following estimate of the progress of the storm's axis,—which, so far as known, coincided nearly with the observed minimum of the barometer, at the several points of observation. We commence from a point on the axis line opposite to the *Openango,* (recital 7,) about 9·30 P. M. on the 4th of October.

From No. 7	to opposite Key West	=246	miles	in	16½	hours;	*rate*	15	miles	per hour.
" Key West	to lat. 27° 30′	=324	"	"	12½	"	"	26	"	" "
" lat. 27° 30′	to lat. 31°	=302	"	"	7	"	"	43	"	" "
" lat. 31°	to lat. 40°	=781	"	"	18	"	"	43·4	"	" "
" lat. 40°	to lat. 45°	=480	"	"	14	"	"	34	"	" "

Previous to the night of the 4th its progress may have been slower than the lowest rate here given.

(1.) We notice that while below the tropic, the rate of progression did not exceed that which has been found in several of the West Indian hurricanes moving in the same latitudes but following a widely different course. (2.) We find that a highly rapid, if not unexampled progression was acquired by this hurricane while on its course from the tropic to the usual exterior limit of the trade winds; in which region the progress of hurricanes has often been comparatively slow. Such former cases of retardation I have attempted to explain by the change from a westerly to an easterly progression; a change that does not appear in the Cuba storm. (3.) We find that the most rapid advance of this storm was from the northern border of the trade winds to the parallel of 40° or 42°; this being the region, in which, if I mistake not, the permanent currents of the lower atmosphere are commonly found in their fullest activity. (4.) We here ascertain a gradually decreasing rate of progression in the latitudes beyond 40°, which has probably occurred in other storms, and which, in connexion with other causes, may serve, in some degree, to explain or account for the extent and complication of the barometric waves and other meteorological phenomena in the higher latitudes.

The average progression of the storm from the Bahamas to latitude 45°, may be stated at forty miles per hour.

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* See Chart IV.

So far as is yet known, the most rapid progression has been attained by those storms which have pursued the most northerly courses, in their progress from the lower latitudes. The highest rate previously known, in the American seas, appears to have been about thirty miles an hour; while in the case before us the rate, through perhaps twelve degrees of latitude, appears to have exceeded *forty-three miles an hour.*

The integral progression of the great storms of the lower atmosphere may be viewed as affording data of great value for any investigations of the actual course of atmospheric circulation, or of the great planetary laws by which this circulation is chiefly maintained.*

Lateral Diameter of the Storm.—In determining the full diameter or breadth of the storm, across its path, it is somewhat difficult to mark an approximate limit of its action on either side of its axis, independently of any deficiency in the observations. Thus it might be questioned whether we should test its extent (1) by the observed prevalence of an active storm-wind, at the surface only,—or (2) by the entire extent of the conformable or vorticular winds at the earth's surface,—or (3) by the presence and observed movements of the lower stratum of storm-clouds, as connected with the foregoing,—or (4) finally, by the more widely extended effects on the barometer.

We may conclude, however, that the broadest lateral extent over which the winds of this storm prevailed in observable strength at the surface, or in which the weather exhibited a stormy appearance, or effect, exceeded a diameter of nine hundred miles and perhaps equalled one thousand; while the general breadth of the *gale*, as one of ordinary, as well as extraordinary force, may be estimated as, at least, eight hundred miles.†

This last, if taken as the average width of the storm path and multiplied by the observed length of the latter, as before esti-

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* It may be proper again to state, that the results of the author's inquiries on the courses of winds, and their relations to temperature, in different regions, and at different elevations, have constrained him to relinquish the common theory that heat is the sole or main cause of wind, or progressive motion, in a planetary atmosphere.

He has been aware of the disadvantage in which this avowal may tend to place him, in the minds of many votaries of science whose approbation it would be his happiness to obtain. The proper elucidation of this question, he conceives, will belong to the future.

† See recitals 2*a*, 2*c*, 22, 25, 26, 44, 69, 154, 99, 106, 107, &c.

mated, indicates an area of *two millions and four hundred thousand square miles*, which was swept over, with more or less violence, by this gale; an extent nearly three times greater than all the territory of the United States east of the Mississippi.

The width of that portion of the track in which was exhibited either the violence of a hurricane or that of a severe or destructive gale may be estimated to exceed *five hundred miles.**

Diameter of the Storm on its Center Path.—The diameter of the storm-wind from front to rear might be directly determined by the distance from a point in front to another in rear at which it severally began or ended at the same time; provided that we could obtain good hourly observations which should so coincide. An available substitute for this method is found in plotting the observations for a given hour, on successive days, as on Chart IV, and the other charts which follow. Thus the distance between the two several positions assigned to the axis of the storm at noon on the 5th and 6th days of October, respectively, is 784 miles. Now the *Demarara*, (45*b*,) in front of the gale on the 5th, was brought to reefed topsails as early as 8 A. M.; while at noon on the 6th, after an advance or drift of 88 miles in the Gulf Stream, this vessel remained hove to, and did not set reefed topsails till 1 P. M.; nor let out reefs and make full sail till 6 P. M., a period of 34 hours. This authorizes an estimate of 1084 miles for this diameter of the storm as a reefed topsail gale.

The distance between the two axis positions on Chart IV for noon of the 6th and 7th, respectively, is 950 miles, and the observations of the winds and minimum of the barometer on board the *Pique* frigate appear to show that the storm figure for noon of 7th should have been placed thirty miles further in advance, making the distance between the two axial points equal to 980 miles. Now, even at Bermuda the strength of the gale was marked 6 at two hours before noon of 6th; and, more in front, the gale was strong with the *Wakulla* (148) at noon, and continued to blow a gale till noon of the 7th. These facts indicate a diameter of more than a thousand miles. These estimates include neither the incipient nor the closing moderate and light winds which were conformable with the body of the gale.

Another good estimate of the diameter in this direction is obtained by multiplying the rate of progress by the whole duration

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* Recitals 11, 20, 66, 118, 136, 156, and others.

of the storm wind, at the several points where the observations have been most complete. If we apply this to the entire observations at Key West, (38,) about 48 hours, with an *average* rate of 15 miles for the first 26 hours, and of 32 miles for the last 22 hours, we have 1094 miles for this diameter. The like estimate applied to the observations on board the *Demarara*, (45*b*,) with the increased rates of advance, and deducting the vessel's progress, will give a result fully equal to the foregoing. These conclusions may be sustained, also, by a like reference to the recitals mentioned below.*

These results cannot be invalidated by the reports which are less determinate, nor by those which refer only, or chiefly, to the more violent portion of the gale. They are satisfactorily tested by the fact that the daily advance of the gale, which from lat. 27° to 42° was equal to 1032 miles per day, does not, in all cases, afford space on the chart sufficient for the separate daily delineation of all the observations of the earliest and latest wind of the storm.

We may hence conclude that the entire extent of the gale on its line of progress was somewhat greater than its lateral diameter; unless we admit that, on its southeastern border, the gale was extended much beyond our points of observation on that side. Its limitation on the left or continental side, owing probably to the obstructions and elevations of the surface and the pressure of the natural currents from the western board, is more distinctly determined.

The diameter of the violent portion of the gale, in the direction of its progress, does not appear to have been less than in the transverse direction.†

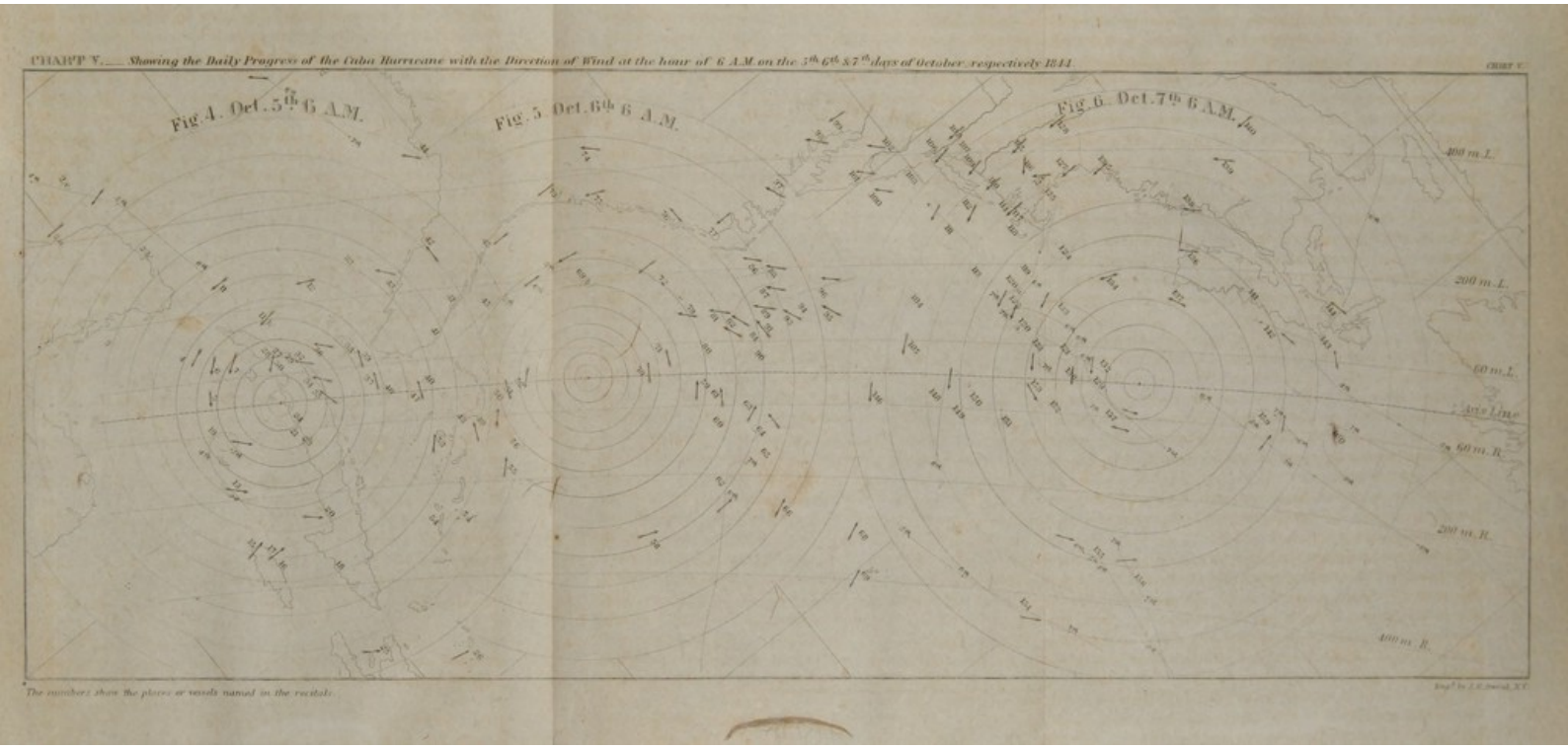
Revolving Character of the Storm-Wind.—As regards the general manner in which the wind was exhibited in this case, as well as in other great storms, I can find no ground for the support of opposite or dissimilar conclusions.

On a general review of the observations, the following state of facts is presented to our notice. (1.) In the early part or front of the storm, on its centre path, we find the wind to have blown from the southeastern quarter, transversely from the right towards the left side of the path. Continuing to follow this wind in its

* Nos. 72, 86, 100, 118, 121, 123, 129, 130, 141, 142, 144.

† This will be seen on an examination of the data presented in cases 35, 38, 64, 70, 71, 121, &c.

CHART V.—*Showing the Daily Progress of the Cuba Hurricane with the Direction of Wind at the hour of 6 A.M. on the 5th 6th & 7th days of October respectively 1844.*



The numbers show the places or vessels named in the recitals.

Engd by J.E. Farrell, N.Y.

course, as we depart from the axis path the observations show it to proceed successively from more eastern and northeastern points, till, on the passing of the gale's axis, it has veered so far to the left as to blow from northern and northwestern points of the horizon, thus turning gradually towards the center path, and, finally, recrossing it, in the rear of the storm's axis, on the fair-weather or clearing-up side. See observations in Table I; which follows. We find, indeed, in some localities, that a portion of the successive changes in the wind's direction have occurred somewhat suddenly, or with some irregularity, but this will not invalidate the general result of the observations.

(2.) If now we place ourselves again in the front of the storm, on its center path, and follow *back* the first southeasterly wind towards its apparent source on the right hand side of the storm path, the observations will show, that as we recede from the axis line and the storm advances, the wind comes, successively, from points more and more southward or southwesterly, till, on the passing of the gale's axis, it comes from points successively more westward and leading us again towards the axis line, on the posterior side of the storm, till, finally, we find ourselves in the same northwesterly wind from which we had parted at the end of our first semi-circuit of the gale. See the successive observations in Table III.

In thus tracing the circuit of the wind, on the two sides of the storm-path, we have followed the order in which the wind's changes are severally presented to observers. We have seen that these changes have been in *opposite courses of succession*, on the opposite sides of the axis path, viz. from the right towards the left, on the left hand side of the path, and from the left towards the right, on its right hand side. But if we follow out our first trace continuously round the circuit, from the rear to the front of the storm on its right side, being the constant direction from right to left, ↻, we shall then follow the wind in its own order of progress, which is the *reverse* of the order in which its successive changes are always presented to observers on this right hand side of the axis route, by the advance of the storm over the places of observation.

It is evident, therefore, that observers in the *right* side of a storm, in this hemisphere, have the changes of wind presented in a *backward* or reversed succession; while with those on the left

side of the path the succession of changes is a forward one, coinciding with the order of the wind's rotative progress.

(3.) In accordance with the foregoing facts, we find that the observed changes in the wind's direction were most rapid or sudden in places nearest to the axis of the gale. On and near the axis path the southeasterly wind, first mentioned, was found to continue without much change of direction as the storm advanced, until the approach of the axis; when, commonly after an axial lull or remission, a change to the opposite quarter took place, more or less sudden, or rapid, and the wind then continued to blow from the northwestern quarter, till the close of the gale. See observations in Table II.

It may be seen that these several statements are but connected summaries of the observations which were made under different portions of the gale, during its progress.

Synopsis of the Observations.—To facilitate a satisfactory examination of this important question of rotation, I annex, in a brief and tabular form, the principal observations contained in the previous recitals; which are comprised in the three tables already referred to. The several cases are marked, in the first column, with the same numbers as before, and the order of progress is observed, except that the observations made within sixty miles of the axis line, comprising a belt of one hundred and twenty miles wide, along the center path of the storm, are comprised in Table II, while the remaining observations on the left side of the path are contained in Table I, and those from the right side in Table III. (For these tables see pp. 78—81.)

I also add the subjoined observations, obtained since the former recitals were printed.

4. Report from Capt. Brown, British ship *Gossypium*, reduced to civil time.—Sept. 30th, 1844, moderate breeze from N. N. E.; hauling northward, with hazy weather.

Oct. 1st, A. M., wind N. to N. N. W., gradually increasing; strong current carrying the ship to southward; lat. 20° 19′, lon. 84° 30′:—P. M., clear weather, wind N. W., increasing.

Oct. 2d, A. M., gale gradually freshening to double reefs; current one and a half knots to southward; lat. 20° 5′, lon. 85° 7′:—P. M., freshening from N. N. W., ship heading N. N. E.; (on larboard tack,) bar. 29·20; reduced sail to close reefed topsails, sent down top gallant yards; at midnight, in lat. 20° 46′, lon. 84° 37′, the gale increased rapidly to a hurricane, blowing from N. W.

Oct. 3d, A. M., hurricane with small rain and heavy sea, lying to on larboard tack with tarpaulins in mizen rigging, to keep the ship's head to the sea; wind veering from N. W. to W. and S. W.; barometer about 29 inches:—P. M., severe hurricane with rain; wind veering from S. W. to S. and S. E., from which last point it blew hardest and longest; at 11 P. M., the mainmast blew over the side.

Oct. 4th, A. M., severe hurricane; at 7 A. M., the foremast blew over the side; wind veering round from S. E. to E. and N. E.; barometer much as before:—P. M., hurricane

with heavy rain; sea running very high; wind veering from N. E. to N., and inclining to moderate.

Oct. 5th, A. M., gale continues; barometer slowly rising; wind veering from N. to N. W.; sea running high and ship laboring heavily:—P. M., strong gales from N. W. with a heavy cross sea.

Oct. 6th, A. M., winds moderate, from N. W.; lat. 20° 52′, lon. 84° 21′.

[Capt. B. gives this as an abstract of a statement drawn up at the time. It shows the same phases of the gale on the 4th and 5th as with the *Angola* (6) and *Openango* (7); while the previous report of the wind's veering "round the compass," during the gale, is also proved to be strictly correct. This statement shows, also, a perfect continuity in the double gale, at this locality, and possibly may indicate a detour in the axis-path of the second storm while in the Honduras sea, corresponding to the general system of progression which is seen on Chart I. The complete revolution of the storm-wind with this ship, whose change of position was not very great, but whose track and winds differ much in direction from those of the *Norman* (19), is quite remarkable.—Capt. BROWN says, "the ship's *drift* was about two knots an hour, forming a kind of circle." The diameter of this circuit may have been 30 to 40 miles. Capt. B. was in the Barbadoes hurricane on the 10th of August, 1831, and thinks this storm quite as bad, while it was of much longer duration. He thinks the ship must have foundered had she been on the other tack.]

11*b*. Barque *Zaida*, Sept. 27th, was near Cape Cruz, S. side of Cuba, in lat. 20° 12′, winds E. by N. to N. E., and continued to vary between N. E. and N. W. till night of Sept. 30th, ending with fresh gales from N.—Oct. 1st, at 5 A. M., made Cape Antonio, [S. W. end of Cuba,] bearing N. N. W.; wind N. N. E., fresh breezes and clear; noon, lat. 22°, lon. 85° 30′; P. M. fresh gales N. N. E., hazy. 7 P. M. took in top gallant sails.—Oct. 2d, strong breezes N. by E. and pleasant; 6 A. M. N. E. by N.; 11 A. M. single reefed topsails; lat. obs. 22° 30′, lon. 85° 28′; P. M. commences strong from N. E., squally; 3 P. M. took in jib and spanker; 4 P. M. close reefed fore and main topsails and furled mainsail, reefed foresail; ends strong gales from N. N. E.—Oct. 3d, took in fore topsail; 4 A. M. furled foresail; sent down top gallant yards and hove to; gale still N. N. E., with a heavy cross sea from N. E. and N. N. W., ship laboring hard; up N. W., off N. N. W.; noon, lat. obs. 23° 28′, lon. 84° 14′; P. M. heavy gale from N. N. E. and cloudy; midnight, heavy squalls with rain.—Oct. 4th, 3 A. M. set reefed foresail; 4 A. M. gale N. E. by N., set close reefed fore topsail and mizen topsail; noon, lat. D. R. 23° 28′, lon. 83° 40′ [?]; P. M. gale N. E. by N., squally; 5 P. M. handed topsails and courses; 8 P. M. set fore courses.—Oct. 5th, 4 A. M. wind N. by W.; 7 A. M. N. N. W., squally, a heavy sea from N. E.; noon, lat. 23° 15′; P. M. fresh gales from N. N. W., cloudy, a heavy sea from S. E., N. E. and N. W.; 2 P. M. set fore topsail and mainsail; 4 P. M. wind N. N. W.; 8 P. M. N. W. by N.—Oct. 6th, A. M. wind N. W. by N., fresh breezes and fine weather; noon, lat. 23° 27′; P. M. winds N. N. W.; 8 P. M. N. N. E. [trades] light and variable.

Capt. CHAPMAN states that during the gale the Gulf Stream current, off Cuba, had become changed in its course, drifting the *Zaida* rapidly to the westward; so that on the morning of the 7th he found himself off Cape Cartouche, in lon. 86° 40′. On the 11th of October, at 3 P. M. he picked up the two survivors of the *Saratoga*, off Cape Florida, in lat. 25° 40′. [This position of the piece of wreck appears to show, also, the extraordinary check of the surface current of the Florida stream; for these men were drifted off the Bank as early as the 7th. See case 43, *ante*. The *Zaida* evidently had the double gale; the second superseding the first, early on the night of Oct. 3d.]

Capt. MCGUIRE, of the *Rebecca* (20), states that the second gale, at Santa Cruz, began in the S. E. quarter, and went round by the S. to the westward, ending on the 5th. At 10 A. M. of 4th, had got to be very heavy, and fluctuated in tremendous squalls between S. S. W. and W. S. W. till 4 P. M., when it began to veer more westward, gradually abating.

35*b*. Capt. LESLIE, from St. Juan de Los Remedios, [N. side of Cuba, lat. 22° 37′, lon. 79° 40′,] reports that a very severe gale of wind occurred at that place on the 1st of October and continued until the 3d, commencing from N. to N. E., and ending at S. E., causing considerable damage to planters. *Charleston Patriot.*

45*c*. Barque *California*, Sept. 30th, lat. obs. 24° 51′, lon. 79° 34′; 2 P. M. fresh gales N. E. by E., cloudy, rough sea; 4 P. M. two reefed the topsails; 10 P. M. wind E. N. E.—

TABLE I.—*Left side of the Storm Path; Hurricane of Oct. 4th to 7th*, 1844.

These observations show the progressive occurrence of the storm-wind, first from the eastern and northeastern quarter, and successively changing or veering, more or less gradually, by the north, to the northwestern quarter, as the gale advanced in its course;—with the lowest state of the barometer noticed during the gale.

No.	Place, or Vessel.	Lat.	Lon.	Date and duration of gale.	Successive directions of storm-wind	Dist. from axis line.	When axis passed.	Bar. min.	Authorities and observers.	Remarks.
2.	*Maria L. Hill*,	19°51′	90°33′	Oct. 3d, to 5th,	'Norther,' ending at N.	380 miles.	3d—4th,		Logbook.	
4.	*Gossypium*, .	20 30	80 40	2d to 5th,	(4th,5th) E, NE, N, NW.	105 "	4th,	29 in.	Capt. BROWN'S statement.	Severe hurricane; dismasted.
6.	*Angola*, . .	20 45	83 40	6 A. M. 4th to 5th,	ENE, to NNE, to NW.	69 "	4th, 9 P. M.	29 in.	Log: Capt. BELL.	Severe hur.; dismasted.
7.	*Openango*, .	21 15	83 30	morn. of 4th to 5th,	E, to NNE, to NNW, NW.	74 "	9·30 "		Capt. VOSE'S statement.	Hurricane very severe.
11.	*Franklin*, .	22 40?	85 40?	4th to 5th,	N. easterly, northerly.	235 "	night,		Marine reports.	Driven 100 miles to s. w.
11*b*	*Zaida*, . . .	23 28	84	2d . 4th to 5th	NE b N, to N b W, NNW, NW b N.	180 "	"	**	Log: Capt. CHAPMAN,	Heavy gale.
12.	*H. Plantagenet*,	24 30?	83 40?	4th to 5th,	. NNE, . .	230 "	5th, 11 A. M.		Marine reports.	Gale strong from N. N. E.
29.	San Antonio,	22 55′	82 43′	5 P. M. 4th to 5th,	E, ENE, N, . .	93 "	7 " ?		Diario de la Habana.	Furious hurricane.
30.	Batabano, .	22 43	82 32	P. M. 4th to 5th,	NE, to NW.	76 "	3 "		do.	do.
31.	Guatno, . .	near	Hav.	noon 4th to P. M. 5th,	ENE, NE, NNE, . NW.	80 "	9·30 "		do.	Furious and destructive hur.
32.	Havana, . .	23 09	82 19	A. M. 4th to eve. 5th,	ESE, ENE, NE by E, N, NW.	85 "	10 "		Capt. FOSTER'S journal.	Terrific hurricane.
36.	*Tasso*, . .	23 45?	82 20?	4th to eve. 5th,	ENE, NE, NNE, N, NNW, NW.	90 "	11 "		Capt. HOWES' statement.	Hurricane.
38.	Key West, .	24 27′	81 50′	A. M. 4th to noon 6th,	E, ENE, NE, N, NNW, W, NW.	118 "	2 P. M.	29·13	Rep. to Sur. Gen. LAWSON.	Destructive hurricane.
42.	Tampa Bay,	27 57	82 35	morn. 5th to P. M. 6th,	E, . NE, . .	300 "	night,	29·79	do.	W. coast of Florida.
45*a*	St. Augustine,	29 40	81 35	morn. 5th to noon 6th,	NE, N, NE, . . NW.	305 "	6th, 2 A. M.	29·82–	do.	Height of gale in night.
45*b*	*Demarara*, .	29 35	79 30	eve. 4th to eve. 6th,	ENE, NE b E, NNE, N, NNW, NW.	187 "	3 "		Log.	In Gulf Stream, off Florida.
45*c*	*California*, .	31 +	79 −	10 A.M. 5th to 10 P.M. 6th,	ENE, NE by E, N by E, NNW.	210 "	5·30 "		Log: Capt. MAYHEW.	do. off Darien, Ga.
72.	*Sterling*, . .	33 4	75 40	noon 5th to night of 6th,	NE, . N, NNW, NW.	230 to 150	9·30 "		Log.	do.; as also many others.
75.	Charleston, .	32 46	79 46	P. M. 5th to night of 6th,	E, . NNE, . NW, W.	335 "	7·30 "	29·80	Rep. to Surgeon Gen.	
76.	Cape Fear, .	33 54	78 1	night of 5th to night of 6th,	E, NE, NE, . . W.	300 "	10 "		do.	
77.	Beaufort, .	34 41	76 50	do. 5th to night of 6th,	. N, N, . .	270 "	noon,		do.	
81.	*Emeline*, . .	33 30	74 30?	5th to night of 6th,	NE, NNE, N, NNW.	117 "	do.	28·15†	Capt. SAWYER'S statement.	Severe hurricane.
82.	*Republic*, . .	33 40	74	through 6th,	ENE, NE, NNE, N, NNW, NW.	148 "	0·30 P.M.		Log: Capt. GATES.	Gale very severe.
85.	*Wm. Nelson*,	35	74	" 6th,	NE, to NW.	162 "	2 "		Marine Reports.	Severe gale.
86.	*Tioga*, . .	35 10	75	early 6th to morn. 7th,	NE, NNE, N, NNW, NW.	205 "	2 "		Log: Capt. HALLOCK.	Gale exceedingly heavy.
87.	*Cotton Plant*,	35	74	. 6th .	NE, NNE, N, NNW, NW.	162 "	2·30 "		Log: Capt. PRATT.	Ship dismasted.
88.	*B. F. Lamar*,	35 30	74 30′	early 6th to early 7th,	NE, NE b N, veering by N, .	200 "	2·45 "		Log: Capt. SANNERMAN.	Tremendous hurricane.
89.	*Clara*, . . .	34 40	73 30	. 6th .	. NNE, N, . .	120 "	2·30 "		Log.	Dismasted.
91.	*Rienzi*, . .	34 30	73 15	. 6th .	NE, E? NNE, N, NNW, NW.	100 "	2·30 "		Mar. Rep.; Capt. CLARK.	Tremendous gale.
97.	Fort Monroe,	37	76 19	night of 5th to night of 6th,	ENE, NE, . . NW.	345 "	3 "	29·82	Rep. to Sur. Gen.	

95.	*Montpelier*, .	35°50′	72°15′	4 A. M. 6th to morn. 7th,	NE, E? NNE, . NNW.	108	"	5	"		Log: Captain's statement.	Hove down; lost topmasts,&c
96.	*J. R. Gardner*,	36var.	73 20?	night of 5th to 6th,	NNE, NE, . N, NW.	140	"	5	"		Capt.'s PEDERSON & GOOD	Severe hurricane.
00.	*Orozimbo*, .	38 45	74 25	early 6th to noon 7th,	NE, NE, N, NNW.	320	"	7·30	"		Log: Capt. SERGEANT.	Heavy gale.
03.	*Orleans*, . .	39 30	73 30	6th to 7th,	NE, NNE, N, NNW.	350	"	8·30	"		Mates' statement.	Close reefed gale.
06.	New York, .	40 42	74 1	noon 6th to P. M. 7th,	NE, NNE, . N b W, NNW.	400	"	9·30	"	29·84–	Jour. of W. C. REDFIELD.	
11.	*Hottinguer*, .	39 40–	70to73	P. M. 6th to 7th,	NE, NNE, N, NNW.	265	"	10·30	"		Log.	Strong gale.
09.	New Haven,	41 18	72 57	noon 6th to P. M. 7th,	N b E, NE, . N b W, . NW.	359	"	11	"	29·72	Jour. of Col. CUTLER.	
12.	*Isabella*, . .	40 30	72	P. M. 6th to 7th,	NE, NNE, N, NNW, NW.	306	"	11	"		Marine Reports.	Very hard gale.
10.	New London,	41 20	72 8	P. M. 6th to P. M. 7th,	NE, . N, . W.	336	"	11·40	"		Rep. to Surgeon Gen.	Heavy rain and high wind.
14.	Newport, .	41 28	71 23	P. M. 6th to P. M. 7th,	NE, . N, . NW.	324	"	12	"	29·79	do.	
18.	Nantucket, .	41 15	70 6	P. M. 6th to P. M. 7th,	E, NE, . N, NNW.	260	"	7th, 0·30	A. M.	29·50–	Jour. of WM. MITCHELL.	Gale extremely heavy.
20.	(*a*) *Unicorn*, .	39 47	68 56	P. M. 6th to eve. 7th,	ENE, NE, N, NNW, NW.	152	"	0·30	"		Log.	Severe hur.; lost sails, &c.
24.	*Nath. Hooper*,	40 20	68 20	P. M. 6th to eve. 7th,	NE, . N, NNW, NW.	152	"	1	"	28.60†	Log: Capt. CHURCHILL.	do.
21.	*Sarah & Arsilia*,	40	66var.	1 P. M. 6th to end of 7th,	ESE, ENE, NE, NNE, N, NW.	103 to 50		3·30	"		Log: Mates' statement.	do.
23.	*Courier*,‡ . .	39 30	67var.	2 P. M. 6th to eve. 7th,	ENE, NE, NNE, N, NW.	80 to 40		2	"		Log.	do.
22.	*Zurich*, . .	40–	67var.	P. M. 6th to P. M. 7th,	E, NE, N, NNW, NW.	140 to 115		1·30	"		Log.	Heavy gale.
26.	Watertown Ars.	41 21	71 12	P. M. 6th to P. M. 7th,	NE, NE, NW.	352	"	1·30	"	29·79§	Rep. to Sur. Gen.	
27.	Portsmouth, .	43 03	70 43	P. M. 6th to eve. 7th,	E, NE, . N, .	364	"	2·30	"		do.	
28.	Hanover, . .	43 41	72 22	P. M. 6th to night of 7th,	N, N, N.	460	"	2·30	"		Jour. of Prof. YOUNG.	
33.	*Roscius*, . .	41 10	65 50	P. M. 6th to 7th,	ENE, . N, NNW, NW.	85+	"	1·30	"	28·25*	Capt. COLLIN'S statement.	
34.	*Rochester*, .	42	67	eve. 6th to 7th,	. NE, . . .	182	"	4·30	"		Marine Reports.	Severe gale.
35.	Portland, . .	43 30	70 21	eve. 6th to 7th,	SE? . N, NW, N.	368	"	4·30	"	29·73	Rep. to Sur. Gen.	
36.	Yarmouth, .	43 51	66 5	eve. 6th to night of 7th,	NE, . N, NW.	225	"	10	"		Marine Reports.	Heavy gale.
37.	*St. Petersburg*,	43 5	65 14	6th to 7th,	E, ...	152	"	9·45	"		Marine Reports.	Severe gale; lost topmasts,&c.
38.	Eastport, . .	44 53	67	end of 6th to night of 7th,	. NE, N, NW.	310	"	10	"		Rep. to Sur. Gen.	
39.	Holton, . .	46 5	67 40	" 6th to " 7th,	. NE, NW, .	390	"	10·30	"		do.	
40.	Fort Kent, .	47	68 20	" 6th to " 7th,	. NE, N, N.	460	"	11·15	"		do.	
41.	Halifax, . .	44 36	63 28	2 A. M. 7th to A. M. 8th,	NE, ENE, NE'terly, N, . NW.	168	"	11·30	"	29·23	Log H. M. ship *Illustrious*.	Ad. Sir C. ADAM, thro' Col. REID
42.	*Scylla*, . .	44 21	63	end of 6th to noon 8th,	E, ENE, NE, NNE, NNW, NW.	88 to 132		11·30	"	28·90	Log H. M. ship *Scylla*.	do.
43.	Cape Canso, .	45 20	60 58	early 7th to 8th,	SE, . to N. and NW.	98	"	2·45	P.M.		Master of Schr. *Actress*.	
44.	*Pique*, . . .	45 33	61 18	early 7th to 10 A. M. 8th,	SE b E, E b N, NNE, N, NNW, NW.	130	"	3	"	29·19	Log H. M. ship *Pique*.	do.

Ships 121 and 123 were in the Gulf Stream, bound eastward; longitude uncertain. Ships 111, 122, 133, 144, with probably 137, were running rapidly westward, as was the case in some degree with several others.

† In the cases of the barometrical entries having this mark, † the several barometers have been compared with my own at New York and the corrections for index errors are here made. This remark applies to all the tables. ** Barometer said to have varied an inch.

‡ The course and drift of the Courier (123) should be more eastward than is represented in the storm charts.

§ Barometer as observed at Boston, by R. T. PAINE, Esq. * Barometer corrected by verbal information.

TABLE II.—*Center Path of the Hurricane of Oct. 4th to 7th*, 1844.

These consecutive observations show the progressive storm-wind, first from the southeastern quarter of the horizon, which, on the passing of the gale's axis, changed rapidly or suddenly to the western or northwestern quarter;—with the lowest state of the barometer observed.

No.	Place, or Vessel.	Lat. N.	Lon.	Date and duration of gale.	Successive directions of storm-wind.	Dist. from axis line.	When axis passed.	Bar. min.	Authorities and observers.	Remarks.
5.	*Majestic*, . .	20°30′	83°10′	Oct. 4th and 5th,	ESE, remission, NW, WNW.	30 miles L.	4th, 3 P. M. ?		Honduras Observer.	Totally dismasted.
34.	Matanzas, . .	23 3	81 41	10 P. M. 4th to P. M. 5th,	E, NE, variable, W.	48 " L.	5th, 11 A. M.	28 in.	Diario de la Habana.	Violent hurricane.
35.	Cardenas, . .	23 2	81 15	eve. of 4th to eve. 5th,	E, . . .	27 " L.	11 "		do.	Vio. hur. fr. 11·30 PM. 4th; 24 hs.
37.	*Columbo*, . .	24 15	80 30	11 P. M. 4th to 2 A. M. 6th,	SE, ESE, lull, sud. to WNW,§ NW.	30 " ? L.	4·30 P.M.		Mar. Rep.: Mates' stat.	Hur. 30 hs., shifted sud. to N.W.
50.	*Reform*, . .	27 15	77	P. M. 5th to 11 A. M. 6th,	SE, sud. lull, SW, W. .	L. near axis.	6th, 2 A. M.		Log: Mates' statement.	Hr. S.E, sud. lull, shift to west'd.
51.	*Star Republic*,	27 25	77 10	P. M. 5th to A. M. 6th,	ESE, sud. lull, W. .	L. do.	2·30 "	28·24†	Log: Capt. HENDLEY.	Hr. E.S.E, lull 30 m. then fu. fr. W.
52.	*Josephine*, .	27 40?	77 6 ?	P. M. 5th to A. M. 6th,	SE, sud. lull, NW.	near do.	3 "		Mar. Rep. A. THOMSON.	Hove on b'm ends; lost spars.
70.	*Leonora*, . .	32 40	74 15	P. M. 5th to A. M. 6th,	ESE, veered sud. to N, NNW, NW.	L. near do.	9 "		Log: Capt. COLLINS.	Totally dismasted.
71.	*Arkansaw*, .	31 30	75	P. M. 5th to P. M. 6th,	ESE, lull, sud. to WNW.	55 m. L.	9·30 "		Log: Capt. BUNKER.	Dismasted. Furious hur.
59.	*Charlotte*, . .	32	73	night of 5th to end of 6th,	SE, NW. .	15 " R.	11·30 "		Marine reports.	Lost all but lower masts.
61.	*Victoria*, . .	32	72 30	" 6th "	SE, rapidly S, to westward.	38 " R.	noon,		Stat. fr. Capt. BUNCE.	Dismasted. Furious hur.
63.	*Potomac*, . .	32 30	71 30	" 6th "	E, ESE, .	60 " R.	1·30 P.M.		Marine reports.	Dismasted; close of g. not rep.
146.	*J. N. Cooper*,	35 50	69 ?	4 A. M. 6th "	SE by E, SSE, SSW, SW, NW.	25 " ? R.	7·15 "		Capt. VARNEY'S stat.	Furious hurricane.
105.	*St. Pierre*, .	37var.	69 36	1 P. M. 6th, to 7th,	ESE, SE, NW.	56 " L.	8·30 "		Marine reports.	Dismasted.
148.	*Wakulla*, . .	36 40	67 30	4 P. M. 6th, gale 14 hours,	SSE, S, sud. to NW.	148 to 20 R.	10 " ?	27·75†	Log: Capt. MULFORD.	Hove on b'm ends; lost spars.
151.	*Elvira*, . .	38 10	66 30	A. M. 6th to noon 7th,	. S, SSW, .	150 to 20 R.	7th, 0·30 A.M.		Marine reports.	Tremendous hurricane.
152.	*Nye*, . . .	38 58	65	P. M. 6th to 7th,	SE, .	47+ R.	2·30 "		Master's protest. }	From WM. MITCHELL; both
153.	*Mt. Vernon*, .	39	66	P. M. 6th to 7th,	SE, sud. by S, and SW to W.	6+ R.	2 " ?		Master's protest. }	ships disabled & returned to pt.
129.	*Mediator*,* .	40 25	64 20	P. M. 6th to 7th,	NE, ESE, SE, SSW, W, NW.	40 L. to 98 R.	4 " ?	28·28†	Log: Capt. CHADWICK.	Crossed axis line during gale.
130.	*St. Nicholas*,*	40 15	65 10	2 P. M. 6th to P. M. 7th,	ENE, E, SE, lull, sud. to NW.	25 L. to 31 R.	3·20 "	28·37†	Log: Capt. PELL.	do.
131.	*Cambridge*,* .	40 30	64 30	5 P. M. 6th to A. M. 7th,	ENE, ESE, SSE—SSW, WSW, W.	40 L. to 90 R.	3·45 "		Log: Capt. BARSTOW.	do.
132.	*Mentor*, . .	40 30	65	2 P. M. 6th to eve. 7th,	SE, .	24 m. L.	4·30 "		Marine reports.	Dismasted and abandoned.
157.	*Hellespont*, .	40	63 30	eve. of 6th to 7th,	hur. SSE, veering SW, .	57 " R.	5 "	28·50‡	Bermuda Gazette.	Dismasted in the hurricane.
159.	*Memphis*, . .	43 6	60	eve. of 6th, to P. M. 7th,	ESE, SE, SW, WNW.	75 to 34 R.	0.40 P.M.		Log: Capt. COFFIN.	Violent gale.
160.	*Europe*, . .	44 19	58	early 7th to morn. 8th,	SSE, S, SE, WSW to WNW.	60 to 45 R.	3·30 "	low,	Log: Capt. FURBER.	Heavy gale.
145.	*Normal*, . .	48 45	53 45	7th to 8th,	ESE, [E. true] to N. and NW. .	40 m. L.	8th, 8 A. M. ?		From a seaman of N. F.	Damaged sails.

* These three ships were in the Gulf Stream bound eastward, and crossed the line pursued by the axis during the height of the gale; the *Mediator* and *Cambridge* apparently in front of the axis, and the *St. Nicholas* nearly intersecting it. Vessels 148 and 151 were running into the gale. The winds for 146 seem better suited to a lower latitude or longitude.

§ Erroneously printed N. N. W. in the recitals. † Index error of barometer corrected. ‡ Sympiesometer.

TABLE III.—*Right side of the Storm Path; Hurricane of Oct. 4th to 7th*, 1844.

These consecutive observations show the progressive appearance of the storm-wind, first from the southeastern quarter, and its successive hanges or veering, by the south, to the western quarter;—with the lowest state of barometer noticed during the gale.

No.	Place, or Vessel.	Lat. N.	Lon.	Date and duration of gale.	Successive directions of storm-wind.	Dist. from axis line.	When axis passed.	Bar. min.	Authorities and observers.	Remarks.
13.	*Trojan*, . .	19°5′	80°50′	noon 4th to A. M. 5th,	SE, SSE, S, SSW, SW.	145 miles.	4th, 8 P. M.	•	Log: Capt. DAVIS.	Heavy gale.
15.	*Eastern Star*,	18 15	78 25	night of 3d to eve. 5th,	SSE, veering by S, to SW. .	315 "	10 " ?		Log: Captain's statement.	Near west end of Jamaica.
17.	Montego Bay,	18 28	77 57	4th to 5th,	. S, . . .	330 "	—		Nautical Magazine.	Destructive swell.
19.	*Norman*, . .	19	82var.	night of 3d to night of 5th,	SSE, S, SW, WSW.	200 to 100	4 " ?	28·50†	Log.	Severe hurricane.
20.	*Rebecca*, . .	20 44	78	4th to 5th,	SSE, S, SSW, WSW, W.	225 "	5th, 3 A. M.		Log: Mates' statement.	Severe gale.
25.	Bay of Gonaives	19 38	73	4th to 5th,	. S, or SW.'erly, .	550 "	2 P.M.?		Marine reports.	Vessels driven on shore.
53.	Nassau, . .	25 4	77 18	5th to 6th,	SE, SSE, S, SSW, SW, .	90 "	9·30 "		Bermuda Gazette.	
55.	*Berlin*, . .	26	75	P. M. 5th to 6th,	SE, veering round to SW, .	175 "	6th, 2 A. M.		Marine reports.	Hurricane.
56.	*Lagrange*, .	26 30	75 30	" 5th to 6th,	SE, SSE, S, . .	127 "	2·30 "		do.	do.
57.	*Herald*, . .	30	73 30	eve. 5th to 6th,	SE, ...	75 "	8·30 "		do.	Heavy gale; dismasted.
58.	*Sea Lion*, . .	28	70 ?	night of 5th to 6th,	SE, veering round to W.	330 ? "	8·45 "		do.	do. lost sails, &c.
62.	*Pioneer*, . .	30 30	69 52	morn. 6th to midnight.	S, SSW, SW, WSW.	275 to 213	1 P.M.?	29·45	Log: from navy depart.	Through Lt. M. F. MAURY.
65.	*Brothers*, . .	32	70 22	through 6th,	SE, . S, SW to WNW.	140 "	1·45 "		Logbook.	Severe hur.; dismasted.
64.	*St. Cloud*, .	32 30	70 25	end of 5th to night 6th,	ENE, SE, S b E, SSW, SW b W.	95 "	2 "	28·40	St. from Capt. EMERSON.	Hurricane.
66.	*H. W. Tyler*,	31 30	68	. 6th, .	. S, . . .	265 "	3 "		Mar. rep.: Capt. CLARK.	Severe gale; lost sails, &c.
68.	*Falcon*, . .	32 50	65 40	6th to early 7th,	SSE, veering to S, SW, and W.	300 "	7 "		Ber. Gaz.: Capt. PITT.	Lying to eight hours.
69.	Bermuda, . .	32 15	64 40	6th to " 7th,	SSE, S, SW, .	375 "	7 "	29·86	Serg. IRWIN's rep., sig. sta.	
149.	*St. Lawrence*,	36 50	67 2	6th to " 7th,	. . . . .	60 "	10·15 "		Marine reports.	Hurricane; dismasted.
154.	*Lowell*, . .	35	60var.	A. M. 6th to noon 7th,	SE, S, SSW, W, WNW.	380 to 460	7th, 1 A. M.		Log: Mate's statement.	Gale.
155.	*Wm. Engs*, .	37 10	60 29	8 P. M. 6th to night of 7th,	SW, veering to WNW.	316 "	3.30 "		Log: Capt. COE's stat.	Heavy gale.
156.	*Charleston*, .	37 50	60	5 P. M. 6th to end of 7th,	SW, SW by S, WSW, W, NW.	380 to 304	6 "	28·10?	Log: Capt. CATERMOLE.	do.
158.	*Sheridan*, .	43	57var.	night of 6th to noon 8th,	E, . WSW, SW, W, WNW.	75 to 270	3·30 P.M.		Log: Capt. DE PEYSTER.	Strong gale.
164.	*Prince Albert*,	45 20	48	P. M. 7th to 8th,	E, SSE, W by S, W by N, WNW.	325 "	8th, early,		Log: Capt. SEBOR.	do.
161.	St. Johns, .	47 33	52 25	A. M. 7th to 8th,	E.'erly, W by S, W by N, WNW.	85? "	8th, A.M.?	29·44–	Log: J. TEMPLEMAN.	
162.	*Independence*,	47 26	45 37	night of 7th to 9th,	E.'erly, . . NW, WNW.	282 "	noon ?		Log: Capt. NYE's jour.	Strong gale.
163.	*Adirondack*, .	46	43 20	early 8th to 9th,	NE, E, . . NW b W, var., WNW.	415 "	" ?		Logbook,	do.

No. 19 was running fast to westward, into the gale; Nos. 154 and 158 were running rapidly eastward, the latter in the Gulf Stream.

† Corrected for index error of the barometer.

Oct. 1st, gale continues; 1 P. M. took in foresail; 5 A. M. close reefed topsails and set foresail: lat. obs. 26° 6′, lon. 79° 35′, in Florida channel: P. M. heavy gale and squally with some rain.—Oct. 2d, A. M. moderate; lat. 27° 2′, lon. 79° 45′; P. M. heavy squalls of rain and rough sea; 4 P. M. furled mainsail.—Oct. 3d, gale abated, and good weather through the 4th.—Oct. 5th, 6 A. M. N. E., fresh; 10 A. M. E. N. E., freshening, cloudy: lat. D. R. 30° 49′, lon. 79° 16′: 2 P. M. E. N. E., cloudy, took in top gallant sails; 6 P. M. N. E. by E., single reefed; 8 P. M. took in mainsail, jib and spanker; 10 P. M. N. E., gale increasing, close reefed.—Oct. 6th, 2 A. M. E. by N., severe gale, hove to; 4 A. M. up E. N. E, off E. S. E.: [showing the wind at about N. N. E.: at 6 A. M. was about 220 miles from axis line of the gale]: 10 A. M. up N. E. by N., off E. N. E., [wind N. by W.?] heavy gale; noon, lat. obs. 31° 13′, lon. 78° 51′; 2 P. M. N. N. W., more moderate, set foresail; 4 P. M. out one reef from topsails and courses; at 10 A. M. gale had ceased, and light winds came from the eastward.

The logs of the *Demarara* and *California*, with the other accounts, will enable us to trace the first gale more perfectly, in its progress from Cuba.

65. Brig *Brothers*, for New York, Oct. 5th, winds N. W. to S. W., set top gallant sails; noon, lat. 30° 48′, wind W. N. W., light, cloudy; 6 P. M. calm and much rain; 8 P. M. light breeze from N. E.; midnight, moderate breeze from S. E.

Oct. 6th, begins wind S. E., and at 8 A. M. had increased to a strong gale, close reefed the topsails and furled the courses and fore topsail; at 10 A. M. hove to, blowing very heavy, in lat. 32°, lon. 70° 22′; at 11 A. M. blowing a hurricane from S. E., cut away the main topmast and also the deck load, the brig nearly on her beam ends; noon, still increasing; all hands at the pumps, blowing a complete hurricane, which at 2 P. M. had shifted to S. W., making a tremendous sea and heaving the brig on her beam ends; cut away the foremast; at 4 P. M. gale abating and a tremendous sea; at 8 P. M. wind had veered to W. N. W.—Oct. 7th, light winds from W. N. W. to N. W. and a heavy sea; noon, lat. 32° 19′. [Logbook.]

97*b*. Dr. JOHN AUGUSTINE SMITH, who was at a point in Virginia about 60 miles W. N. W. from Fort Monroe, informs me that on the 6th October the storm exhibited there the character of an ordinary northeaster.

144. H. M. S. *Pique*, river St. Lawrence, first Cuba gale:—Oct. 3d, A. M. winds southeasterly, strength 2 to 4, weather b c, c; 9 A. M. bar. 30·24 in.; noon, 30·20; lat. 49° 30′, [lon. 66° 26′,] St. Ann's River S. by W. ½ W. 22 miles. P. M. winds southeasterly, light; 8 P. M. bar. 30·19.—Oct. 4th, begins calm; 4 A. M. S. E. 4, c; 8 A. M. 5, m g; 9 A. M. bar. 30·18; 10 A. M. wind S. S. E., 4 b c; noon, S. S. E., 5; bar. 30·17; lat. 49° 41′, [lon. 64° 42′, off the W. end of Anticosti.] At 1 P. M. wind S. E., 6; reefed topsails and spanker, down royal yards; 2 P. M. split jib and set fore staysail, bar. 30·12; 3 P. M. 7 b c q; 4 P. M. two reefs in topsails; 6 P. M. wind S. E., 5, c; 8 P. M. 4, c, bar. 30·08, set top gallant sails; 10 P. M. S. E. by E., 5, c.—Oct. 5th, 1 A. M. S. E. by E., 5, c; 2 A. M. 6, c q; in third reef of main topsail; 4 A. M. 7, c q r; set reefed foresail, close reefed and furled fore and mizen topsails, down top gallant yards and housed the masts; 5 A. M. wind E. S. E., 7; 6 A. M. 8; 8 A. M. S. E., 7, c r q, bar. 29·44; 9 A. M. E. S. E., 6, o q d; 10 A. M. 5, bar. 29·36; 11 A. M. S. E. by S., 5; noon, S. E. by E., 4, o q r, bar. 29·31; lat. 49° 35′, [lon. 64° 35′,] off W. end of Anticosti:—1 P. M. wind S. E., 2; up top gallant masts and yards and made sail; 2 P. M. bar. 29·28; 3 P. M. wind S. by E., 3; 4 P. M. 3 bar. 29.23; 6 P. M. S. S. W. 4, c q, *bar.* 29·16; in second reef of topsails and driver; 7 P. M. set top gallant sails; 8 P. M. wind N. W. b N., 2, o c, bar. 29·19; 11 P. M. wind W. S. W., 3, c r; midnight N. W., 4, b m. [This shows the axial center of the first gale to have passed near the *Pique*, with indications of an extensive central lull or remission. For the continuation of this log see recital 144, as previously given.*]

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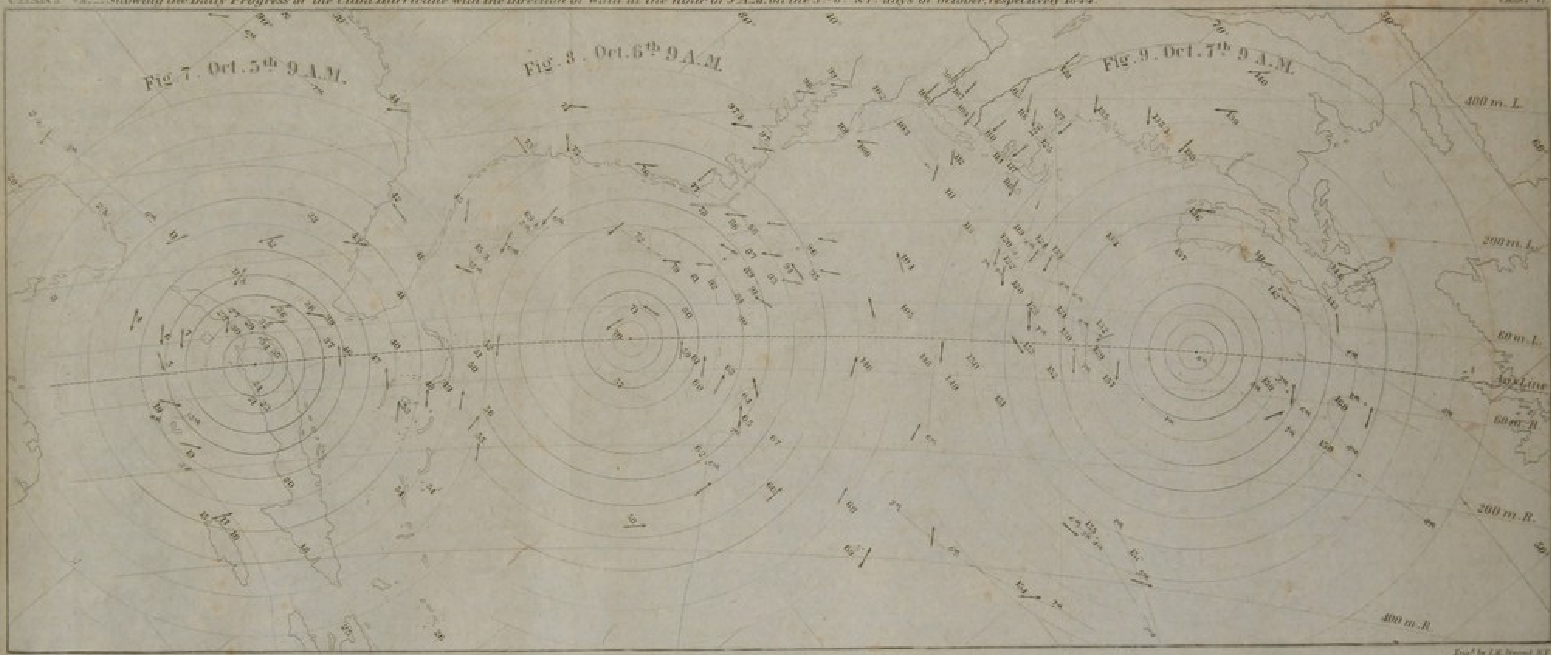
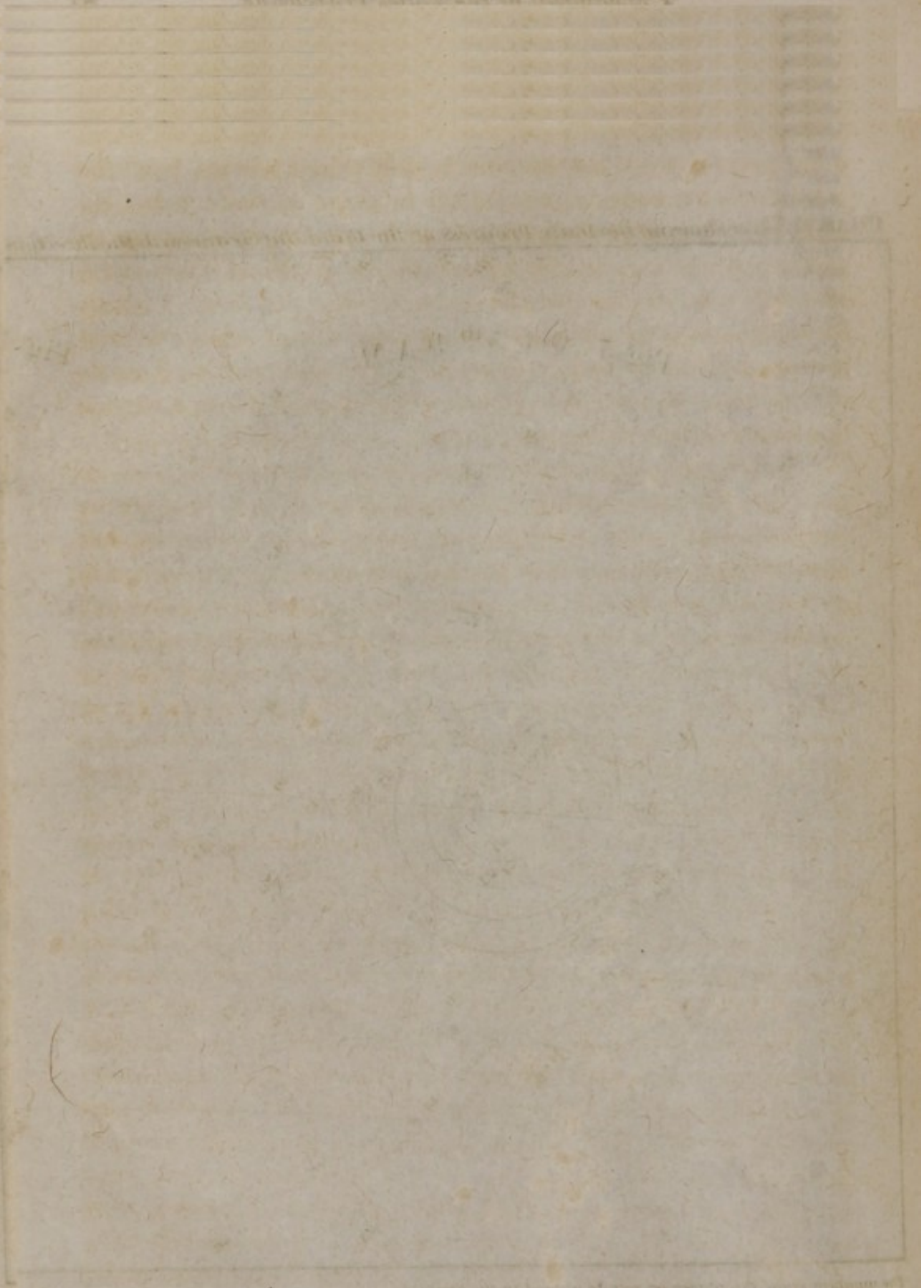
* This further extract has been obtained through the favor of Col. Reid.

CHART VI.... *Showing the Daily Progress of the Cuba Hurricane with the Direction of Wind at the hour of 9 A.M. on the 5th 6th & 7th days of October, respectively 1844.* CHART VI



The numbers show the places or vessels named in the recitals.

Eng. by J. R. Strond. N.Y.



THE PARADOX OF REVOLVING WINDS.—It is still possible that some persons may not be able to understand, clearly, how the wind in a progressive storm which revolves in one constant direction around its axis, can at the same time be found to veer in opposite directions, on the opposite sides of the axis line, as is seen in Tables I. and III. respectively. But this fact, of which an explanation has already been attempted, may be seen to be a necessary result of the law of rotation, as manifested in all revolving bodies; and failing to understand this law, no one can intelligently pursue the inquiry.

Let a circular disk of stiff paper be written upon in one or more circular lines, around its center, either in a concentric or vorticose form; then put this disk in rotation upon its center, and pass two fingers across it in parallel directions, one on each side of the axis, and it will be found that one finger passes the circular writing in the order in which the words are written, while on the opposite side of the axis the other finger, though moving in the same direction, will pass over the writing in the opposite or *reverse* order to that in which the words are written. Of course this will equally follow in case the revolving disk be advanced under the fingers, as when the fingers are advanced over the disk.

The two opposite orders of succession in which the letters are thus presented on the revolving disk, are equivalent to those of the winds which are presented to separate observers on the two opposite sides of the storm. This then being the law of rotation, it follows, that if the general course pursued by a storm be known, two rough observations of the order of changes in the wind, one on each side of its axis path, may be quite sufficient to determine its revolving character; provided that the early and later winds near the axis path have blown transversely to the course of progression; to determine which, even the same observations may suffice.

PROOF OF ROTATION AFFORDED BY DIRECT INSPECTION.—Perhaps it may be deemed that the rotation of great storms, as a question of fact, resting on observations, was as distinctly determined in the case of the American storm of Sept. 3d, 1821, or that of August 16th, 1830, as by the great case which is now before us.* But the latter affords data of a more precise and

* The jointly revolving and progressive movement of the entire storm which visited Connecticut on the 3d day of September, 1821, was distinctly ascertained in

extended character than is often obtained, and is, therefore, well suited to remove doubts from those who are unaccustomed to a course of specific inquiries. To such, the proofs of rotation afforded by a direct inspection of simultaneous observations, when plotted on a map, may be more satisfactory. This case is also a favorable one for the study of navigators; who must necessarily become acquainted with the progressive character and determinate changes of revolving gales, or submit to the inevitable evils of neglecting such knowledge.

For these objects, it proves favorable that the unusually rapid progress of this hurricane was such as to enable us to show, on the same chart, a separate development of the daily advance of the storm, and the simultaneous direction of its wind on all sides at the same hour, on successive days. This is first done on Chart IV, where the place of the storm at noon of each day, as approximately determined, is denoted by separate sets of concentric

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the course of that month. This unexpected result, as made apparent also in other storms, was made known without reserve to the writer's friends and others, but was not published in any Journal till April of 1831, when the westerly progression in low latitudes was also distinctly shown. It was not till seven years later (1838) that I became acquainted with the suggestions and opinions of Col. CAPPER, and with the particular views and elucidations published by Prof. DOVE in his paper on Barometric Minima, found in POGGENDORF's Annalen, 1828.

To the valuable investigations of Prof. DOVE, I am anxious to do full justice. But I have found some degree of difficulty in ascertaining the *extent* in which his elucidations and views of certain storm-winds, as exhibited in his article above mentioned, coincided with the main results of my separate inquiries; a difficulty which perhaps may be owing chiefly to my want of acquaintance with the German language and with the modes of illustration used at that time by this distinguished inquirer.

It is evident that the integral rotation of the trade and general winds in performing their great circuits, both in the northern and southern hemispheres, is in the direction which is opposite and reverse to that which is uniformly found in the revolving storms or eddies which are carried forward in these general currents of rotation. Thus the great rotative and geographical course of the latter, in the northern hemisphere, is successively from S., W., N., E., S.; while the rotation of a storm, borne along by this current, proceeds successively from S., E., N., W., S.; being the opposite direction of rotation. At the same time, the constant *tendency* of the difference of velocity in the earth's rotation, in different latitudes, is to favor or produce, locally, such *leftwise* movements of rotation as the storms exhibit in the northern hemisphere; at least in those parts of the general currents which have a progression towards the polar latitudes, and as apart from the concurrent influences of rotation which may exist in greater or less force in various regions. This leftwise tendency of rotation in storms, may be counteracted in the opposite parts of the great circuit, in returning towards the equator.

lines; and the direction of wind at that hour, so far as determined by direct or approximate observation, is indicated by the several wind-arrows.

To avoid any chances of error, the like delineations are also made for different periods of the day, at intervals of three hours each; which will be found on Charts V to X, inclusive. These are drawn on the same scale and ground work as Chart IV, and are severally derived in like manner from the observations. This will afford opportunity for mariners and others to contemplate the progressive changes which are produced, on different sides, by the advance of the revolving storm.

This manner of plotting the simultaneous observations, for inspection, was adopted in my notice of the New England storm of Dec. 15th, 1839; but without the advantages of a successive exhibition at daily intervals, which the present case affords.*

If any inquirer, who is careful to apprehend rightly the several accounts relating to the wind's direction, and the true periods of the several successive changes there mentioned, shall conclude that any of the wind-arrows found on these Charts are without sufficient authority, he has only to cancel the same and rely on those others which he may deem to be more truly determinate; and it will easily be seen whether the proof of a general rotation of the storm-wind is at all invalidated by such omissions.

Vortical Inclination of the Storm-Wind.—By this is meant some degree of involution from a true circular course.† In the New England storm above referred to, this convergence of the surface winds appeared equal to an average of about six degrees from a circle. In the present case, such inclination seems more or less apparent in the arrows on the storm figures of the several charts; where the concentrical circles afford us means for a just comparison of the general course of wind which is approximately shown by the several observations. In some *quadrants* of the storm, as thus exhibited, the average inward convergence, at certain periods, may amount to two or more points of the compass. This may possibly be due in part, to the trending of the coast, and also more probably to the very prevalent habit of re-

* This Journal, vol. xlii, p. 117. Trans. Am. Phil. Soc., vol. viii, part i, p. 81.

† *Ante*, vol. i, Second Series, p. 14.

ferring nearly all northeasterly and northwesterly winds to the northeast and northwest points specifically.

Perhaps we may estimate the average of the vorticose convergence, as observed in the entire storm for three successive days, at from five to ten degrees,—out of the *ninety* degrees which would be requisite for a congeries of centripetal or center-blowing winds. This rough estimate of the degree of involution is founded only on a bird's eye view of the plotted observations. But however estimated, this involution seems to afford a measure of the air and vapor which finds its way to a higher elevation by means of the vortical movement in the body of the storm. It probably finds its limit at various and unequal distances from the general center of revolution, and at a very moderate elevation from the earth's surface; according to the existing conditions and activity of the storm. That it does not commonly extend over the entire area of central inactivity, which is found at the earth's surface, may be inferred from the general absence of rain, and sometimes even of clouds, in this axial area of the storm.

Observed Direction of the Storm-Scuds.—It may be of some importance to notice, that, so far as can be settled by my own observations of the storms of the United States, the directions of the *scuds* which fly in the most active portion of the gale, intermediately between the earth's surface and the great stratus cloud which overlies the gale, and below any regular cloud stratum, *have generally no inward inclination* in their course, as regards the gale's axis; but rather the contrary. By careful observations, these scuds are commonly found to fly from directions which are from half a point to one or two points *more to the right*, on the compass card, than the direction of the storm-wind at the earth's surface. The elevation of these floating scuds is also comparatively small; and in the rainy portions of the gale, appears chiefly comprised in a range from five hundred to twenty-five hundred feet above the surface.

These results are nearly alike common, whether the observer be placed on the axis path of the storm, or on the right or left side of this path; and are found in a large portion of the true storm-winds, from the north round by the east to the southwest. If there are some apparent exceptions, arising from irregularities in the attending or overlying winds, or from invisibility of scuds

and the presentation of other cloud-currents, it is believed they will not invalidate the general results of the observations.*

In the case before us, I can find no strict observations directed to this point, except my own; which, on the afternoon of the 6th, show the wind from N. N. E. and the storm-scud from N. E., being the not unusual difference.

Accelerated Rotation in the Body of the Storm.—We find in this case, as in other storms, a greatly accelerated velocity of rotation in the wind as we proceed from the exterior limits towards the axis of the gale, till we reach that interior portion where the destructive force of a hurricane was exhibited. This is in accordance with the universal law of vortical revolution, which seems no other than the law of *equal areas in equal times.*

Like the vortical involution, this acceleration finds its principal limit externally to the region of central inactivity in a storm; and, in some storms and localities, at a very great distance from the geographical center of revolution; the active portion of the

* From the observations found in my journal I select only the following. The several columns show, successively, the dates,—observed direction of the storm-wind at the surface,—the simultaneous direction of the storm-scuds,—and lastly, the mean range of the barometer in the storm, reckoned from its next previous and subsequent maximum.

Dates.	Winds.	Scuds.	Range, inches.	Dates.	Winds.	Scuds.	Range, inches.
1832, Nov. 19,	SSW.	SW.	0·80	1837, June 2,	S.	SW.	0·78
" 22,	NNE.	NNE. brisk,	0·53	" 7,	ENE.	E.	"
" 23,	WSW.	W.	"	" 18,	N.	NNE.	0·52
Dec. 15,	NE.	ENE.	0·29	1838, March 3,	NE.	ENE.	
1833, Jan. 13,	NE. by E.	ENE.	0·86	June 23,	SE.	SSE.	0·29
" "	NNE.	NE.	"	Sept. 6,	ENE.	E. by N.	
Feb. 7,	NW. by N.	NNW.	0·22	Oct. 19,	ESE.	SE.	0·67
" 13,	ENE.	E.	0·70	1839, Jan. 15,	NE. b E.	ENE.	
" 19,	SSW.	WSW.	0·57	June 3,	ESE.	SE.	
Oct. 12,	ESE.	SE.	0·90	" 4,	E. by N.	ESE.	
1835, March 22,	NNE.	NE.	1·02	" 18,	S.	SW.	0·20
May 15,	N.	NNE.	0·29	Aug. 30,	NNE.	NE.	0·35
1836, Jan. 10,	N.	NNE.	1·01	Nov. 5,	E.	ESE.	0·71
April 22,	NW.	NNW.	0·59	Dec. 4,	NNE.	NE. b E.	0·30
May 3,	SSW.	WSW.	0·58	" 16,	NNW.	N.	0·75
" 12,	SE.	SSE.	0·70	" 22,	ENE.	E.	1·01
" 30,	NE. by E.	ENE.		1840, April 23,	SSW.	SW.	0·40
June 2,	NE. by E.	E. by N.		May 9,	NE.	ENE.	0·32
" 4,	NE. by E.	ENE.		" 21,	NE.	ENE.	0·64
" 21,	NE.	ENE.	0·29	" 24,	ESE.	SE.	"
July 13,	NE.	ENE.	0·25	1841, May 30,	NE.	ENE.	
" 22,	N. & NNE.	NE.	0·54	June 23,	ESE.	SE.	0·24
Oct. 4,	NE.	ENE.	0·75	Aug. 29,	NE.	ENE.	
Nov. 20,	ESE.	SSE.	0·56	Oct. 4,	N. ½ W.	N. by E.	0·36
Dec. 21,	SSE.	S.	1·00	Nov. 19,	NE.	ENE.	0·34
1837, Jan. 21,	NE. by E.	NE.	1·25	1842, Feb. 3,	SSW.	SW.	0·89
Feb. 28,	NW.	NNW.	1·18	" 16,	SE. b S.	SSE.	1·43
March 13,	S.	SSW.	0·70	" 26,	ENE.	E.	
" 22,	NE. by E.	ENE.	0·40	May 20,	NE. b N.	ENE.	
April 26,	NNW.	N. by W.	0·37	Dec. 13,	NE. b E.	ENE.	0·16

storm having, in these cases, somewhat the form of an annular disk, of great internal diameter.

THE AXIAL REGION.—The lull or abatement of the wind's force in the center of the hurricane or gale, is a marked feature of this and other active storms. The superficial extent of this area of inactivity seems variable and uncertain. It is commonly found to be greatly extended as the storm advances into the higher latitudes; where, not unfrequently, it seems to become merged with a general remission in the force of the easterly winds which belong to the anterior portion of the gale; as may be seen in the more advanced stages of this storm, (reports 161 to 165,) and perhaps may be shown more fully hereafter.*

This axial lull and the shift of wind which immediately follows it, must be distinguished from sudden but more partial changes in the wind's direction at greater distances from the center, which may result from mere oscillatory movements in the advancing axis or from the concurrent force of adjacent winds, or other causes, and which may be communicated over large portions of the most active part of the gale. This unequable shifting or veering is strongly exemplified in the reports from the *Roscius* (133) and *Wakulla* (148), concurrently on different sides of the axis, at nearly the same time; as if the higher portion of the storm had measurably overrun the lower, in its progression, and suddenly taken its place at the surface. Some lesser degrees of this unequal veering, and sometimes of a fluctuating or oscillatory character, may be seen in other parts of the storm.†

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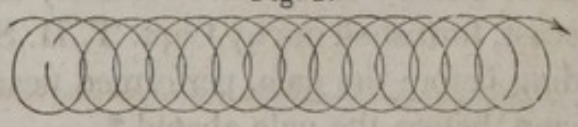
* It might be inquired how far the direct *momentum* of the violent and onward wind in the right hand side of the storm path may favor its partial or complete *oversliding* of the more sluggish atmosphere on the earth's surface, in passing to the front of the storm, in the higher latitudes; thus approximating more nearly to a true plane of rotation. If any possible weight can be allowed to this suggestion, which, to a limited extent, is accordant with an idea of the late Prof. LESLIE, it may perhaps serve in explaining the comparative inactivity of the easterly winds in this and other storms of the Atlantic, in the higher latitudes, particularly in the colder portions of the year, when, often the principal strength and duration of the gales are found mainly in the westerly winds of the posterior side of the storm, on a rising barometer; as is frequently experienced in navigating between Europe and the northern portions of America. But the slower easterly rotation of the earth in higher latitudes, in a constantly reducing ratio as the gale advances, appears to afford a better explanation of this somewhat common inequality of force in the anterior and posterior sides of the storm.

† Recital 160, and others.

Oscillations of the Axis of Rotation.—We may infer that the centrifugal force, within the body of the revolving storm, will seldom be equally balanced on all sides, by the exterior pressure which is indicated by the barometer, and that the impulsion which results from the temporary predominance of pressure on any side, will be propagated around the axis, causing the latter to move in a series of spiral revolutions, or curvilinear deviations, during its progression. This revolving oscillation may often be observed, even where there is no progression of the whirling body; as in the case of a vortex in water discharging into an orifice or through a funnel. This oscillation of local pressure and the eccentrical revolution of the axis, may go far, among other causes, in explaining the *flaws*, *puffs*, *gusts*, and *squalls*, as they are loosely and sometimes interchangeably called, which are so very common in violent storms; and, in the larger movements, may account for some of the irregular changes previously noticed.

Phenomena of Axial Oscillation.—The specific course of the actual center of gyration, under the oscillations referred to, must differ greatly in storms which have different rates of progression. It has been shown by Mr. Piddington and Mr. Thom that the progression of some storms of the Asiatic seas and Indian ocean, during some portions of their advance, has been as slow as *three miles and even two and a half miles per hour*. This remarkably slow progress, in connexion with the axial oscillation, must produce unusual conditions in places near the center of the storm, and may serve to account, in part at least, for the most extraordinary series of opposite and successive shifts, veerings, and calms, recorded by Mr. Lloyd as having occurred at Port Louis, Mauritius, in March, 1836, in a slow moving hurricane which lasted three days.* In this storm, the line pursued by the axis of gyration might have been somewhat like that seen in the following figure.

Fig. 1.



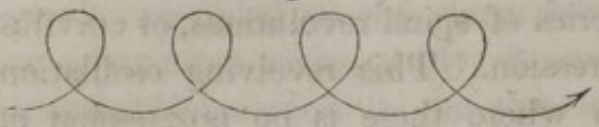
In this case, if we suppose the circuit of the axial oscillation to have been equal to the diameter of the lull, inclusive of the interior edge of the gale, this course of its axial point would produce, on or near its center path, a series of oscillating changes not unlike those observed by

* London Nautical Magazine, June, 1837.

Mr. Lloyd. It is proper to add, also, that Port Louis is situated near an abrupt ridge of mountains which might have greatly disturbed the regular course of the wind at that place.

With a higher rate of progression the center of gyration might move on a line or course more like the following:

Fig. 2.



But with a very rapid progression in the body of the storm, like the case before us, the revolving center or point of gyration might describe a line more nearly like one of the two following figures.

Fig. 3.

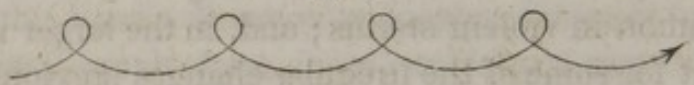
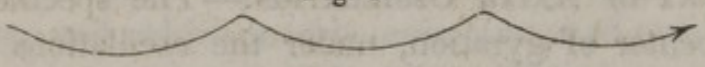


Fig. 4.



Such oscillations of the axis of a storm, however, cannot easily be detected, for want of sufficient and exact observations in the axis path, in those regions where the winds have free action. They may be best noticed in a storm of slow progress, like that of Mauritius, above mentioned, but may also be often evinced in other observations. In the case before us, we find cause to infer that some deviations existed in the axial course, without being able to determine these with precision.

Circuit Sailing in Storms.—In the rapid progression of the Cuba hurricane, no great portion of a circuit of revolution would be described by any vessel, in sailing before the wind. Nor is the ordinary progress of the Atlantic gales sufficiently slow to induce often such a result, under the courses ordinarily steered in these gales. But I have formerly shown a case on the American coast, furnished me by Capt. T. H. Sumner, where a ship, in scudding before the gale, performed nearly half the circuit of the horizon, before the gale abated.*

In the slow progression found in storms of the eastern seas, as already noticed, not only a complete circuit of revolution, but more

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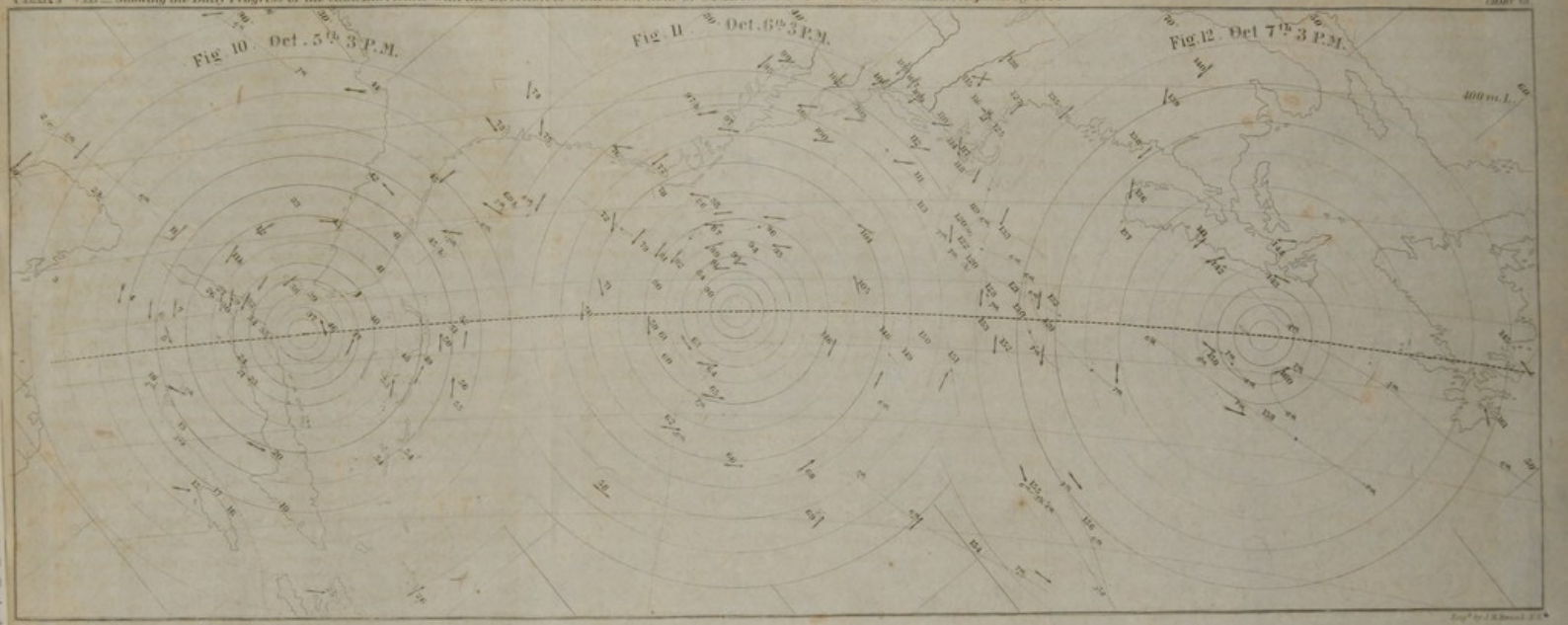
* Ship *Cabot*. See Journal of Franklin Institute, June, 1839, vol. xxiii, p. 370; with a diagram.

CHART VII. — *Showing the Daily Progress of the Cuba Hurricane with the Direction of Wind at the hour of 3 P.M. on the 5th 6th & 7th days of October, respectively 1844.*



The numbers show the places or vessels named in the margin.

Engd by J. H. Russell, N.Y.

than one circuit might sometimes be made in a gale by the same vessel, in sailing around the axis of the storm; thus adding another practical demonstration of its revolving character. One such case of complete circuit sailing I have referred to, in 1836.* Mr. THOM, in his account of the Rodriguez storm of April, 1843, has shown that the *Robin Gray* run once and a half times around the axis of the storm, from left to right, ↻, (this being in the *southern* hemisphere,) till, being thrown on her beam ends, she was prevented from continuing her circuits. In the same storm the *Argo* made part of her second circuit, scudding round in the gale in the same direction. In like manner the *Margaret* made a circuit and a quarter around the axis, chiefly in the heart of the gale. Several vessels, after once falling out of this hurricane, pursued their course, again overtook it and plunged into the heart of the storm, where they suffered most serious disasters.† It appears probable, and indeed certain, that nearly all of the great loss and damage sustained in this hurricane might well have been avoided, by a knowledge of the laws of rotation and progression in these storms.

But the most striking case of circular sailing in a storm is that of the *Charles Heddle* in a hurricane near Mauritius, in February, 1845, which has been furnished me by Mr. PIDDINGTON. This was a clipper built vessel, once a slaver, and was bound from Mauritius to Muscat. It appears from the log, that in her course, round and round in the gale, the wind veered five complete revolutions in one hundred and seventeen hours, with an average run of eleven and seven-tenth knots per hour, the whole distance thus sailed being thirteen hundred and seventy-three miles; while the progression of the hurricane, at this period, *was less than four miles an hour.* The average distance from the gale's axis is estimated at about forty-five miles. During this time, the vessel made good a course S. W. $\frac{3}{4}$ W., three hundred and fifty-four miles, only; nearly on the usual course pursued by the hurricanes, near Mauritius.‡

These are results obtained by Mr. PIDDINGTON, who has already published his Twelfth Memoir, and who informs me that

* Lond. Nautical Magazine, April, 1836, p. 205. Am. Journal, vol. xxxi, p. 122.

† Nature and Course of Storms in the Indian Ocean; with Diagrams. Lond. 1845.

‡ These highly interesting cases of circuit sailing in storms give proofs of their revolving character not unlike those which are afforded of the earth's rotundity by voyages of circumnavigation: and, like the latter, may be received by some who perhaps may not be able to appreciate the evidence, equally conclusive, from other sources.

he is preparing another on this hurricane of the *Charles Heddle.* In his Eleventh Memoir, he has given an account of two storms, which were nearly contiguous, but on opposite sides of the equator, and revolving in counter directions, ↻ ↺, each according to the law of rotation and progression of its own polar hemisphere.*

Vertical Height of the Storm Wind.—What is the general height or thickness of the storm, and by what means can this be approximately determined? These questions and their solution are doubtless of some importance in their bearing on meteorological theories, and seem to deserve our attention.

In nearly all great storms which are accompanied with rain, there appear two distinct classes of clouds, one of which, comprising the storm-scuds in the active portion of the gale, has already been noticed. Above this, is an extended stratum of stratus cloud, which is found moving with the general or local current of the lower atmosphere which overlies the storm. It covers not only the area of rain but often extends greatly beyond this limit, over a part of the dry portion of the storm, partly in a broken or detached state. This stratus cloud is often concealed from view by the nimbus and scud clouds, in the rainy portion of the storm, but, by careful observations, may be sufficiently noticed to determine the general uniformity of its specific course, and, approximately, its general elevation.

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* Prof. Dove, in his paper on barometric minima, alledged that storms in general are whirlwinds,—that the turning or rotation of storms in the southern hemisphere is in the opposite direction to those in the northern; and he adduced certain European storms as turning from S. W. to W. and N. W., and says that most of the hurricanes compared by him, in the southern hemisphere, are in the opposite direction, that is S. W., S. E.; but probably different in different longitudes. (Pogg. Ann. 1828, pp. 597, 598.)—Both these directions, however, are seen to be contrary to the true rotative direction in the storms thus refered to; and I am at a loss to know if he did not then consider the opposite veering of the winds, on opposite sides of the barometric minima, to be evidence of two opposite and distinct rotations.

The opposite rotation and polar progression in the storms of the two opposite hemispheres, had early appeared to me as a probable if not necessary result, and was soon confirmed by the evidence of numerous facts, of an isolated but uniformly consistent character. This point was summarily alluded to in this Journal for October, 1833, vol. xxv, pages 121 and 128. In the last named instance, the complete inversion of the storm-winds, as exhibited on the center-path of the storms in southern Australia, was referred to as conclusive evidence.

Col. Reid, in his work, published in 1838, has given the results of his inquiries on the rotation and progression of the hurricanes of the South Indian ocean, which afford ample proofs of the opposite polar relations in the storms of the two hemispheres.

The more usual course of this extended cloud stratum, in the United States, is from some point in the horizon between S. S. W. and W. S. W. Its course and velocity do not appear influenced, in any perceptible degree, by the activity or direction of the storm-wind which prevails beneath it. On the posterior or dry side of the gale, it often disappears, before the arrival of the newly condensed cumuli and cumulo-stratus which not unfrequently float in the colder winds, on this side of the gale.

It appears, therefore, that the proper storm-wind revolves entirely below the great stratus cloud which covers so large a portion of the storm; and we may infer, also, that the production of the accompanying rain and the depressing effect of the storm's rotation on the barometer, are chiefly confined within the same vertical limit. In regard to rain, this result is in accordance with observations on the quantity which falls at different elevations above the earth's surface; and in the case of the barometer, a like accordance is shown in the diminished range of the mercury in storms which is found in ascending from the ocean level.

The general height of the great stratus cloud which covers a storm, in those parts of the United States which are near the Atlantic, cannot differ greatly from one mile; and perhaps is oftener below than above this elevation. This estimate, which is founded on much observation and comparison, appears to comprise, at the least, the limit or thickness of the proper storm-wind, which constitutes the revolving gale.*

It is not supposed, however, that this disk-like stratum of revolving wind is of equal height or thickness throughout its extent, nor that it always reaches near to the main canopy of stratus cloud. It is probably higher in the more central portions of the gale than near its borders, in the low latitudes than in the higher; and may thin out entirely at the extremes, except in those di-

* See Amer. Journal, vol. xxx i, p. 127—128. If a disk be cut from the thin paper of Chart IV, of a size which will represent one thousand miles in diameter, it will be found to have a thickness which represents more than a vertical mile, by the scale of the chart. A disk of the same size, but on a scale representing a storm of but 400 miles diameter, if cut from the paper of this Journal, will also represent more than a mile of vertical thickness, in the storm. These and other analogous considerations, deserve the attention of those who may think that winds are mainly induced and supported by movements or influences of a vertical character or tendency. It might be useful for those holding such views, to attempt to draw out the supposed paths of vertical induction and geographical progression in the winds, on an accurate and uniform linear and vertical scale, for the purpose of attaining a more precise standard for estimating the supposed vertical action or influence.

rections where it coincides with an ordinary current. Moreover, in large portions of its area there may be, and often is, more than one storm-wind overlying another and severally pertaining to contiguous storms. In the present case, we see from the observations of Prof. SNELL and Mr. HERRICK, at Amherst, Mass. and at Hamden, Me., (115 and 135 *b*) that the true storm-wind, at those places, was super-imposed on another wind; and various facts and observations may be adduced to show that brisk winds, of great horizontal extent, are often limited, vertically, to a very thin sheet or stratum.

LOCAL TORNADO IN THE CUBA HURRICANE.—The accounts from Matanzas mention a destructive phenomenon of this kind as having taken place at Yabu, (in the central part of Cuba, lat. 22°, lon. 79° 34′, on the right of the axis line,) during the hurricane. It is described as "a tremendous water spout which passed through the place, doing much damage," and confined to a narrow path. "The effects were the same as if a violent river had run through the town, leaving a kind of channel." This case has since been mentioned, erroneously, as having occurred in Mexico.

The appearance of violent tornado-vortices within the body of a great storm is not new nor very unfrequent. A remarkably destructive case occurred at Charleston, S. C., on the 10th of Sept., 1811, during a great storm which visited our coast. It caused the loss of a great amount of property and about twenty lives. Its track was about one hundred yards wide; and it followed the course of the local storm-wind, from southeast to northwest, transversely to the progression of the great storm. Two very violent tornadoes appeared in New Jersey, in a general storm, on the 19th of June, 1835, moving in different but nearly parallel paths, at an interval of several hours. These pursued the course of the higher general current which then overlaid the great storm.* Several other tornadoes, together with numerous gusts and severe thunder squalls appeared on the same day, in different places, within the compass of the same general storm. Another tornado occurred on the 13th of August, 1840, at Woodbridge, near New Haven, Ct., during a general storm, following the local direction of the storm-wind, from S. S. E. to N. N. W.; transversely to the course pursued by the larger storm.

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* One of these was the New Brunswick tornado, described in the American Journal, vol. xli, pp. 69—79. See also foot note, vol. xliii, p. 276.

These with other cases which might be adduced, may serve to show that the small tornadoes which sometimes occur in great storms have no essential or inherent connexion with the vortex of the larger storm, even in those cases in which the courses of progression may chance to coincide.*

We have further to notice the barometrical phenomena of the two Cuba storms, their geographical relations to contiguous winds and currents of the lower atmosphere, and some of the practical bearings of the subject upon the interests of commerce and navigation.

Phenomena of the Cuba Hurricane and Cotemporary Storms.

Effect of the Gale's Rotation on the Barometer.—The extraordinary fall of the mercury in the barometer which takes place in gales or tempests, has attracted attention since the earliest use of this instrument by meteorologists. But I am not aware that the principal cause of this depression had ever been pointed out, previously to my first publication in this Journal, in April, 1831; when I took the occasion to notice this result as being obviously due to the *centrifugal force* of the revolving motion found in the body of the storm.*

Since that period, inquiries have been continued by meteorologists in regard to the periodical and other fluctuations of the barometer, and the relations of these fluctuations to temperature and aqueous vapor.† But these incidental causes of variation in the atmospheric pressure prove to be of minor influence, and we are left to the sufficient and only satisfactory solution of this marked phenomenon which is found in the centrifugal force of rotation.

In the Cuba Hurricane, the fall of the barometer may now be viewed in its obvious relations to the known rotation of the gale. In the previous Tables, I, II, and III, the reader may have noticed the depressing effects of the centrifugal force at different dis-

* In like manner, common thunder storms are often known to appear in or above the local portions of a great storm. An examination of this class of storms will show that the narrow tornadoes and thunder storms often extend to a greater height than the great gales or hurricanes.

† American Journal of Science and Arts, xx, 45–46.

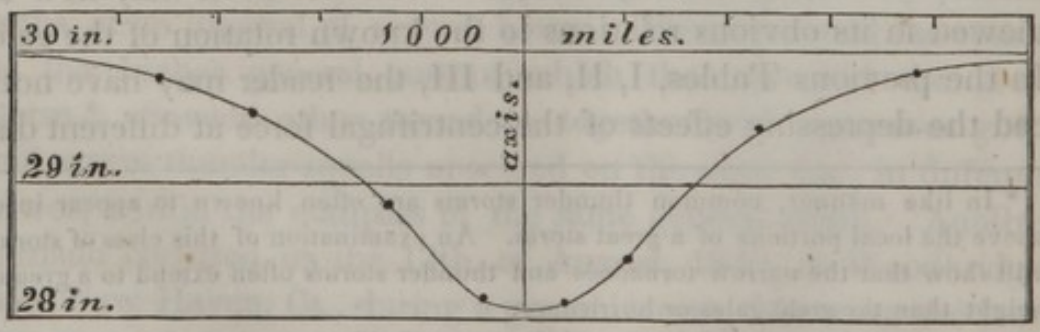
‡ It is apparent that hygrometrical observations made at the earth's surface cannot show the relative condition of the higher strata of air, which move, as currents, in different directions, with a rapid progression, and have different geographical and hygrometrical relations. Nor can observations at mountain stations resolve the difficulty; for these must commonly have relation to the inferior stratum of air which has ascended the mountain slope.

tances from the storm's axis and in the various stages of its activity and progression. These tables enable us to determine, approximately, *the mean of the barometric curve, through the central portion of the storm, transversely to its path*, as shown by the lowest observations obtained during its progress, which may be grouped as follows:

On the left side of the storm path, the lowest observations found in recitals 45*a*, 75, 97, 106, 109, 114, 126 and 135, at points varying from 305 to 400 miles from the axis line and at an average distance of 349 miles, afford us a mean of 29·76 inches. At most of these points, as at others, the true minimum doubtless occurred between the times of observation, but only in 45*a* is a subtraction of ·12 in. made on this account. Recital 118, at a distance of 260 miles, shows 29·50 in., probably within an hour of the true minimum. Recitals 4, 6, 11*b*, 38, 81, 124, 133, 141, 142 and 144, in positions from 69 to 168 miles from the axis and at an average distance of 126 miles, show an average minimum of 28·84 inches. On the *center path*, as per Chart, the average minimum, as per recitals 34, 51, 148, 129 and 130, is 28·13 inches. On the right hand side of the path, recitals 19 and 64, at a mean of 98 miles from the axis, show an average minimum of 28·45 inches. The *Pioneer* (62) at 230 miles gives 29·45 inches:—and at Bermuda, at 375 miles, being a station where the barometer shows an annual mean of at least 30·16 in., our lowest observation is 29·86 inches. These several elements afford us the approximate curve which is here annexed.

Fig. 5.

Mean Barometric Curve across the centre of the Cuba Hurricane, transversely to its path, Oct. 4th to 7th, 1844.—Vertical scale, one half.



It is worthy of remark that the barometric depression in this gale does not appear to increase according to the increase of latitude; showing that the proper effects of the centrifugal force of rotation are constantly found on the *center path* of the storm, in all latitudes.

The mean barometric curve on the center path, in the direction of the storm's progression, appears not to differ essentially from that given above, so far as may be inferred from the various observations, except that on the posterior side of the storm the return of pressure, at some places, was apparently more rapid than its previous reduction. The contrary of this effect is sometimes seen in other storms.*

Thus, during successive days of the storm's greatest activity, and while passing through twenty-five degrees of latitude and near twenty-three degrees of longitude, we find an extraordinary barometric depression, the intensity of which increases rapidly as we approach towards the axial area of this great progressive whirlwind, coinciding, also, most remarkably, with the progress and intensity of the whirling action. We find, too, that the greatest intensity of the hurricane, and of its influence on the barometer, has no necessary connexion, or coincidence, with the local point of greatest rain or condensation; as clearly appears from recitals 38, 148, and other reports. Nor can any such coincidence at all lessen or contravene the known centrifugal force of rotation. To deny the proper influence of this force in rotatory storms, would appear equivalent to a denial of the great law of matter and motion to which the term is applied.

The same law of centrifugal action must tend to produce an accumulation of pressure beyond the verge of the active whirlwind, or at least in the areas or spaces which separate distant storms; a result which we have already viewed, in another connexion, in the two October storms of 1842 and 1837. In the present case, the barometric curve, in front of the hurricane as well as laterally, is found to blend with the more advanced and extended depression of the first Cuba gale;† and if we view the two centers of depression as comprised in one great area of gyrative influence, the accumulated exterior pressure, or summit of the barometric wave, will appear to be strongly exhibited, over a vast extent of surface, previous to the arrival of the storm. This is apparent from the various recitals previously given, and is shown more extensively by the barometric observations comprised in Table IV, which is annexed.

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* It may be noticed that the barometric depression in this gale does not appear to increase according to the increase of latitude; showing, that the proper effects of the centrifugal force of rotation are truly shown in the center path of the storm, in all latitudes.

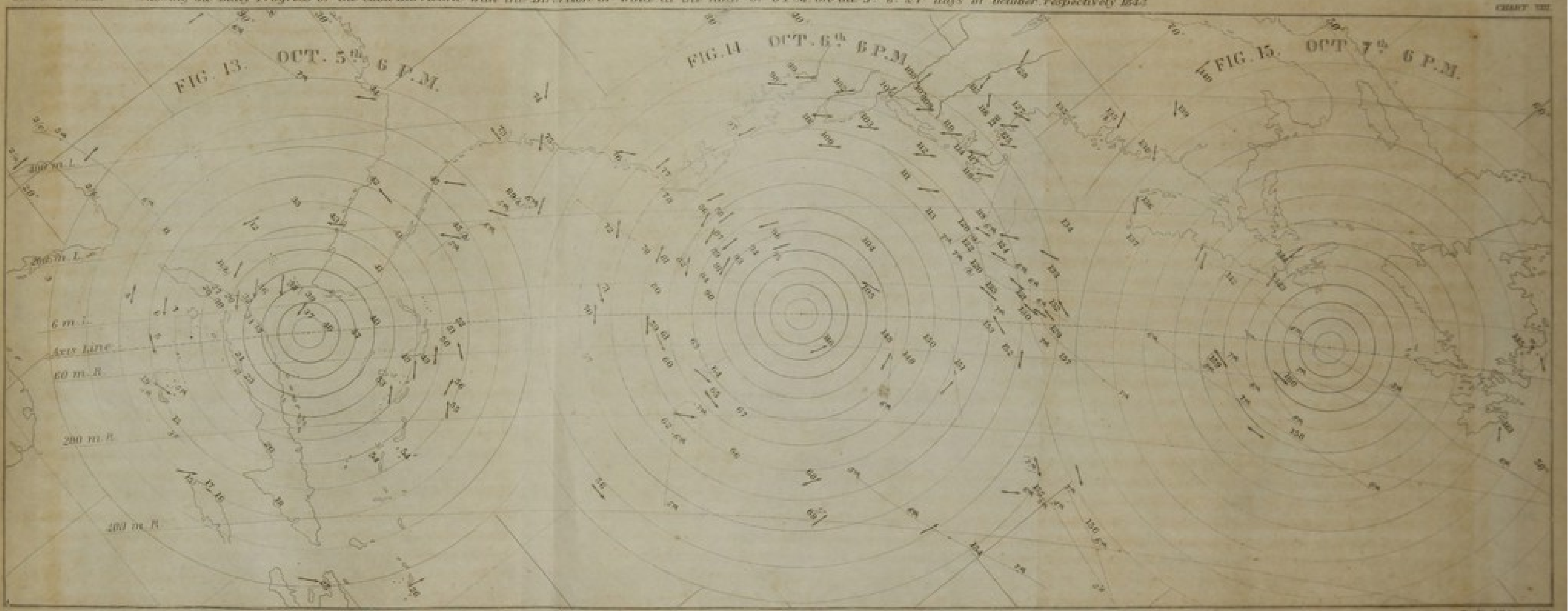
† See Plate XI, figs. 21 and 22.

TABLE IV.—Height of the Barometer (corrected for elevation) at the hours of 9 A. M. and 9 P. M., or other nearest hours of observation, for seven days in October, 1844; together with the highest and lowest observations made in this period.—In the daily columns, only the excess of 28 inches is noted, 2 inches being thus the equivalent of 30 inches of the barometric scale.

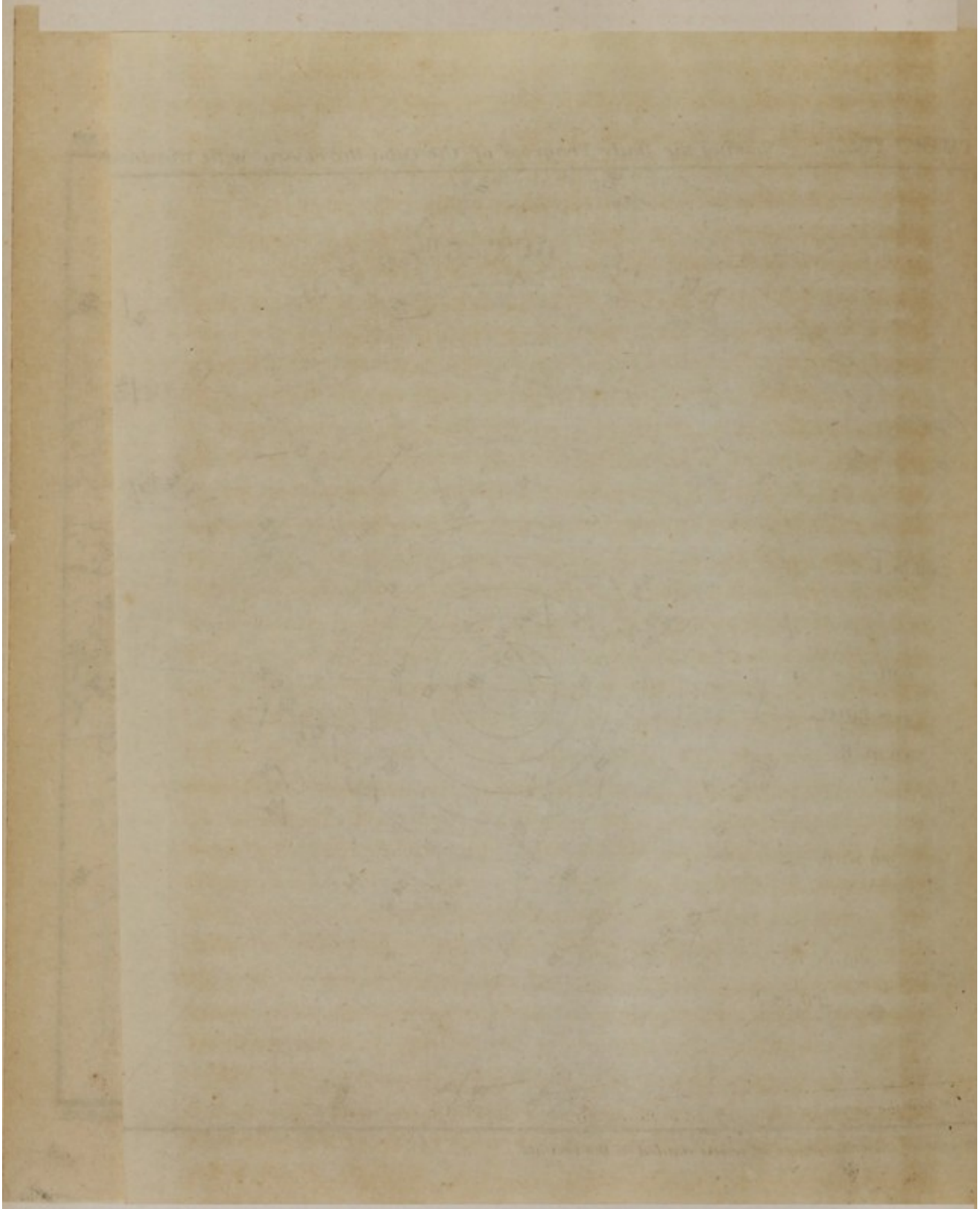
Places, numbered for order of progression.	Dist.fr. axis l.	Lat.	Lon.	Feet ab.tide	Oct. 1st.		Oct. 2d.		Oct. 3d.		Oct. 4th.		Oct. 5th.		Oct. 6th.		Oct. 7th.		Lowest obs.		Rain.	Inches.
					A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	1st g.	2d g.		
Fort Snelling (15)	1350	44° 53′	93° 08′	350 ft.	2·18	2·12	2·12	2·07	2·05	2·05	2·10	2·03	2·	2·05	2·16	2·16	2·21	2·05	29·98	30·03	None	
Fort Crawford (14)	1200	43 3	90 53	642	2·28	2·29	2·20	2·14	2·07	2·04	2·03	2·06	2·08	2·06	2·16	2·16	2·23	2·23	30·04	30·06	None	
Fort Gibson (10)	1160	35 47	95 10	600 ?	2·30	2·27	2·30	2·23	2·28	2·17	2·13	2·06	2·07	2·03	2·04	2·05	2·22	2·22	30·05	30·03	None	
Fort Towson (9)	1090	33 33	95 05	600 ?	2·19	2·20	2·22	2·15	2·18	2·04	2·05	1·95	1·96	1·89	1·93	1·86	2·06	2·10	29·92	29·80	None	
Fort Brady (20)	1040	46 39	84 43	600	2·37	2·39	2·01	1·78	1·62	1.74	1·93	1·95	1·91	2·	2·20	2·16	2·19	2·06	29·61	30·16	2–3d,	·46 in.
Jeff. Barracks (13)	990	38 28	80 08	390	2·38	2·26	2·29	2·16	2·12	2·01	2·05	2·01	2·06	1·93	2·06	2.12	2·28	2·23	29·96	30·03	None	
Fort Jessup (7)	885	31 30	93 47	270 ?	2·17	2·22	2·15	2·12	2·17	2·14	2·21	2·14	2·14	2·11	2·15	2·15	2·12	2·11	30·13	30·13	None	
Natchez (8)	850	31 34	91 25	270	2·34	2·25	2·27	2·25	2·18	2·08	2·06	1·99	2·	1·98	1·94	1·93	2·16	2·20	29·99	29·89	None	
Detroit (17)	800	42 24	82 28	580	2·32	2·31	2·23	2·03	1·89	1·83	1·95	1·93	1·99	2·04	2·10	2·12	2·12	2·15	29·83	30·12	2–4th,	·15
N. Orleans Bar. (6)	730	29 57	90 05		2·32	2·31	2·29	2·26	2·16	2·13	2·05	2·03	2·08	2·04	2·10	2·02	2·32	2·26	30·03	30·01	None	
Toronto Obs. (21)	700	43 39	79 21	342	2·46	2·36	2·22	1·91	1·75	1·70	1·69	1·67	1·79	1·87	2·05	2·03	2·11	2·10	29·66	30·03	2–3d, rain	
Buffalo (19)	660	42 53	78 56	620	2·27	2·43	2·36	2·13	2.92	1·79	1·84	1·76	1·86	1.95	2·08	2·10	2·14	2·10	29·76	30·10	2–4th,	·46
Rochester (22)	635	43 08	77 51	506	2·34	2·37	2·36	2·26	2·13	1·96	1·76	1·62	1·75	1·88	1·92	1·79	1 90	2·11	29·62	29 79	2–5th,	·76
Fort Barrancas (5)	620	30 18	87 12		2·20	2·17	2 19	2·23	2·16	2·07	2·07	2·01	2·02	2.07	1·99	2 03	2·08	2·08	30·03	29·96	nt. 6th,	·30
Sackett's Harbor (24)	580	43 57	76 04	240	2·43	2·37	2·33	2·13	2·03	1·89	1·79	1·60	1·68	1·94	2·11	2·11	2·10	2·13	29·60	30·10	3–5th,	·85
Plattsburgh Bar. (31)	520	44 41	73 26	240 ?	2·39	2·35	2.42	2·39	2·03	1·91	1·77	1·78	1·60	1·73	2·01	2·03	2·19	2·19	29·60	30·09	3–5th,	1·18
Carlisle Bar. (18)	490	40 12	77 10	473	2·45	2·50	2·41	2·29	2·11	1·94	1·84	1·78	1·78	2·01	2·13	2·05	2·05	2·16	29·76	30 05	3d,	1·55
Augusta Ars (12)	470	33 27	81 35	370	2·23	2·23	2·25	2·20	2·15	2·10	2·04	1·90	1·92	1·98	1·90	1·92	1·94	2·15	29·90	29·90	None	
Hanover, N. H. (30)	460	43 41	72 22	360	2·40	2 50	2·48	2·28	2·16	2·	1·80	1·51	1·60	1.84	1·98	1·96	1·99	2·11	29·51	29 85	3–4th,	2·85
H. M. S. *Pique*,* (35)	415*	49 35	64 30						2·24	2·19	2·18	2·02	1·36	1·19	1·40	1·90	1·50	1·19	29·16	29·19	5th, *r.*; 7th, *r.*	
Amherst, Mss. (27)	410	42 22	72 28	290	2·44	2·42	2·47	2·35	2·22	2·10	1·82	1·69	1·64	1·83	2·02	2·02	1·99	2·10	29·62	29·92	3–4th,	1·98
New York (23)	400	40 43	74 01		2·53	2·48	2·49	2·34	2·17	1·94	1·73	1·69	1·82	1·89	2·06	1·84	2·05	2·18	29·66	29·84	4th, slight *r.*	
Worcester (28)	375	42 16	71 47	376			2·40	2·28	2·03	1·99	1 70	1·47	1·53	2·07	1·89	1·84	1·73	1·94	29·35	29·61	3–4th, 2·49; 7th, ·21	
Hamden, Me. (32)	365	14 42	68 56	180			2·49	2·60	2·43	2·30	2 03	1·50	1·49	1·68	2·03	2·04	1 85	2·14	29·47	29·85	4th, ·95; 7th, ·54	
Boston (29)	345	42 20	71 05		2·30	2·33	2·40	2·31	2·20	1·96	1·90	1·48	1·55	1·79	1·92	1·79	1·83	2·03	29·47	29·79	4th, 1·34; 7th, ·74	
Fort Monroe (16)	345	37 02	76 12		2·61	2·55	2·53	2·55	2·22	1·99	1·87	1·81	2·06	2·07	2·	1·86	2·16	2 28	29·81	29·82	None (?)	
Charleston, S. C. (11)	335	32 46	79 46		2·35	2·40	2·35	2·25	2·11	2·	1 90	1·85	1·95	2·	1·80	1·95	2·10	2·20	29·85	29·80	None	
Fort Adams, R. I. (25)	325	41 28	71 23		2·41	2·44	2·47	2·39	2·21	2·	1·68	1·60	1·64	1·84	1·98	1·79	1·88	2·	29·60	29·77	4th, 2·1; 7th, 1·	
Fort Brooke, Fl. (3)	305	27 57	82 35		2·61	2 61	2·16	2·16	2·07	2·03	1·94	1·95	1·89	1·79	1·86	1·94	2 07	2·	29.93	29·79	2d,	·10
St. Augustine (4)	305	29 40	81 35		2·18	2·22	2·18	2·18	2·16	2·	1·92	1·86	1·91	1·83	1·85	2·10	2·13	2·10	29·86	29·75	5th, rain	
Nantucket (26)	260	41 15	70 06		2·30	2·30	2·29	2·27	2·15	2·	1·55	1·50	1·56	1·53	1·85	1·85	1·70	1·85	29 50	29·50	4th, shs.; 6–7th, 1·50	
Halifax (flag sh.) (33)	168	44 36	63 28							2·19	2·09	1·92	1·54	1·55	1 73	1·80	1·50–	1·59	29·48	29·23	4–5th, *r.*; 7th, *r.*	
H. M. S. *Scylla* (34)	132	14 21	63 ?				3·20		2.40		2·20		1·30		1 75		0.90		29·30–	28·90	4th, *r.*; 7th, *r.*	
Key West (2)	120	24 27	81 50		2·13	2·08	2·04	2·	1·97	1·93	1·87	1·82	1·54	1·59	1·98	2·16	2·18	2·22	29·93	29 13	2–5th,	13 50 !
Matanzas (1)	50	23 03	81 15		1·60				1·		1·		0·		1·80				29· in.	28· in.	4–5th, heavy *r.*	

* The *Pique's* position in the *second* gale was about 130 miles left of the axis line, in lon. 61° 18′.

CHART VIII. *Showing the Daily Progress of the Cuba Hurricane with the Direction of Wind at the hour of 6 P.M. on the 5th 6th & 7th days of October, respectively 1844.*



The numbers show the places or vessels named in the recitals.



This table is taken from a fuller one, so as to suit the dimensions of the printed page; and the field of observation will be seen to comprise a breadth of thirteen hundred and fifty miles on the left side of the axis path of the hurricane. An approximate correction has been made for the known or supposed elevation of the stations in the interior, at the assumed rate of one tenth of an inch of mercury for ninety feet. The places stand in the order of distance from the axis line, beginning with the most remote; and the order of succession in the storm's course, parallel to this line, is indicated by the numbers affixed in the first column. As there is room for but two daily observations, those of the military posts are given for 9 A. M. and 9 P. M., as dividing the time into equal periods, and in other reports the times nearest to these hours are taken. The Toronto observations, only, are reduced for temperature to 32° Fahr.

The observations made at Bermuda, Newfoundland, and on board the *Trent*, (2*c*) at Vera Cruz, and the *Prince Albert*, (164) in lon. 38° 30′, (the latter being six hundred and fifty miles to the right of the axis line,) should also be included with those in the table.* Our barometrical survey is thus extended to two thousand miles, laterally to the path of the hurricane, and over more than thirty degrees of latitude, and fifty-six degrees of longitude.

During the progress of the two associated Cuba storms they are seen to have been immediately preceded, over this vast field, by a barometric wave or accumulation of pressure, rising above the usual or annual mean. An approach to this condition is seen

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* The observations at St. John's, Newfoundland, are entitled to an additive correction of 16 in. for 140 feet of elevation. The elevation of the barometer at Bermuda is not known; but another barometer, observed by an officer at the naval station, ranged from 30·46, on the 1st of October, to 30·07 on the 4th. Winds S. S. E. veering to W. S. W. on the 4th and 5th; and S. S. E. veering to W. on the 6th aud 7th.

The importance of establishing a station for meteorological observations at Bermuda, like those which have been instituted by the liberal enterprise of the British government at various other points, appears enhanced by the favorable character of this position, in the open sea, free from all continental and important local influences, and so nearly on the line of equal division between the polar and equatorial areas of the earth's surface. Perhaps the great height of the barometer at Bermuda, and the characteristics of the winds at that place, when these are accurately determined, may afford some additional knowledge of the laws of atmospheric circulation and distribution.

also on the left flank of the two storms, and in the rear of the hurricane. But the decided inequality which thus appears in the wave of maximum pressure in front of these storms as compared with their left border, together with the early disappearance of any excess on this border, in the Atlantic states, after crossing the thirty-first parallel of latitude, will be understood better when we take into view *another storm* which this extended inquiry brings to our notice. I will only remark here, that the areas or waves of cumulated pressure which are thus found between distant storms, as well as the gyrative character of the storms and their extensive barometrical depressions, appear entitled to special consideration in estimating, relatively, the mean barometrical conditions of different zones of the same polar hemisphere.

Cotemporary Storm of the Great Lakes.—The inspection of Table IV and other observations leads me to notice another storm, as above mentioned, the central portions of which passed over the basin of the great American lakes, and the St. Lawrence, cotemporaneously with the progress of the first Cuba gale. The first decided barometric indication of this storm, we obtain at Fort Brady, at the outlet of Lake Superior, on the 2d of October; from whence, advancing at the rate of about twenty-two miles an hour, we find its influence extending over the northern parts of the United States, Canada, and Nova Scotia, crossing the Gulf of St. Lawrence, and coinciding in part, with the phenomena of the first Cuba storm.* Its action, though widely extended, appears at first to have been moderate; and it was accompanied with light rain, which extended over Michigan and a part of Ohio, Pennsylvania, New York, and a large portion of the New England states. As the storm advanced in its course, its activity appears to have increased, and its barometric curve, blended with that of the first Cuba storm, becomes deeper, and, after a partial rising, is found to merge in the marked depression which attended the Cuba hurricane.

We may suppose that these different storms continued to pursue their several distinct courses, each crossing obliquely the path of another. Perhaps, too, the progress of this storm from the lakes might avail us in explaining more perfectly the origin of

* The effects of this storm on the southern borders of Lake Michigan were noticed in the newspapers of that period.

the group of storms which appeared on the European coasts about the 10th of October.

Local Curves of Pressure during the Progress of the several Storms.—The barometric observations at various points on or contiguous to the track of the Cuba hurricane from the 1st to the 7th or 8th of October, in the order of distance from its center-path, are delineated on Plate XI, fig. 21. This order of axial distance cannot be combined with that of the storm's progression, but the latter order is indicated by the numbers annexed to the several places of observation. The rising of the barometer, after its depression in the first Cuba storm and that of the lakes, is here seen to have been interrupted or prevented by the depressive effect of the hurricane which followed. In the first storm the fall of the barometer is seen to increase, northward of the Carolinas, in approximating with the route and the wide spreading influence of the storm from the basin of the great lakes, so that from New York to the mouth of the St. Lawrence the barometric depression was greater than was subsequently found in the left margin of the succeeding hurricane. In fig. 22, Plate XI, the same barometric curves are all adjusted to one point of advance in the Cuba hurricane, for the purpose of facilitating the comparisons. The several distances from the axis line are noted in the right hand column.

The importance of these extended observations, as affording some explanation of the causes and character of the irregular barometric undulations which occur in temperate latitudes, induces me to exhibit, in fig. 23, Plate XI, a delineation of the local curves in the track of the *third* or Lake storm; showing, as we approach the seaboard, the united barometrical effects of at least two storms as they are found converging in their course. The distances of the several places of observation from Halifax are noted on the Plate, beginning at Lake Superior. The route of this Lake storm appears to have been nearly parallel to that of the storm of Nov. 11th, 1835; which is found on Chart I, marked XI.

Thus it appears that two different storms may at one period in the course of their progression, be found moving in the same geographical area, even when their several places of origin have been greatly distant from each other. Their convergence in such cases, may result from different courses of progression, as well as

from the convergence of the lines of longitude at increased distances from the equator, and may be aided in some degree by the greater horizontal expansion or diffusion of the several storms which is often found to take place in the higher latitudes.

Distribution of Temperature during the Storms.—Though unable to detect any controlling or characteristic influence of temperature in the development or progression of great storms, other than is involved in the induced or the incidental phenomena of these storms, I present here a summary view of the thermometric observations made in the extensive region under review, during the observed progress of the two Cuba storms. So many of the observations obtained as can be comprised on a single page are shown in Table V, which follows:—(See next page.)

In presenting the observations from the military posts, in this table, I have taken those of sunrise and 3 p. m. because they are accompanied by observations of the wet bulb thermometer; although the observations made at 9 a. m. and 9 p. m. might afford better indications of the thermometric effects induced by, or attending, the storm. The observations from other places, when taken at 6 a. m. are deemed as nearly equivalent to those for sunrise at the beginning of October, and those for 2 p. m. or 2·30 as being sufficiently accordant with those made at 3 p. m. The observations made at other hours are so specified in the first columns of the table.

Temperature of Winter Storms.—If there be any appreciable results shown in Table V, they are perhaps found in a slight reduction of the local temperature in the areas of the two Cuba storms, while south of Cape Hatteras, and an increase of the local temperature when in the higher latitudes, as also in the storm from the lake basin. In colder months, and particularly in the winter season, a marked increase of temperature in the heart of the storm is commonly observed in the United States and Canada. This increase appears to result, mainly, from the geographical distribution of temperature in the different seasons and from the revolving and progressive character of the several storms. For it will readily be seen, that on the approach of a great storm from the lower latitudes by the usual routes, while revolving from right to left, ↻, its first effect will be to bring in the warm and humid air of a more southern region; and when the axis of the gale has passed, the contrary result necessarily follows and is in-

TABLE V.—Showing the state of the Thermometer at 6 A. M., (or at sunrise,) and at 3 P. M., with the daily mean, from the 1st to the 8th of October, inclusive, 1844; with some observations at other hours, as indicated in the body of the table.

Places.	Oct. 1st.					Oct. 2d.					Oct. 3d.					Oct. 4th.					Oct 5th.					Oct. 6th.					Oct. 7th.				
	Sun r.	3 P.M.	Daily mean.	Wet bulb.		Sun r.	3 P.M.	Daily mean.	Wet bulb.		Sun r.	3 P.M	Daily mean.	Wet bulb.		Sun r.	3 P.M.	Daily mean.	Wet bulb.		Sun r.	3 P.M.	Daily mean.	Wet bulb.		Sun r.	3 P.M.	Daily mean.	Wet bulb.		Sun r.	3 P.M.	Daily mean.	Wet bulb.	
	°	°	°	°		°	°	°	°		°	°	°	°		°	°	°	°		°	°	°	°		°	°	°	°		°	°	°	°	
Fort Snelling	44	63	56	43	57	48	64	56	48	50	44	59	51·5	41	50	34	58	46	34	50	39	57	48	39	57	36	62	49	36	52	37	67	52	37	55
Fort Crawford	45	70	57·2	42	57	56	59	62	53	60	47	60	53·2	44	59	43	62	52·2	41	57	42	60	51	40	57	41	58	49·2	40	55	39	64	51·2	40	55
Fort Gibson	54	77	65·1	50	67	64	82	73·1	60	70	53	79	66·5	50	65	49	85	67·2	46	74	57	81	69·2	55	71	47	76	61·5	44	63	58	74	66·2	51	66
Fort Towson	51	75	63	45	46	61	77	64	59	68	56	82	69	55	67	45	83	64	42	44	48	88	68	42	50	50	83	66·5	44	50	55	71	63	48	42
Fort Brady	34	59	46·5	34	55	50	57	53·5	50	55	44	52	48	44	51	46	51	48·5	45	49	45	48	46·5	44	45	34	50	42	34	46	30	55	42·5	30	50
Jeff. Barracks	54	64	59	50	54	61	72	66·5	55	63	55	70	62·5	48	56	51	64	57·5	43	55	47	63	55	39	55	53	70	61·5	48	63	48	60	54	40	52
Fort Jessup	42	68	55	36	60	43	67	55	40	60	41	84	67·6	45	75	52	85	68·5	46	76	61	82	71	54	78	62	88	75	54	80	55	69	62·5	48	62
Natchez	55	66	(*noon*)			59	71				64	73				63	71				58	70				56	77				58	69			
Detroit	42	70	56	40	50	50	64	57	47	58	46	54	50	43	50	46	56	51	44	52	45	58	51·5	42	54	46	62	54	42	56	33	68	51·5	31	60
New Orleans	55	78	66·5	51	68	59	82	70·5	54	71	60	82	71	55	71	63	82	72 5	56	61	53	77	65	49	64	56	79	67·8	53	66	65	79	72	59	69
Toronto Obs.†	31	55	45	34	48	41	60	52·4	41	57	44	60	54	44	55	44	54	50·4	43	51	48	52	48.8	46	47	48	67	57·5	43	50	33	47	39·2	32	42
Buffalo	31	62	46·5	31	62	43	68	55·5	42	67	56	64	60	56	63	47	61	54	46	60	43	54	48·5	43	53	41	54	47·5	62	53	40	43	44	40	47
Pittsburgh Ars.	44	64	54	43	56	45	64	54·5	44	56	55	64	57·5	54	57	44	55	49·5	44	42	48	59	53·5	46	53	48	55	51·5	53	46	40	55	47·5	38	49
Pensacola	58	84	71	54	64	62	82	72	58	70	62	78	70	58	70	62	84	73	58	60	52	82	67	52	60	52	74	63	50	58	60	78	69	56	60
Sackett's Harbor	26	54	40	25	52	30	64	47	30	63	50	56	53	50	55	53	57	55	52	55	49	52	50·5	40	52	42	46	44	41	44	42	50	48·5	42	50
Plattsburgh	50	62	56	46	57	55	68	61·5	52	64	44	60	52	42	53	52	64	58	50	61	48	59	53·5	46	57	16	56	51	43	53	34	50	42	31	46
Carlisle Bar.	54	65	54·5	44	57	56	64	60	46	56	56	68	62	47	54	62	64	63	54	56	54	68	61	42	58	53	64	58·5	46	56	46	56	51	44	48
Augusta Ars.	52	72	62	51	64	60	76	68	58	70	64	79	71·5	60	71	65	73	69	64	55	56	72	64	55	67	56	70	63	55	65	55	74	64·5	54	64
Hanover, N. H.	30	60	(1·30 P. M.)			21	58	"			43	56	"			52	54	"			49	59	"			15	52	"			42	46	"		
H. M. S. *Pique*											9A.M.50·5;		9P.M.56			9A.M.53;		8P.M.56.5			9A.M.55;		3P.M.57			9A.M.54;		3P.M 55			8A.M 56;		3P.M.57		
Amherst, Mss.	29	54	41·5			26	58	42			44	61	52 5			55	63	59			43	55	49			37	51	44			43	50	46·5		
New York*	48	62	55	44	52	50	63	56.5	49	56	54	65	59·5	52	62	60	67	63.5	58	63	52	65	58·5	49	61	50	56	53	44	56	48	55	51·5	47	50
Worcester						29	69	(2 P. M.)			42	58	50			58	66	62			46	60	53			43	57	50			43	59	46·5		
Hamden						27	50	38·7			43	51	47·7			54	58	55·7			53	60	54·7			46	55	49·7			43	43	42·2		
Boston	40	56	48			36	57	46·5			49	61	55			59	64	61·5			59	63	61			48	51	49·5			46	52	49		
Fort Monroe	53	68	60·5	51	61	63	68	65·5	58	65	64	69	66·5	61	63	62	69	65·5	59	64	58	63	63	56	60	64	64	64	59	60	54	66	60	53	58
Charleston, S. C.	60	73	66·5	55	64	67	75	71	60	66	69	73	71	64	65	67	75	61	62	59	60	71	65·7	53	59	62	72	67	54	59	67	73	70	58	63
Fort Adams	45	56	50·5	43	51	46	57	51·5	45	52	53	60	51·5	51	58	61	68	64·5	61	63	54	64	59	52	59	52	60	56	50	55	45	56	50·5	45	51
Fort Brooke	68	75	71·5	65	72	73	80	76·5	70	76	72	80	76	70	75	73	78	75·5	71	74	71	74	72·5	68	70	67	75	71	64	71	59	80	69·5	58	76
St. Augustine	74	78	76	72	76	76	77	76·5	73	75	74	80	77	72	77	70	79	74·5	67	72	71	74	72·5	68	73	64	74	69	62	70	64	73	68·5	57	70
Nantucket	52	54	9 A. M. &			53	59				59	60				61	64				61	60				59	61				48	52			
Halifax†			3 P. M.													52	58	54·5			59	62	54·2			54	62	55·7			50	49	48		
H. M. S. *Scylla*		(noon only)					52					54					56					62					60					56			
Key West	79	83	81	76	80	78	78	78	76	76	79	78	78·5	78	76	76	75	75·5	75	75	73	72	72·5	75	72	76	79	77·5	72	73	72	84	78	65	77

* At Fort Columbus.

† Observations taken every two hours, night and day; and the daily mean of the whole is given; but at all other places the daily mean as between 9 A. M. and 3 P. M. is copied, and appear not always correct.

creased, apparently, by the subsidence or vorticular depression of the higher and colder currents on the posterior or western side of the gale. Indeed, this rising of the thermometer during the access of winter storms, and its great depression as they pass off in their northeasterly courses, might in itself afford us good proof of the storm's rotation, were more direct evidence wanting.

In summer, when the geographical distribution of temperature on the path of the storm is more equal, the case is greatly altered, and a sinking of the thermometer is not unfrequently noticed in the earlier portions of the storm. The mean temperature of the several storms, is then often below that of the periods between the storms. Thus, while the general course and revolving character of North American storms, at all seasons of the year, are essentially the same, the phenomena and ranges of their temperatures are greatly varied in the different seasons.

Winds of the two Precursory Storms.—The axis of the first Cuba gale, in its early progress, seems to have advanced on a more inflected route than that of the subsequent hurricane, and having passed to the southward and westward of the island of Jamaica, it appears to have crossed the north shore of Cuba at some point eastward of long. 80°. It seems to have partially abated in its visible force in approaching the parallel of 30°, at least on its left and central portions, till it arrived near lat 40°, from whence onward it appears increasing in activity and extension. Its revolving character, when below the tropics, seems fully made out by observations on its different sides; and, during its course in higher latitudes, its right hand portion presents nearly the same winds and consecutive changes that characterized the like portion of the Cuba hurricane. Its more central portions also, exhibited southeasterly winds, followed in the higher latitudes by northwesterly; while, in the eastern states of the American Union, its northerly winds appear to have been partly intercepted by the passing storm from the lakes, and by the closely following hurricane; a result which I have several times observed, in similar cases.

In regard to the winds of the Lake storm, it may suffice to notice that they were chiefly southeasterly in the earlier part of the storm, in the basin of the great Lakes, and northwesterly or northerly during its later periods;—sometimes strong, and at other times weak and fluctuating in direction. At Plattsburgh, a gale

at S. E. is noted on the 4th,—winds strong from S. W., N. E. and N. W. on the 5th,—and northwesterly on the 6th. In more southern portions of this storm the winds were southerly, and southwesterly, for the most part,—passing to the W. and N. W. The subsequent state of the storm in approaching the Atlantic, may be seen in the previous recitals, at stations where the effects of this and the first Cuba gale appear as partially blended, or as closely succeeding each other. Numerous observations which were made in New York and other states, at this period, are omitted for want of space; but these appear to afford no additional facts or views requiring our consideration.

In overland storms of this character, where but little force is found in the surface winds, attempts to map out the true vortical course of the storm-wind by means of the local observations will be but partially successful. This difficulty may be owing in part to the want of symmetrical uniformity in the revolving action, and to the diversities of the positions and elevations, over the face of a great continent or island, as well as to the intrusion of other winds, stratiformly, in the same geographical area. Thus the true horizon of the storm-wind may be but imperfectly noted, in the assemblage of observations, and different strata and fluctuations of the aërial currents be represented to our view as being in the same plane of movement. These and other causes of discrepancy and want of conformity in the winds, the enquirer may be wholly unable to classify or detect. Strongly characterized as was the Cuba hurricane, we have seen, clearly, the intrusion of other winds beneath the true horizon of the storm, in the New England states. Indeed, too much reliance may be placed upon mere observations of the surface winds, in meteorological inquiries. But the falling of the barometer in the storm, and the direction, strength, and order of succession of its principal winds, on one or both sides of the storm-path, will commonly afford sufficient evidence of its essentially revolving character.

Lake Gale or Hurricane of October 18th, 1844.—Two weeks after the occurrence of the Lake storm above noticed, a very violent and destructive gale passed over the basin of the great Lakes, on a course which also nearly corresponds to No. XI, on Chart I. Its effects were eminently destructive to the vessels on the Lakes, and also in the town of Buffalo, and during its further progress, it was severe also in Maine, Nova Scotia and the

estuary of the St. Lawrence. At New York, and, generally, in the interior of the continent, the anterior winds of this gale were felt but moderately, though, at Toronto, the barometer fell to 28·86; the violence of wind, at the surface, being chiefly in the posterior side of the storm, on the rising barometer, as is the case in most of our overland gales, and in many of those on the Atlantic. This common feature of the Lake storms greatly enhances the value of the barometer, in navigating these inland seas.

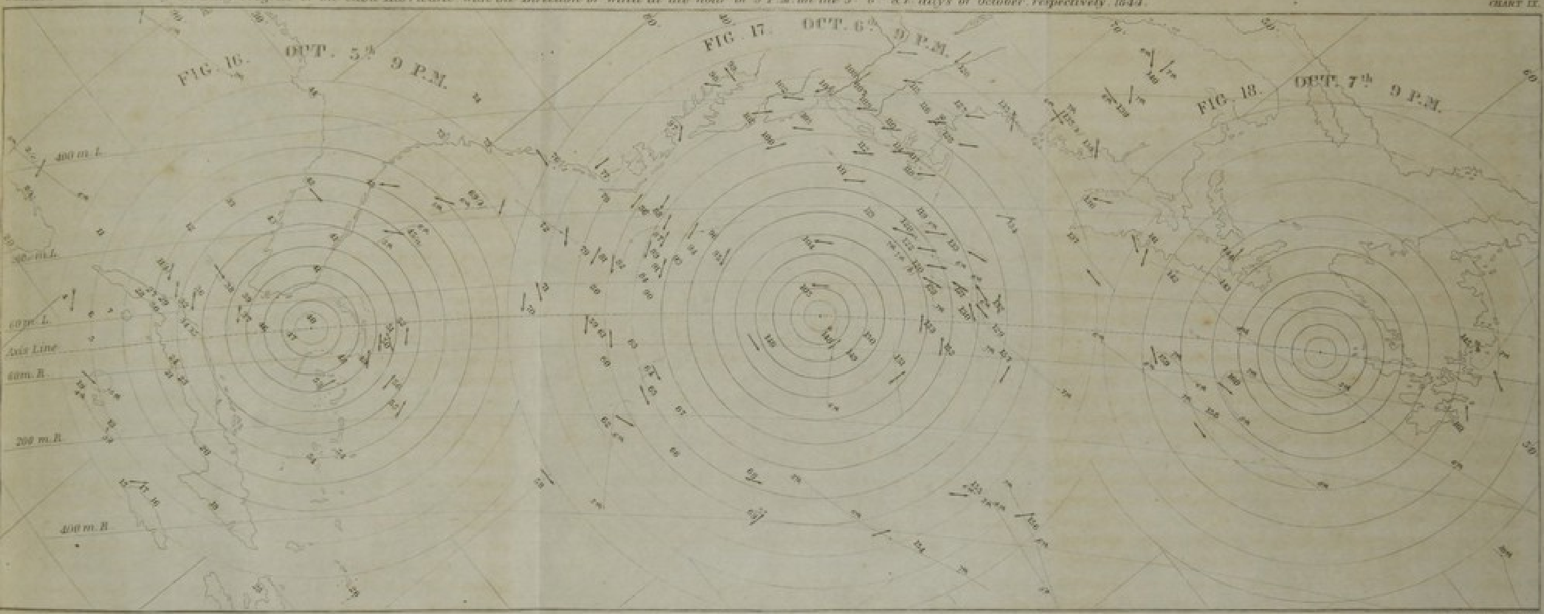
Relations of the Cuba Gales to the Northers of Honduras and Yucatan.

Having previously shown that a portion of the great storms of the United States and the Atlantic ocean are identified with the Mexican Northers, several of which have been traced to the Atlantic,* it remains to notice a like identity of the Northers of Yucatan and Honduras with the storms which sweep over the island of Cuba and the Atlantic ocean. The common name of Northers has been applied to the gales which visit the northern coasts of Central America, as well as to those of Mexico, as far eastward as the Musquito coast and gulf and near to lon. 80°, over which region they are found frequently to occur, except in the summer months. The swell from these Northers is often injurious in ports of this coast which are sheltered from their immediate force.

From the Musquito coast to Cape Honduras, (lon. 83° to 86°,) when the wind gets "to S. E. and then veers to S. and S. W., a gale will surely succeed." These gales are very violent, and occur more frequently from W. S. W., west, and N. W., than from north.—Upon the Musquito shore, Honduras, and the eastern coast of Yucatan, the general winds are frequently interrupted in February and March by *norths*. In September, October, November, December, and January, the winds are from the northward or southward of west, [northwesterly or southwesterly,] with frequent gales from W. S. W., W., N. W., and north.—On the north-

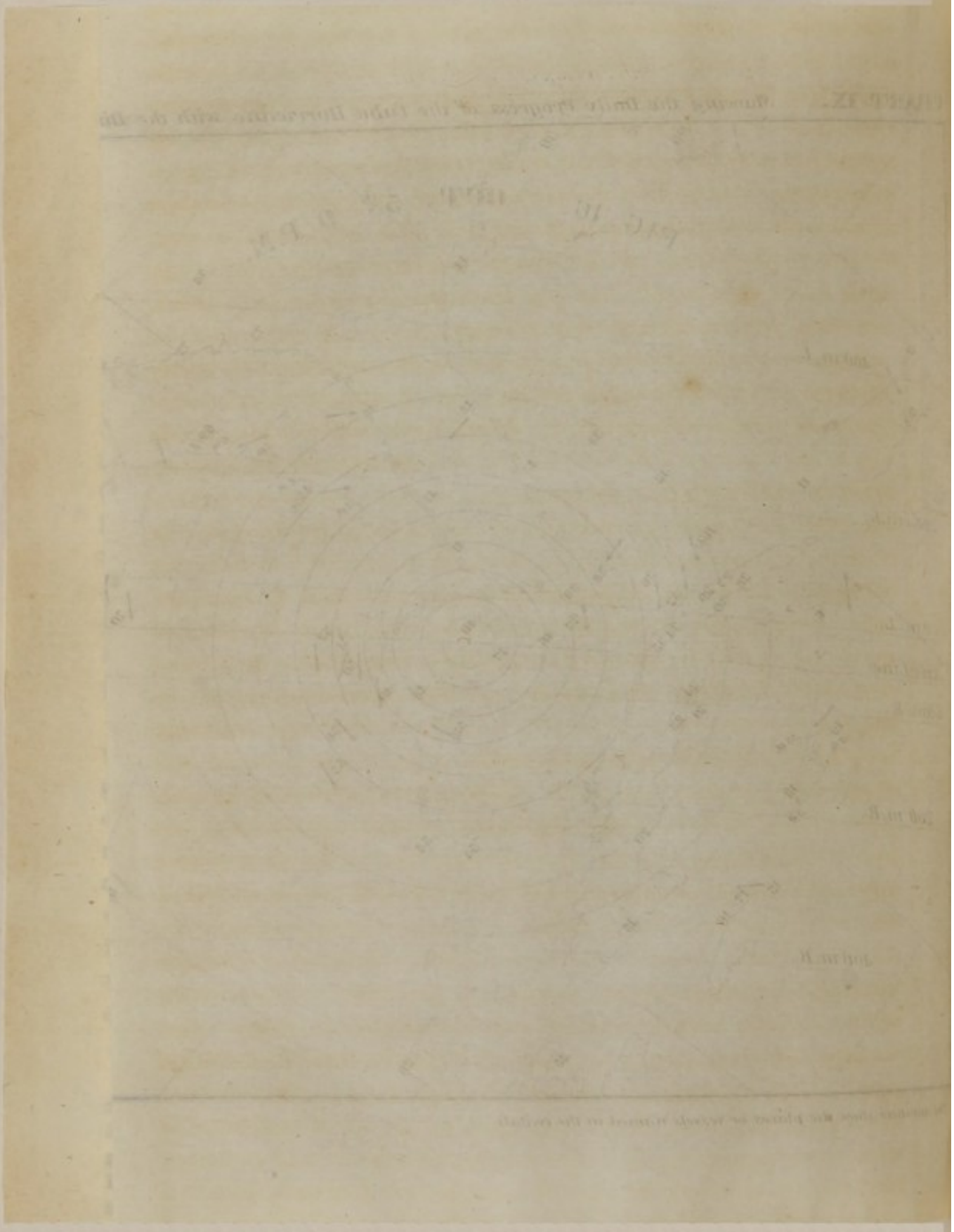
* The events of the present year, (1846,) have served to bring to our notice the frequent occurrence of the Northers in the countries and on the coasts which border the Mexican sea, and their subsequent progress to the Atlantic as revolving gales, not only during the winter season but in the months of May, June, and July. Indeed, it would be an error to suppose that American storms or gales are limited, in their occurrence, to any one portion of the year. The great gale of the Atlantic coast, Sept. 8th—10th, since the foregoing was in type, was also a norther from the Gulf of Mexico, where it caused the loss of the steamer *New York*, and other vessels on the 6th and 7th.

CHART IX. *Shewing the Daily Progress of the Cuba Hurricane with the Direction of Wind at the hour of 9 P.M. on the 5th 6th & 7th days of October, respectively, 1844.* CHART IX.



The numbers shew the places or vessels named in the Tables.

Eng^d by J.R. ... N.Y.



ern and western coasts of Yucatan, the general winds are interrupted by hard Northers, in the season of them.*

That these northers of Central America move in a regular course of progression, like other storms, cannot well be doubted. In the case of the *Racer's* gale, we have seen that the course corresponds with the westerly progression of hurricanes which have visited the windward islands of the Antilles; while in the two Cuba storms, which have been considered, the northeasterly progression has been found commencing in the northwesterly portion of the Caribean sea. A like course with the latter, I find was pursued also by other hurricanes from the Caribean sea, which have crossed the central portion of Cuba.

A similar course, at least from the north side of Cuba, was taken by that destructive hurricane of the western Atlantic which passed the coast of the United States on the 11th of December, 1844. The hurricane which devastated the western part of Jamaica on the 3d of October, 1780, also pursued a northeasterly course from the Caribean sea, as I had occasion to notice in 1836, and has since been fully shown by Col. Reid, in his work;† and is the most eastward of the storm tracks known to belong to this particular group. Of these storms which have thus crossed the island of Cuba, not one has been traced from the eastern portions of the Caribean sea, and hence there is reason to conclude that they can only have belonged, locally, to the class of storms known under the appellation of Northers, on the western borders of that sea.

Relations of the Cuba Gale to Contiguous Winds and Aerial Currents.—These relations may be viewed, first, in reference to the rotation of the gale, and second, to its geographical progression.

I have already referred to the natural tendency to a left-wise rotation in the winds of the northern hemisphere, when moving on the earth's surface from the equator towards the poles. But it is evident, from the prevalence of violent storms in some regions and their absence from other localities in like latitudes, that this general tendency of rotation does not serve to explain the actual distribution or prevalence of these storms. I have found, however, on a careful examination of marine Journals, that this

* Derrotero de las Antillas.—American Coast Pilot, &c.

† Lond. Nautical Magazine, v, 203–204. This Journal, xxxi, 120.

tendency to rotation is commonly shown in some degree, in the successive phenomena and phases of the trade winds, in the region near St. Helena and in other tracts of ocean which are exempt from severe storms. In some other regions, as in the western portions of an oceanic basin in the tropical latitudes, the Indian ocean near Mauritius, and in the south Pacific from the Society to the Navigator's Islands, this tendency to a vorticular rotation appears to be directly promoted by local or specific causes, the most efficient of which are found in the actual courses of the several local winds or aërial currents, either in the same plane of the horizon, or at different elevations. Thus, Mr. Thom maintains that the hurricanes of the Indian Ocean are due to the opposite or tangential action of the N. W. and S. E. monsoons on each other in that sea; and I apprehend that the earliest activity and violence of the intertropical hurricanes may often be rightly explained in this manner.*

This, however, cannot always explain the uniformity of the direction of rotation, nor the continued activity of the storms in their progress to other regions and in higher latitudes, where their greatest violence is sometimes developed.† Nor is the extraneous and tangential force of contiguous winds or currents at all necessary to the continued activity of the storm, when once the fall of the barometer and the involute vortical movement has been produced; for the pressure of the external atmosphere, around the basin of the storm, constantly aids or impels the involute movement at the earth's surface, and may be sufficient to maintain the existing vortical action, as may be seen in the case of a common vortex or whirlwind.

We have seen that the two Cuba storms, as well as the Mexican Northers, have appeared to come from the contiguous border of the Pacific ocean. Now, are there any peculiarities in the winds and aerial currents of those regions which may serve to induce or support a leftwise rotation in extensive portions of the lower atmosphere, while moving on or near the earth's surface? I apprehend there are such peculiarities, which have an extensive, constant and powerful influence.

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* In such cases I suppose that extensive portions of these different or opposite winds may coalesce in a vast gyration; instead of pursuing their usually independent courses, stratiformly, without interference with each other.

† As in the case of the extremely violent hurricane near lat. 50° in the eastern Atlantic, December 12th, 1844.

First, we find on the eastern portion of the Pacific from Upper California to near the Bay of Panama, an almost constant prevalence of northwesterly and westerly winds at the earth's surface. Next we have an equally constant wind from the southern and southwestern quarter which, having swept the western coast of South America, *extends across the equator to the vicinity of Panama*, thus meeting, and commonly oversliding the above mentioned westerly winds and tending to a deflection or rotation of the same from right to left, ↺. As this influence may thus become extended to the Caribean or Honduras sea, we have next the upper or S. E. trade of this sea, which is here frequently a surface wind, and must tend to aid and quicken the gyrative movement, ↺ ascribed to the two previous winds; and lastly, we have the N. E. or lower trade from the tropic, which coinciding with the northern front of the gyration, ↺, serves still further to promote the revolving movement which may thus result from the partial coalescence of these great winds of Central America and the contiguous seas.

Thus, while a great storm is in part on the Pacific ocean, its N. E. wind may be felt in great force on that side of the continent, through the great gorges or depressions near the bays of Papagayo or Tehuantepec, as noticed by Humboldt, Capt. Basil Hall and others, the elevations which there separate the two seas being but inconsiderable; and when the gyration is once perfected, the whole mass will gradually assume the movement of the predominant current, which is generally the higher one, and will move off with it integrally; as we see in the cases of the vortices which are successively formed in particular portions of a stream, where subject to disturbing influences. It is true that different winds which are found moving direct or obliquely towards each other in the aërial ocean, are never found to *meet*, in the opposing or antagonistic sense, any more than currents of the aqueous ocean; but they either stratify one upon the other when arriving on the same field, or else blend in a partial or common gyration and a united progression of their masses.

There seems, then, to be sufficient cause why the prevailing winds of southern Mexico and Central America should assume an aggregated and sinistrorsal rotation, such as is successively exhibited in the Northers and Atlantic storms;—why the Norther originated in the dry wind of the Pacific coast, should on first

reaching the S. W. border of the Gulf of Mexico at Vera Cruz, be found to afford little or no rain;—and why these North American storms should be distinguished for their almost regular *periodicity* of occurrence.*

Progress of Storms due to Prevailing Currents.—That the progression of these and other storms is caused by the predominating current in which they are imbedded, appears nearly a self-evident proposition; and there is much evidence of the prevalence of aërial currents which correspond to the courses pursued by the several storms.

At the windward islands of the Antilles, we have seen that the course of the *lowest* trade winds is often from E. to S. E.; although, from thence to the northern border of the trades, it comes, most commonly, from the N. E. quarter. Mr. Lawson has shown us that at Barbadoes, during a part of the year, the predominating course of the wind, both at the surface and in the region of clouds, is from east to southeast, and this is also the prevailing course of the higher portion of these winds in other months.† His observations, which are confirmed by others, may be deemed to show the actual course which is there pursued by the great body of the trade wind, and thus may fully account for the west-northwesterly course which is commonly pursued by the hurricanes of the Antilles, while passing to the extra-tropical latitudes. In the United States and north of the tropic in the Atlantic, the predominating currents come from the southwest quarter, which also corresponds to the courses here pursued by the great storms.—I have now to maintain that this prevailing southwest current exists far back in the intertropical latitudes, where it is derived, not from the trade wind of the Atlantic, north of the equator, but, to a large extent, from the prevailing winds of the Pacific ocean.

In the lower latitudes a general current from the southwest quarter has been noticed, as seen in the common course of the higher clouds, which pertain to the lower half of the atmosphere;

* The interval between the great Cuba gale and the next stormy weather was the same at both Campeche and New York. I have long since referred to the tendency or approximation to weekly periods which is shown in the occurrence of our storms; a fact which is very generally noticed when they occur on Sundays. At some seasons they are often bi-weekly. From the nature of the case, this periodicity is not absolute, but variable.

† *Ante*, vol. i, 2d Ser., p. 13, foot note.

while immediately below this current the upper portion of the trade wind is found to be from the southeast, as above noticed, and no longer moves towards the equator, but becomes also in due course of its progression to the higher latitudes, a southwesterly wind. This higher and main current from the southwest, coincides with the observed course of the two Cuba storms in the lower latitudes; and in its further progress and periodical variations it also accords with the general course of the storms which have been traced in the temperate latitudes.

That this predominant current is mainly or largely due to the prevailing winds of the Pacific Ocean, I cannot doubt. The great extent of northwesterly and westerly winds found on the eastern border of the Pacific, *in the trade wind latitudes*, has been noticed above, and a portion of this current appears to find its way to the southern parts of the Caribean sea as a surface wind, at certain seasons. Without inquiring whether the higher portions of this current of the north Pacific may not unite with the westerly winds of the Atlantic basin, it may suffice to state, that on the southern coast of Central America it is not found within six or eight degrees of the equator. On the contrary, we here meet with the vast stream of southwesterly winds, which have crossed the equator from the southern hemisphere, where they constantly prevail, as the southerly winds, on the coasts of Chili and Peru. That the lowest and most westward portions of this current are deflected in the southern hemisphere and merged with the southeast trade wind, I do not doubt; but the main current still pursues its course, which is necessarily more towards the northeast on crossing the equator, and in its further progress, as above stated, it is found superimposed on the westerly and other inferior winds of Central America and southern Mexico, and constitutes the main southwest current which is so often recognized in the lower latitudes.

There are two other extensive winds of the Pacific, of a character somewhat anomalous, which in their ultimate tendencies may serve to promote and strengthen this aerial movement to the north Atlantic basin; first, the great westerly monsoon, south of the equator, which, even as a surface wind, is found to cross the greater part of the Pacific, from the Indian Seas, in the principal season of the Northers; and, second, the equatorial belt of westerly winds, which is so remarkable a feature in the aërology of that great ocean.

The course of the great aërial stream into the Atlantic basin, after crossing the equator from the southern hemisphere, is seen from other evidence than the reported courses of the clouds, and occasional surface winds. We learn from Humboldt, that in the great eruption of Jorullo, a volcano of southern Mexico, which is 2100 feet above the sea in lat. 18° 45′, lon. 101° 30′, the roofs of the houses in Queretaro, more than 150 miles N., 37° E. from the volcano, were covered with the volcanic dust. In January, 1835, an eruption took place in the volcano of Cosiguina, on the Pacific coast of Central America, in lat. 13° N., and having an elevation of 3800 feet, the ashes from which fell on the island of Jamiaca, distant 730 miles N. 60° E. from the volcano. The elevated currents by which volcanic ashes are thus transported, are seldom or never of a transient or fortuitous character, and these results therefore afford us one of the best indications of their general course. Thus the progress of the higher portion of the trade wind was marked by the eruption of Tuxtla, lat. 18° 30′, lon. 95°, which covered the houses in Vera Cruz with ashes, at the distance of 80 miles, N. 55° W. and also at Peroté, 160 miles N. 60° W. The ashes from the volcano at St. Vincent, which fell at Barbadoes and east of that island in 1812, mark the course of a current from the westward, which appears there at times, in the region of clouds, and may perhaps be connected with the permanent winds on the Pacific coast of Mexico. Few facts in meteorology are more worthy of our attention than the stratiform character and the vast horizontal extension of the aerial currents, in different portions of the globe.*

Over the United States and the temperate latitudes of the Atlantic the course of this great southwest current is strongly marked both by the movements of the clouds and the general course of the surface winds, notwithstanding the degree of obscurity which is induced by the generally revolving character of the lower winds; for even the northeasterly and northwesterly winds are found comprised in a general movement of the lower atmosphere towards the northeast.† Thus, we find the great Cuba

* For the positions of the volcanoes of Cosiguina and Jorullo and course of the drift, see Charts I and IV.

† For results of seven years' observations on the courses of the clouds and the lower winds, at New York, see this Journal, i Ser., xxxiv, 373; and xxxviii, 323, 324.

hurricane moving in this direction, with a progress of 500 to 1000 miles per day, overlaid and accompanied by a regular southwest current; and yet, if we should attempt to resolve the aggregate course and progression of this storm solely by a general mean of its observed winds, at the earth's surface, we might be led to very erroneous conclusions. For these rotary winds, instead of showing the true progression of the storm, might appear nearly to balance each other. Moreover, the winds of this storm, when considered locally, are found to exhibit nearly the same phases or succession of changes which are common to the temperate latitudes of the north Atlantic basin; which serves to show that our successively observed winds are commonly of a rotary character, and that the common method of estimating the mean resultant courses or progression of the surface winds is necessarily defective and cannot show the true progression of the lower atmosphere.

Some writers have described our northerly winds as sweeping from Canada to the Gulf of Mexico and Cuba, and thus reducing the temperature of the latter regions. But it is evident that these persons have mistaken the cold winds which are found on the western side of our revolving storms, as being a direct current from the higher to the lower latitudes. I cannot find that the above geographical course has ever been pursued by the winds of this continent. On the contrary, in times of the greatest depression of the thermometer, in numerous instances, the cold period has been found to have first taken effect in or near the tropical latitudes and Gulf of Mexico; and has thence been propagated towards the eastern portions of the United States, in a manner corresponding to the observed progression of the storms.

The only proper current of surface winds found coursing towards the equator, in the temperate latitudes of North America, exists on the western side of the continent. But a high current from the northwest, which may have crossed the Rocky Mountains in its course, appears at successive and alternate periods, of considerable duration, in the higher region of clouds. Its direction nearly coincides with the closing winds of our revolving storms, and in the winter season, in some cases, it probably subsides to the surface and immediately follows these storms, for two or three days, and sometimes longer. This will accord with views which have been expressed by the late President Dwight

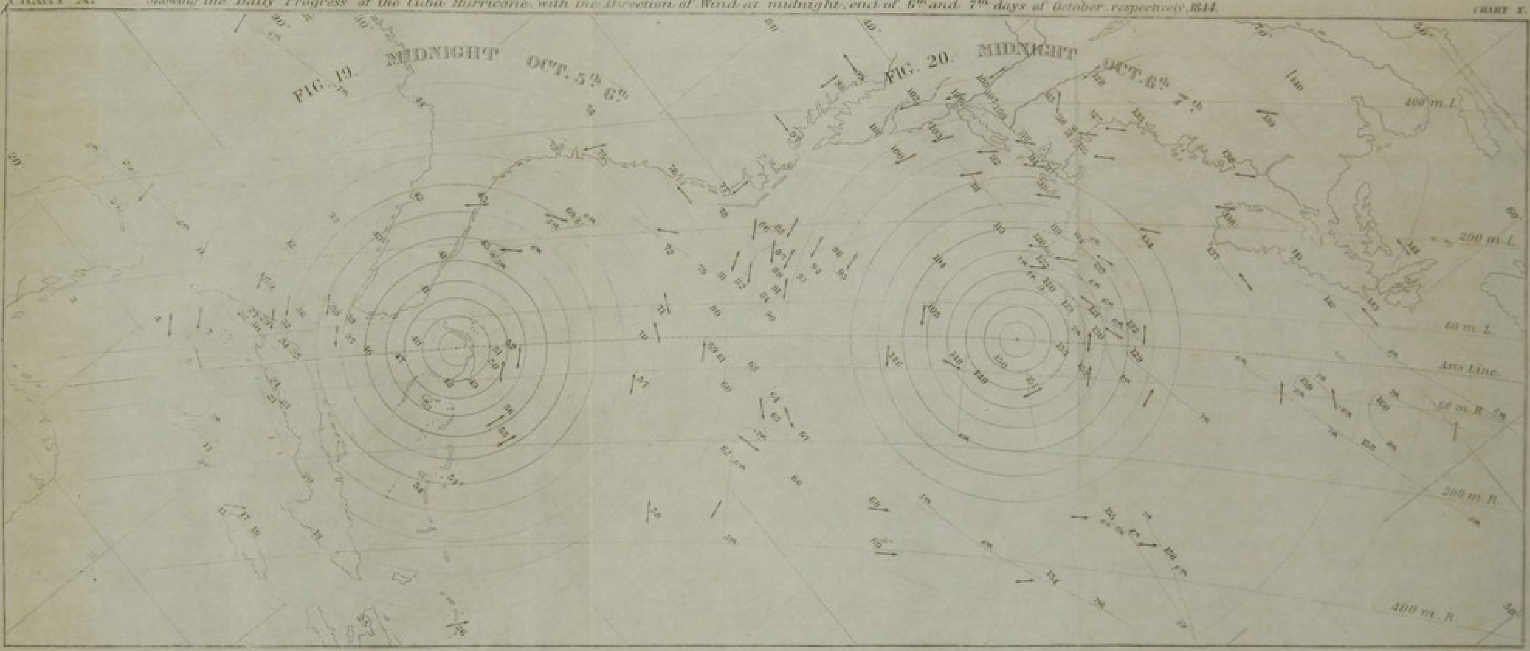
and other writers. But I have in no case found the integral progression of a great storm to be in accordance with the specific direction of this wind.

To my own apprehension, it is the constant course of the lower winds towards the equator, on the western shores of America, below the latitude of 40°, that best explains the aridity of those regions. And it is to a *counter* course of progression, in the lower atmosphere, that the United States, China, and western Europe are mainly indebted for their rains and fertility. To these general and remote causes may also be ascribed the varied electrical and hygrometric phenomena of these different regions.

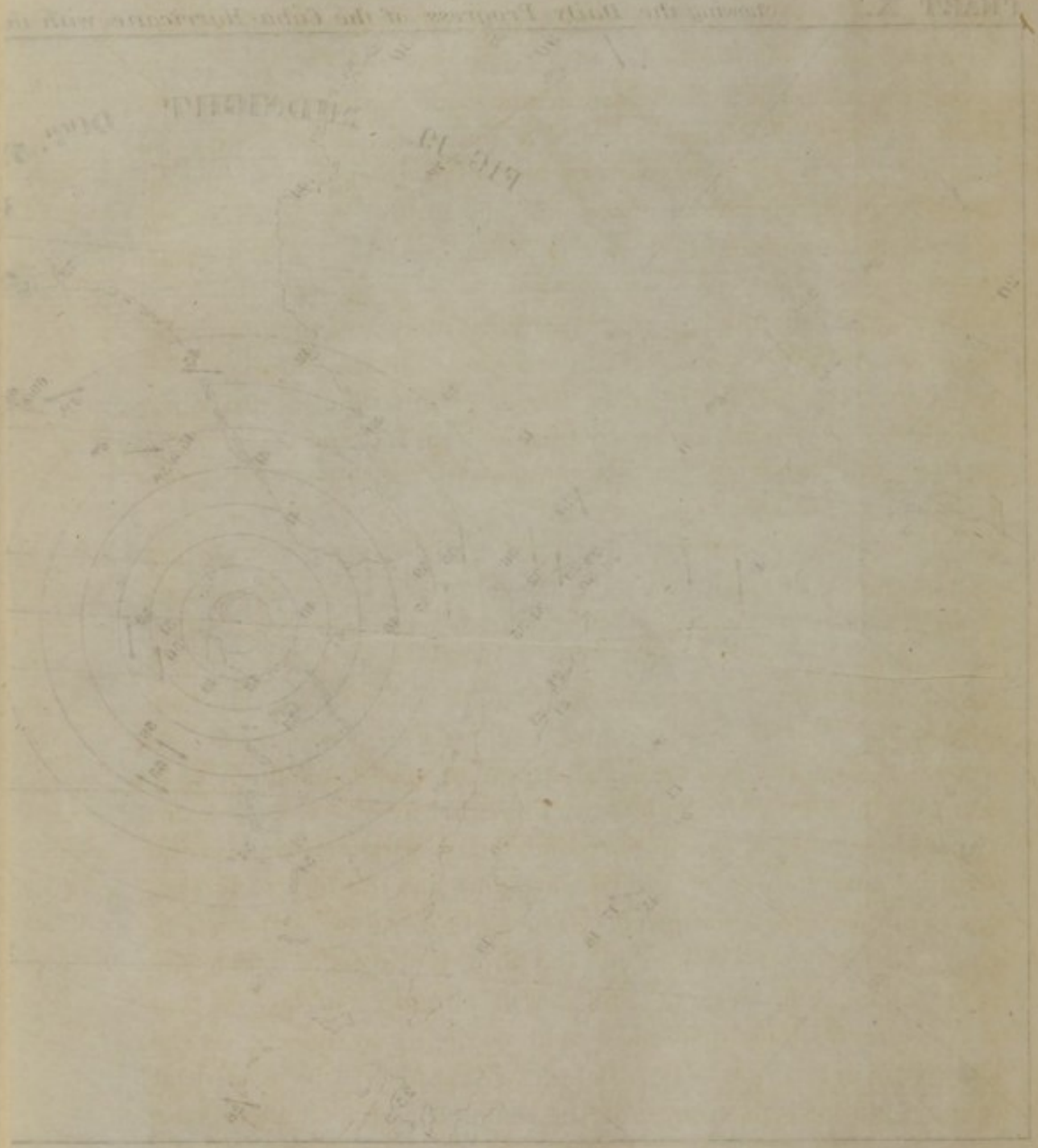
In closing these imperfect remarks and statements on the American tempests, I tender my thanks to all who have aided me in the inquiry. To Col. Reid, Governor of Bermuda, and through him to Vice Admiral Sir Charles Adam, and other officers of the British Navy, and to the officers and agents of the R. M. steamships, I am indebted for valuable logs of various vessels. Surgeon General Lawson, under the favor of the War Department, has kindly furnished me with the meteorological reports from our military stations, and by the aid of Lieut. M. F. Maury and the favor of the Navy Department I have obtained the logs of our national vessels. Prof. J. R. Beck, secretary of the Board of Regents, has given me free access to detailed reports from the several academies in the state of New York, and various professors and other gentlemen have furnished me with copies of their private journals. I am indebted, also, to many merchants, shipmasters, and others, for important aid, and can only hope that the results attained may prove useful to those who may be engaged in commercial and other pursuits.

Practical Deductions.—It was my purpose to add some further practical exposition of the law of rotation and progression in storms, which might aid the mariner in avoiding their destructive violence, and render the rotary winds and gales more subservient to navigation; but my proposed limits have already been exceeded. It is necessary, however, that the character and general extent of the rotation, and the usual courses of progression, be once clearly understood. Perhaps no one case can better illustrate these conditions than the Cuba hurricane, viewed in its

CHART X. *Showing the Daily Progress of the Cuba Hurricane, with the Direction of Wind at midnight, end of 6th and 7th days of October, respectively, 1844.* CHART X.



The numbers show the places or vessels named in the recitals.



successive positions and local changes of wind, as shown in Charts IV to X, and compared, also, with the varying courses of progression which are shown in Chart I. Let the mariner suppose himself in any position which may fall under the approaching gale as there delineated, and he may perceive the successive changes of wind which must necessarily take place, as the gale passes onward. This gale, in its various local phases, may be taken as illustrating pretty fairly, nearly all the great storms in the northern temperate latitudes, as well as the successive local changes of a large portion of the common winds of these latitudes.

The chief difficulty, in some latitudes, may be in determining the actual course of the gale's progression; for the choice of any course for avoiding the heart of the gale must depend partly on this knowledge. But the local position and latitude of the ship, together with the attending appearances of the storm, will commonly afford sufficient indications.

But a course for avoiding the heart of the storm is not all that is to be considered; for this may be controlled by imperious circumstances or considerations, and little choice be allowed. Other things being equal, it is important, in the commencement of a gale, to take such a course as will be favorable to the ultimate prosecution of the voyage, and will enable the ship to encounter with most safety that portion of the gale which may be chosen, or found unavoidable. This may involve the questions of *scudding* and of *lying to*, which must partly depend on the character and lading of the vessel; and also the *tack* to be preferred, in the latter alternative. The early direction of the storm-wind and the course taken by the ship, will usually decide the further changes of the gale, and it will be proper to lay on that tack in which the ship's head will come up to the sea, as the wind veers or changes,—not that on which she will be headed off by the wind into the trough of the sea, and perhaps taken aback in the heart of the gale. A glance at the storm figures on the Charts will commonly show which tack should be chosen, in different parts of the storm, by vessels bound in different directions. The chief difficulty in deciding is when the ship happens to be on or near the axis of the gale; in which case the discretion of the mariner must rule; but it is desirable first to get away from this line as far as possible. The *degree* of caution and forethought which it may be proper to exercise, may best be deter-

mined by the indications of the barometer, not neglecting other appearances.

Thus when vessels are bound westward, in the temperate latitudes, and have southeasterly winds with a falling barometer, they should steer to the northward and westward, instead of keeping their direct course; and when the wind has veered to the northeast quarter they may resume their true course, with a fair wind which will veer northward; but if finally compelled to heave to with the wind northeasterly or northerly, they should then take the *port tack*, so as to come up to the wind, in its further changes. This curved course will be found to favor a speedy passage, in most cases, as it gives a fair wind of longer continuance, by placing the ship in the left side of the storm path, and in a position which renders the subsequent northwesterly wind more available. But in case of a gale's hauling *southward* and westward, the ship, when headed off from her course, should be hove to on the *starboard* tack, being in the right hand side of the storm path. The ship will then come up to the sea, as the wind veers by the west towards the northwest.

It will at once be seen that in revolving winds a direct course is not always most conducive to a quick passage, but such variable course should be preferred as will render available the succeeding changes of the wind; which changes, whether by *south* or *north*, sometimes depend on the course of the vessel.*

The foregoing statements and suggestions are equally applicable in the southern hemisphere, with only this difference; viz., that in the actual courses of the winds and storms, *south* is there always substituted for north; east and west remaining the same. Hence, the practice must be varied accordingly.

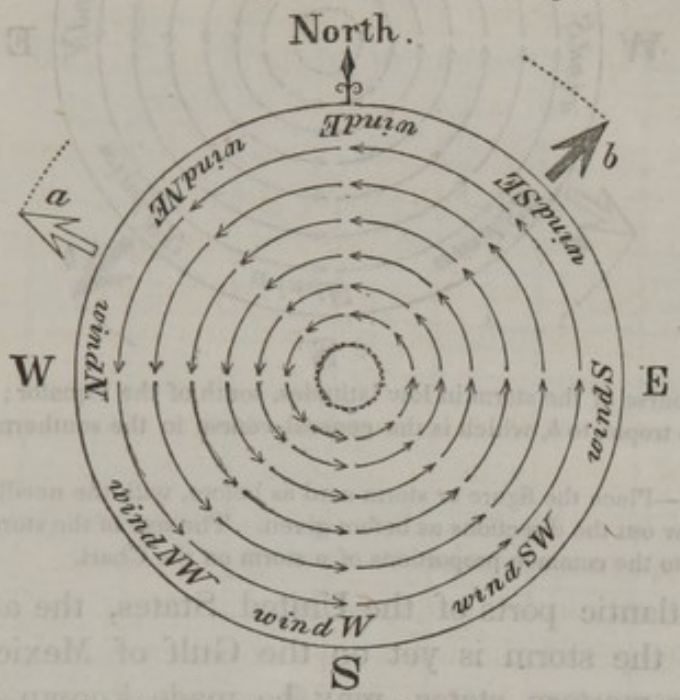
These practical deductions accord with the statements and diagrams which I have published in 1831 and subsequent years. Storm figures of this kind, better elaborated, have also been given by Col. Reid, in his work, accompanied with remarks on lying to, and by him and Mr. Piddington have been placed on cards, and on plates of horn or glass, in order that a mariner may determine the place of a vessel in a storm, by placing the figure on the face of his chart, in such manner as to coincide, on the outer

* See, also, Col. Reid's valuable Note on Progressive Revolving Winds and the Advantages of Sailing on Curved Courses; Jameson's Ed. New Phil. Journal for July, 1846. Also, Remarks on Lying to, in the Messrs. Blunt's forthcoming edition of the Young Seaman's Sheet Anchor.

circle, with the observed direction of the storm-wind, at the first freshening or commencement of the gale. In this manner the geographical position and coming changes of the storm may be apprehended by those who may not fully comprehend the law of the wind's rotation.*

These storm figures and their uses, may be exemplified in the annexed diagrams.†

Fig. 6.—Storm Figure for Northern Hemisphere.



a, General Course of the Storm in the low latitudes; changing successively to *b*, which is the general course in the Temperate latitudes.

Directions.—First, mark the position of the ship on the Chart, at the beginning of a gale, and then place this figure to the southward of such position, with the needle pointing to the North, and in such location on the Chart that one of the wind arrows in the outer circle will conform to the actual direction of the wind. This will show nearly the true position of the storm at that time. Then move forward the figure in the direction in which gales commonly advance in that latitude and locality, but without turning the figure. The arrows which are thus brought in succession over the ship's place, will show the changes of wind which may be expected, in the further progress of the gale; and also, into what portion of the storm the vessel will be likely to fall, in her then position, and what changes of the ship's course will be likely to favor her safety and the further prosecution of the voyage.

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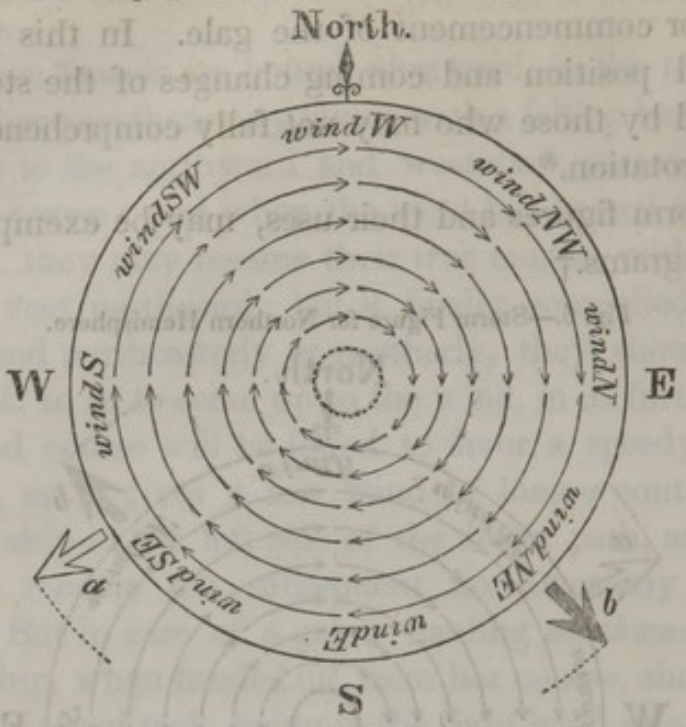
* See Col. Reid's work, first edition, pp. 5—7 and 424—427. Weale, London, 1838. Also, Horn Book of Storms, for the Indian and China Seas, by Henry Piddington: Ostell & Lepage, Calcutta; W. H. Allen, London, 1845. I have lately received from Mr. Piddington his Thirteenth Memoir, which relates to the hurricane of the *Charles Heddle*, before mentioned, and is well worthy of the attention of both navigators and meteorologists.

† See, also, Bowditch's Navigator, edition of 1839, pp. 441, 442; edition of 1845, pp. 440, 441.

Fig. 7.—For the Southern Hemisphere.



a, General Course of the storm in low latitudes, south of the Equator; changing, on its approach to the tropic, to *b*, which is the general course in the southern Temperate latitudes.

Directions.—Place the figure or storm card as before, with the needle pointing to the north, and follow out the directions as before given. The size of the storm figure, for use, may be drawn to the common proportions of a storm on the Chart.

In the Atlantic ports of the United States, the approach of a gale, when the storm is yet on the Gulf of Mexico, or in the southern or western states, may be made known by means of the electric telegraph; which, probably, will soon extend from Maine to the Mississippi. This will enable the merchant to avoid exposing his vessel to a furious gale soon after leaving her port. By awaiting the arrival of a storm and promptly putting to sea with its closing winds, a good offing and rapid progress will be secured by the voyager.

However useful the knowledge of storms may prove, no one will expect the tempest to be disarmed of its power. Nor can disasters in navigation be in all cases avoided. But, contemplating this subject in its relations to the thousands of lives and the millions of property which are lost by shipwreck, almost annually, we cannot doubt that much of this loss might be prevented, by the exercise of timely and intelligent precaution. Indeed, the practical value of accurate knowledge and investigation, in all branches of science, is generally admitted; and in so important a matter as that of the rotation and progression of storms, it will not be estimated too highly.

New York, Sept. 2d, 1846.

PLATE XI. BAROMETRIC CURVES AS OBSERVED IN THE STORMS OF OCTOBER 1842. PLAT

Fig 21.

Local Barometric curves during the progress of the two Cuba Gales in October 1844.

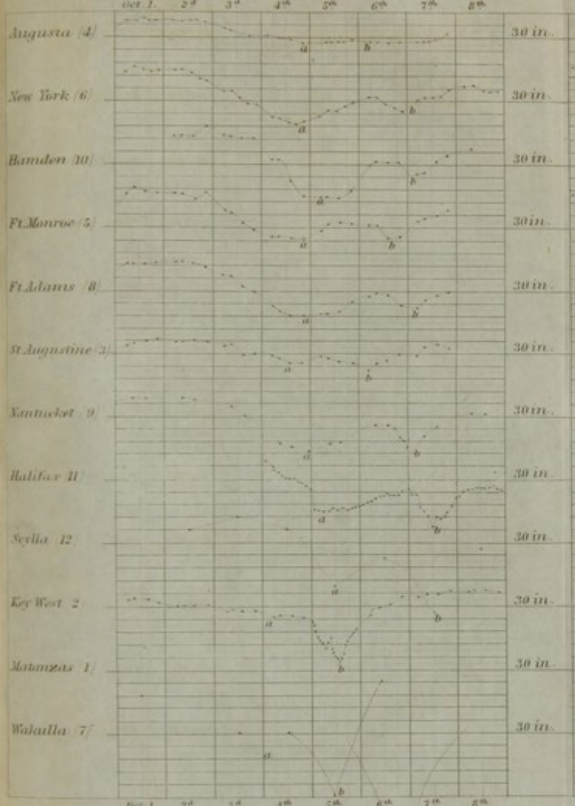


Fig 22.

The same Barometric curves adjusted to one point of progress

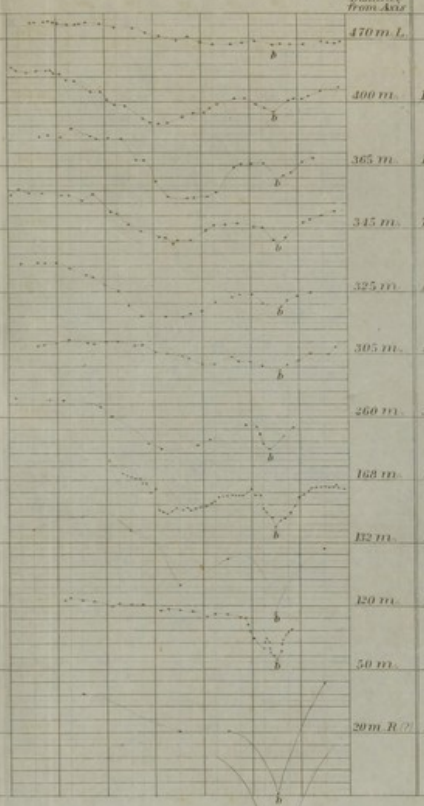
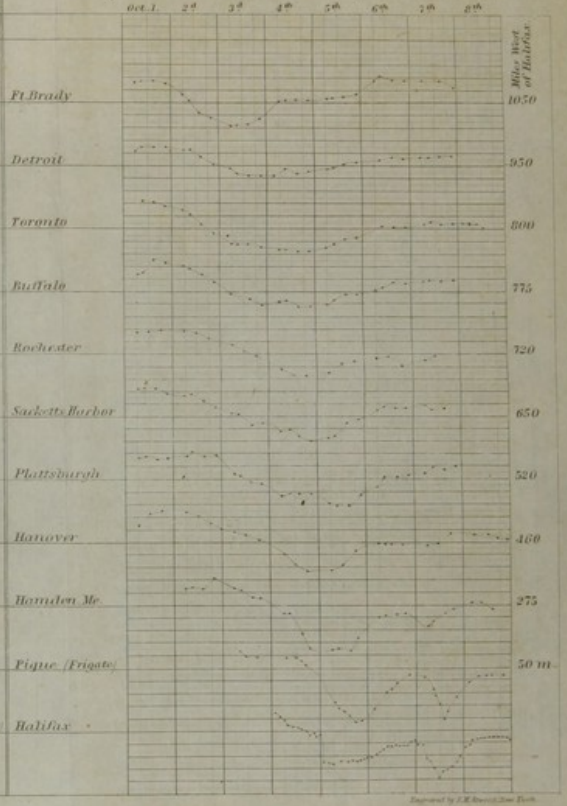


Fig 23.

Local Curves in the Route of the Lake Storm in its approach to the Routes of the Cuba Gales



Vertical scale one half. Each principal line indicates 30 inches, the interval to the next line one inch. a marks the minimum of the first gale. b the minimum of the Hurricane or second gale.

Wakulla