

September 13, observers at Portland, Eastport and adjacent ports, 12:05 a. m. : Signals down.
HAZEN.

As soon as the storm was over, General Hazen telegraphed to all the observers at the Gulf and Atlantic ports, to collect statistics of the values of the vessels and their cargoes that were detained from sailing, by the cautionary signals, warning them of dangerous weather. What losses resulted from the storm are not yet known, but captains who were caught in it say, that it was the worst weather they had ever experienced.

It has been found impossible to secure full and even adequate returns of the vessels detained. The observers at New York, Baltimore, and Philadelphia make no returns, having been unable to secure statistics. The reason given is, that at these ports the harbors are so long, and there are so many safe anchorages toward the sea, that on the approach of a storm all vessels that are ready to sail go to these anchorages, and wait for the clearing off-shore wind. Boston's returns are also inadequate, and it is probable that more good was done coasters than ocean going vessels, the masters of the latter taking more risks owing to the greater size of their ships.

Statistics enough have been obtained, however, to give some idea of the very large amount of property that was prevented from going to sea in the cyclone, or that ran into harbor after seeing the signals. The total amount of the figures sent by the observers is \$6,460,586. It is estimated at the signal office that at least \$13,000,000 of property and many persons remained safely in harbor on account of the warnings given by the signal office, and that the saving in this one storm pays the expenses of the service for at least ten years.

III.—On the 12th, a depression entered British Columbia and advanced very rapidly to the eastward, moving on the 13th over Manitoba, Dakota, and Minnesota, the centre of low area being charted at the last observation of the day over the western part of Lake Superior. The pressure at Duluth was 29.58, or 0.33 inch below the normal; thus far the depression had exhibited very slight energy, but in the hours from midnight to morning the low area developed into a storm of great violence and pursued, during the day, an easterly track over the Province of Ontario and entered the Saint Lawrence valley. High south to west winds were reported from all the lakes except Lake Superior.

The following newspaper extracts give a description of the disasters caused by this storm in Ontario and New York.

Collingwood, Ontario, 14th: The steamer "Asia" was lost in the storm on Georgian bay, on Thursday, the 14th, and of one hundred passengers on board only two are known to have survived.

Oswego, New York, 14th: The gale was the most severe of the season. The schooner "Louise" foundered at "Deep Hole," near Port Rowan, Ontario; schooner "John T. Mott," with grain, was driven ashore off Hinkley's Point, Wolf Island; schooner "Mystic Star" was dismantled and damaged to the amount of \$2,000; schooners "Mary Ann Lyden," "Two Brothers," and "Ann'e Minnes" were more or less damaged; schooner "T. R. Merritt" had her sails blown away and was damaged about \$500; schooner "Plow Boy," laden with wheat, was driven into Pultneyville.

The lowest pressures recorded were: Alpena 29.48, Rockliffe, Canada, 29.19, Montreal 29.29.

On the 15th and 16th, the storm-centre moved to the eastward over Maine and the maritime provinces, but with diminishing energy.

Cautionary signals displayed for this storm were justified by the following maximum velocities:

Alpena 37 w., Port Huron 28 w., Detroit 26 w., Toledo 28 sw., Cleveland 25 w., Erie 34 w., Buffalo 40 s., Rochester 56 w., Oswego 25 w., Eastport 42 se., and off-shore 34 nw.; Portland 36 s., and off-shore 28 nw.; Boston, off-shore 35 nw., Provincetown 32 se., Newport, off-shore 35 w., Block Island 30 s., and off-shore 32 n.; New London 27 s., New York, off-shore 28 nw.; Sandy Hook 37 nw., Barnegat 32 nw., Atlantic

City 25 s., Cape May 39 s., and off-shore 32 nw.; Delaware Breakwater, off-shore 28 n., and Chincoteague, off-shore 27 nw.

IV.—On the 22d, there was a sharp fall in pressure on the North Carolina coast, and at midnight there was a well-developed low-area of slight extent west of Hatteras, the lowest barometers along the track being more than 0.25 inch below the mean pressure. On the 23d, the centre of depression moved in a northeasterly track along and near the middle Atlantic coast, when the winds shifted from high southeast to southwest. Cautionary signals displayed along the track of the storm were justified from Fort Macon, North Carolina, to New London, by the following maximum velocities: Fort Macon, 28 sw.; Hatteras, 48 se., and off-shore, 25 n.; Kittyhawk, 28 se.; Cape Henry, 32 e.; Chincoteague, 28 nw.; Delaware Breakwater, 31 nw.; Cape May, off-shore, 40 nw.; Atlantic City, 32 se.; Barnegat, 38 s.; Sandy Hook, 40 n.; New Haven, 25 n.; New London, 28 se.

INTERNATIONAL METEOROLOGY.

International charts iv. and v. accompany the present number of this REVIEW. Chart iv. is published for July, 1880, and continues the series of that chart begun in January, 1877. Chart v. is prepared for October, 1880, and continues the series of that chart begun November, 1877. In the description of these charts, much valuable information has been obtained from the "Monatliche Uebersicht der Witterung," published by Professor Dr. G. Neumayer, Director of the German Marine Observatory at Hamburg, and from the "Bulletin Mensuel," published by Mr. Marc Dechrevens, of Zi-Ka-Wei, China.

Chart iv. exhibits the mean pressure, mean temperature, and the prevailing direction of the wind over the northern hemisphere and at certain isolated stations in the southern hemisphere, as determined from one observation taken each day at 7:35 a. m., or 0:43 p. m. Greenwich mean time.

The lowest mean pressures are shown over British India, the isobar of 29.50 (749.3) occupying the Punjab; southward of that region, the pressure gradually increases, until the isobar of 29.80 (756.9) covers the southern part of the country.

A second area of low-pressure, 29.70 (754.4), occupies Siberia, northeastern Russia, China, and Japan.

The third area, indicated by the isobar of 29.80 (756.9), covers central and southern Russia and Scandinavia. The isobar of 29.90 (759.4) extends from the northern part of North America northeastward over the Atlantic toward Iceland, thence southerly over Ireland, the southern part of England, and over central Europe.

The area of highest pressure, 30.20 (767.1), is found over the Azores, and the isobar of 30.10 (764.5) occupies mid-ocean between the parallels of 40° and 60° north latitude. In the United States, the area of highest mean pressure occupies the Southern states and the north Pacific coast, where the highest pressures were, 30.09 (764.3) and 30.11 (764.8), respectively.

Compared with the preceding month (June), the mean atmospheric pressure over North America shows no material change, except over the region lying north of the fiftieth parallel. In the United States, a slight decrease, ranging from .01 to .03 inch, occurred over Alabama and Georgia; elsewhere, the pressure remained unchanged. A decrease of .10 inch is shown over Hudson's Bay; in Ontario, there was no change, and over the Gulf of Saint Lawrence, the decrease was very slight.

In Europe, the changes of barometric pressure were very slight, and caused no material change in the positions of the isobars, except over Spain, where the mean pressure was about .05 inch below that of the preceding month. In Greenland, the pressure has decreased .10 of an inch, while an increase of .06 inch is shown over Iceland.

In Asia, the mean pressure over Hindostan ranged from .03 to .10 inch above that for June, and in China, Japan, and Siberia, it was .10 inch below the mean for the preceding month.

Compared with the corresponding month of previous years, the pressure was slightly below the normal along the Atlantic

and Gulf coasts of the United States, and westward to the Rocky mountains, except in Ohio and Illinois, where it was about .04 inch above the normal. In the lake region, the pressure was about .05 inch above the normal. In Canada, the pressure was normal.

The following table shows the mean pressure and mean temperature for the month of July, 1880, in the several countries of Europe and Asia, compared with the means as determined from observations taken during the years 1877, 1878, and 1879:

Countries.	Mean Pressure.			Mean Temperature.		
	July, 1877, 1878 and 1879	July, 1880.	Departure.	July, 1877, 1878 and 1879.	July, 1880.	Departure.
Algeria.....	30.03	30.04	+0.01	80.1	89.4	- 0.7
Austria.....	29.89	29.91	+0.02	72.1	79.1	+ 7.0
British Isles.....	29.91	29.89	-0.02	62.6	63.7	+ 1.1
Denmark.....	29.78	28.84	+0.06	62.6	65.5	+ 2.9
France.....	30.02	30.03	+0.01	72.0	76.9	+ 4.9
Germany.....	29.89	29.95	+0.06	68.1	72.5	+ 4.4
India.....	29.58	29.56	-0.02	84.8	82.5	- 2.3
Italy.....	29.96	29.96	normal	80.6	83.8	+ 3.2
Norway.....	29.74	29.77	+0.03	62.8	61.8	- 1.0
Portugal.....	30.05*	30.05	normal	81.3*	77.9	- 3.4
Russia.....	29.75	29.82	+0.07	72.6	75.9	+ 3.3
Spain.....	30.01*	30.01	normal	80.4*	80.8	+ 0.4
Sweden.....	29.74	29.81	+0.07	63.6	65.6	+ 2.0

* Mean for two years only.

The accompanying table shows the deviations in pressure and temperature at isolated stations during the month of July, 1880, as compared with the mean of three years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Pressure.			Mean Temperature.		
	July 1877-78-79.	July 1880.	Departure.	July 1877-78-79.	July 1880.	Departure.
San Jose, Costa Rico, C. A.....	30.00	30.00	normal	68.1	67.1	- 1.0
Gibraltar.....	30.00	30.00	normal	77.9	73.8	+ 0.9
Malta, Mediterranean Sea.....	29.97	29.97	normal	72.5	84.6	+ 2.1
Sandwick Manse, Orkney Islands.....	29.81	29.82	+0.04	55.5	56.6	+ 1.1
Bridgetown, Barbadoes.....	29.99	30.03	+0.04	82.4	81.7	- 0.7
Cape Town, Cape Good Hope.....	30.13	30.24	+0.11	61.1	64.5	+ 3.2
Fort Napier, Native South Africa.....	30.01	30.12	+0.11	67.5	71.1	+ 3.6
Freetown, Sierra Leone.....	30.00	29.85	-0.02	80.8	82.7	+ 1.9
Mauritius, Indian Ocean.....	30.16	30.24	+0.08	71.9	70.0	- 1.9
Melbourne, New South Wales.....	30.14	30.15	+0.01	48.0	47.7	- 0.3
Nassau, Bahamas.....	30.04	30.09	+0.06	83.8	85.0	+ 1.2
Godthaab, Greenland.....	29.80	29.81	+0.01	44.1	46.8	+ 2.7
Stykisholm, Iceland.....	29.78	29.83	+0.05	51.5	55.8	+ 4.3
Thorshavn, Faroe Islands.....	29.76	29.50	-0.14	54.1	54.1	normal
Fort-de-France, Martinique.....	29.88	30.12	+0.34	80.5	79.5	- 1.0
Zi-Ka-Wei, China.....	29.73	29.71	-0.02	78.7	75.6	- 3.1
Athens, Greece.....	29.88	29.89	+0.01	88.3	88.0	- 0.3
Lahore, British.....	29.43	29.43	normal	97.9	84.4	- 13.5
Cagliari, Sardinia, Italy.....	29.97	29.98	+0.01	81.6	83.7	+ 2.1
Tokel, Japan.....	29.88	29.82	-0.06	76.9	73.4	- 3.5
Tromso, Norway.....	29.75	29.81	+0.06	54.7	62.7	+ 8.0
Angra, Azores.....	30.39	30.25	-0.10	72.5	72.1	- 0.4
Funchal, Maderia Islands.....	30.16	30.15	normal	71.8	73.9	+ 2.1
Ponta Delgado, Azores.....	30.38	30.19	-0.14	75.1	75.8	+ 0.7
Archangel, Russia.....	29.69	29.74	+0.05	64.1	65.0	+ 0.9
Tiflis, Russia.....	29.74	29.77	+0.03	84.1	88.9	+ 4.8
Astrakhan, Russia.....	29.79	29.78	-0.01	89.9	89.1	- 0.8
Ekaterinburg, Russia.....	29.65	29.70	+0.05	71.0	70.9	- 0.1
Nukuss, Tookkistan, Asia.....	29.72	29.77	+0.05	90.1	88.9	- 1.2
Tashkend, Tookkistan, Asia.....	29.72	29.65	-0.07	88.1	85.6	- 2.5
Barnaul, Siberia, Asia.....	29.65	29.69	+0.06	76.5	69.4	- 7.1
Yeniseisk, Siberia, Asia.....	29.62	29.74	+0.12	72.6	66.6	- 6.0
Pekin, China.....	29.64	29.71	+0.07	81.3	76.4	- 4.9
Nikolajevsk on the Amoor, Asia.....	30.00	30.08	+0.08	82.8	81.0	- 1.8
San Juan de Puerto Rico, W. I.....	29.76	29.77	+0.01	89.8	86.4	- 3.4
Beirut, Turkey in Asia.....	30.08	30.10	+0.02	56.0	55.0	- 1.0
Mexico, Mexico.....	30.03	30.10	+0.07	82.5	81.6	- 0.9
Havana, Cuba, W. I.....	29.84	30.02	+0.08	82.2	80.7	- 1.5
Navassa, W. I.....	30.03	30.00	-0.03	81.7	82.7	+ 1.0
Paramaribo, S. Guiana, S. A.....	29.80	29.93	+0.13	53.6	52.5	- 1.1
York Factory, B. A.....	29.80	29.93	+0.13	53.6	52.5	- 1.1

In the United States the temperature ranged from 0°.5 to 3°.2 below the normal throughout the country, except along the Atlantic coast, where it was normal; in the Canadian maritime provinces it was slightly above the average; in other parts of Canada it was slightly below.

In Europe the temperature was everywhere above the normal, except in Portugal, where it was slightly below the average.

In British India the temperature was slightly below the average; the highest mean, 91°.4 Fahr. (33° Cent.) was re-

ported from Lahore, and the lowest, 68°.8 Fahr. (20°.4 Cent.), occurred at Belgaum.

The following are some of the extreme monthly mean temperatures reported at isolated stations.

HIGHEST.	Degrees.	LOWEST.	Degrees.
Tiflis, Russia.....	88.9	Godthaab, Greenland.....	46.8
Athens, Greece.....	88.0	York Factory, British America.....	52.5
Nassau, Bahamas, W. I.....	85.0	Tromsoe, Norway.....	52.7
Malta, Mediterranean Sea.....	84.6	Thorshavn, Faroe Island.....	54.1
Freetown, Sierra Leone.....	82.7	Nikolajevsk on the Amoor, Asia.....	61.0

The prevailing directions of the wind in the United States were: From the Rocky mountains eastward to the eighty-sixth meridian, generally southerly; in Texas it was southeasterly; along the Atlantic coast and in the lake region, southwesterly; in New England, northwesterly and southerly; in Canada the winds were mostly southwesterly.

In Europe the prevailing direction was westerly over the entire continent, except in the Scandinavian peninsula, where it was northerly in Norway, and westerly and southeasterly in Sweden; in Algeria the prevailing winds were easterly and southerly.

In British India, the winds were mostly southwesterly, except in the region lying between the eightieth and ninetieth meridians, where they were southerly and easterly. In Japan, the winds were southerly.

Over the north Atlantic ocean, from 35° to 50° north latitude and west of the fiftieth meridian, the prevailing winds were southwesterly; east of the above-mentioned meridian, they were northerly and northeasterly, and on the immediate European coasts, they were westerly and northwesterly.

The rainfall of the month was in excess of the average over the British Isles and northwestern Europe; in the United States, it was in excess of the average along the Atlantic coasts and in the Gulf states; elsewhere there was a deficiency. In the Canadian maritime provinces, a deficiency occurred, and in Ontario, it was in excess of the average.

A noteworthy feature of the month was the prevalence of barometric maxima over the north Atlantic ocean and the absence of severe storms. On referring to the chart of storm-tracks for July, 1880, it will be seen that no storm could be traced across the ocean during that month.

Chart v. exhibits the paths of barometric depressions which have been traced from the daily international charts for the month of October, 1880.

The data are charted for each day of the month on the charts accompanying the "International Bulletin" for that day, and from these charts and additional reports, the movements of the centres of barometric minima are traced.

Twenty-seven of the principal storms occurring over the northern hemisphere have thus been traced. Concerning the general distribution of these depressions, the following is given:

Nine appeared over the United States and Canada. Of these, three were tropical storms, which developed south of latitude 30° N.; six storms have been traced from the interior of the country to the Atlantic coast, and three—numbers iii., iv., and vii.—have been traced as continuous storms across the Atlantic ocean and over Europe.

Fourteen depressions are exhibited over Europe; eight of these traversed the northern part of the continent, while six prevailed in the central and western sections. Of the latter, numbers xvii. and xxii., were unusually severe over the British Isles and northern Germany, and caused great damage to shipping on the North sea, and on the Baltic.

Two depressions are traced in eastern Asia, together with the tracks of three typhoons which occurred during the month.

The following brief descriptions are given of the storms first appearing in the United States and Canada:

I.—This area probably developed in the northwest territories of British America on the 1st, and moved in a southeasterly direction towards Lake Superior, where it was central on the

2d, near Duluth. During that day, the depression crossed lakes Michigan and Huron, attended by rain and generally high winds on the lakes; on the 3d, the course changed to the northeastward, and the centre of disturbance moved down the Saint Lawrence valley, causing unsettled and rainy weather in the Canadian maritime provinces. The depression finally disappeared over Labrador on the 4th.

I a.—This was a storm of cyclonic tendency, which probably developed in the tropics during the last days of September. Owing to the absence of regular reports, the path of the centre is only approximately located, but the disturbance was evidently near Bermuda as a severe storm during the first week of October. The following vessels reports indicate the severity of the storm: On the 1st, the bark "Trelawney," in N. 25°, W. 63°, encountered a severe hurricane; same date, in N. 26°, W. 64°, bark "Marianne" has a hurricane from e. to nw., lasting twelve hours. The brig "Princess," three hundred and fifty miles east of Bermuda, was struck by a hurricane and dismantled; s. s. "Wm. Dickinson," in N. 27°, W. 63° 20', encountered a violent sw. gale, throwing vessel on her beam-ends. The brig "Golden Fleece" reported: October 1st, terrific squalls; with rain, thunder, and lightning; in N. 28° 30', W. 68° 30', every sail blown away, vessel thrown on her beam-ends; at 8:00 a. m. of the 2d, the hurricane-centre passed over the ship, barometer 27.60 (701.0); calm for thirty minutes, after which the wind suddenly shifted to sw. and w., and blew with terrific violence for two hours. On the 2d, the bark "T. K. Weldon," in N. 32°, W. 64°, encountered a hurricane from se., veering to wnw., and lasting four hours, had decks swept and vessel hove on her beam-ends. On the 3d, the bark "Mary S. Gibson," in N. 34°, W. 57°, had a hurricane, vessel badly damaged; bark "Matteo," in N. 37°, W. 58°, terrific hurricane, beginning at se. and veering to nw.; tremendous high sea. Reports from numerous vessels within five hundred miles of Bermuda, indicate that the storm raged with great violence until the 6th or 7th, nearly all vessels reporting loss of sails and spars.

II.—This depression appeared near Moose Factory on the 5th, and moved in an east-southeasterly direction down the Saint Lawrence valley. On the 6th, the centre of disturbance was near Father Point; crossing the Gulf of Saint Lawrence during the 6th and 7th, the depression apparently disappeared to the northward of Newfoundland on the latter date.

III.—An area of low-pressure remained nearly stationary over Dakota from the 7th to the 9th, but on the appearance of an area of high barometer on the Pacific coast, the depression moved northeastward on the last-mentioned date and by the 10th, was central near Lake Superior. During the 11th and 12th, the storm moved over Canada, with its centre probably to the north of the stations of observation, the course then changed to the southeastward and on the 13th, the depression passed the southern extremity of Newfoundland. During the 14th and 15th, the disturbance remained central, as a severe storm near the Banks of Newfoundland; the following vessel reports indicate the severity of the storm during these days: 14th, s. s. "Ethiopia," in N. 45° 20', W. 52° 42', fresh se. gale, heavy sea; s. s. "Lamperts," off the Banks, severe ne. to nw. gale, lasting twenty-four hours; brig "B. T. Nash," in N. 43°, W. 55°, heavy nw. gale, lost deck load. 15th, schooner "Annie J. Marshall," in N. 45°, W. 50°, hurricane from sse., veering to nw. by e., lasting sixteen hours; s. s. "Ethiopia," in N. 43°, W. 57°, strong nw. to wnw. gale, heavy sea. On the 16th, the storm was central near N. 50°, W. 45°, the s. s. "Hibernian," in N. 49° 30', W. 45° 08', reporting barometer 29.05 (737.9), wind ese., force 4, cloudy; s. s. "Indiana," in N. 51° 06', W. 36° 20', barometer 29.67 (753.6), wind sse., force 5. On the 17th, the depression, moving in an east-northeasterly course, was probably central south of the fiftieth parallel, and about W. 35°. The s. s. "Hibernian," in N. 50° 22', W. 39° 22', reported barometer 29.40 (746.7), wind e., force 2, and the s. s. "Bristol City," in N. 50° 30', W. 30° 00', reported heavy sse. gale, lasting twenty-four hours. The

storm continued its easterly movement during the 18th and 19th, and on the 20th was central near the mouth of the English Channel, attended by moderate gales and a decided fall in temperature over the British Isles, the minimum temperatures of the month having occurred during the prevalence of this area. The subsequent course of this depression is described as low-area xvii.

IV.—This disturbance developed in the Gulf of Mexico during the 5th or 6th, and passed northeastward, with its centre to the north of Cuba, but at too great a distance to exert any decided influence over that island. On the 8th, the depression was off the Florida peninsula, attended by strong southeasterly gales and very heavy rains along the Atlantic coast. On the 9th, the disturbance, moving northeastward, was central off the North Carolina coast; the bark "Belle Wooster," in N. 33°, W. 76°, reported having encountered a cyclone from se. to n., lasting nine hours, and the schooner "Almeda Willey," in N. 32° 23', W. 79° 50', a heavy ssw. gale. During the 9th and 10th, the storm moved eastward toward Bermuda, and the centre was probably to the southward of that island on the last-mentioned date, causing extremely heavy rains and fresh ne. gales. The storm-centre appears to have moved rapidly northeastward, and on the 11th, was in N. 32°, W. 52°; the bark "Adeline Gibbs" reported on that day, in N. 32° 00', W. 52° 10', heavy ese. gale; ran into a calm, lasting fifteen minutes, when the wind suddenly shifted to n., blowing with hurricane force for two hours, after which it moderated to a strong gale. On the 12th, the s. s. "Oder," in N. 44° 48', W. 50° 56', reported, heavy gale and high sea, "hurricane-centre passing south of us"; on the same day, the s. s. "Republic," in N. 45° 43', W. 40° 01', reported, barometer 29.52 (749.8), wind ene., force 8. On the 13th, the disturbance was central near N. 45°, W. 30°, the s. s. "Republic," in N. 47° 31', W. 34° 01', reporting, barometer 29.69 (754.1), wind nne., force 5. During the 14th and 15th, the depression appears to have moved northward and gradually filled up, finally disappearing in about N. 55°. Reports from vessels near Bermuda, indicate that a secondary depression gradually developed during the 11th and 12th, and increased in energy until the 15th, as low-area iv. moved eastward.

V.—This depression was first observed in Dakota, and, moving northeastward, was central in Minnesota on the 14th. During that day and the following, the disturbance moved rapidly towards Hudson's Bay, causing high winds on the lakes.

VI.—This disturbance first appeared in Kansas, where it was central on the 15th, with an area of high pressure in its rear, covering Arizona, New Mexico, Utah, Idaho and parts of Dakota and Colorado. The depression developed increased energy as the centre moved eastward, and in Iowa this storm was reported to have been one of the most violent experienced in that state during a period of twenty years. During the 15th the storm-centre moved north-northeastward and on the 16th was in Minnesota, the lowest pressure reported being 28.85 (732.8) at Saint Paul, and the barometric gradient having rapidly increased. Heavy snow occurred in rear of the depression, while equally heavy rains fell in advance of the centre. During the 16th the storm continued with great violence in the lake region, causing much damage to shipping and other property. By the 17th the centre of disturbance had crossed Lake Superior and was in Ontario; during the day it moved eastward, with increasing pressure and attended by occasional high winds and rain and snow squalls. On the 18th the depression passed into Labrador, where it finally disappeared.

VII.—This depression first appeared over the Atlantic ocean, off the North Carolina coast. On the 21st, the schooner "City of Chelsea," in N. 32°, W. 77°, reported heavy ene., veering to nw. gale, with high sea. On the 22d, the storm-centre was north of Cape Hatteras, causing strong gales along the middle Atlantic and New England coasts. The bark "America," in N. 39°, W. 73°, reported heavy ne. gale and high sea during the day; at 7:30 p. m., the wind shifted to nnw., blowing with

hurricane force for two hours. On the 23d, the centre of disturbance was off the New England coast, causing strong gales and heavy rain in the maritime provinces of Canada. The following vessel reports indicate the severity of this storm over the ocean: 22d, the ship "Nevada," in N. 42° 30', W. 62° 00', reported high barometer, with moderate breezes and fine weather during the day; toward night a gale suddenly began from se. to sse.; at midnight the wind had increased to hurricane force, lasting twelve hours. The s. s. "Compton," off George's Bank, encountered a sse. gale with heavy rain, afterwards increasing to a violent hurricane. The s. s. "Titania," about two hundred miles east of Halifax, reported fine weather until the 22d; from 10:00 a. m. to 3:00 p. m. of the 23d, experienced tremendous hurricane, moderating at 8:00 p. m.; s. s. "Newham," in N. 41° 35', W. 68° 10', heavy se. gale with high confused sea. On the 24th, the depression was central near the mouth of the Saint Lawrence, attended by high winds and heavy rain; crossing the Gulf of Saint Lawrence and Newfoundland on the 24th, the storm-centre reached the fiftieth meridian on the 25th. On the 26th, the s. s. "Germania," in N. 47°, W. 45°, reported moderate e. gale with rain, and the s. s. "Allemania" in N. 47°, W. 36°, reported strong ene. gale. During the 26th and 27th, a large area of low barometer covered mid-ocean, between N. 40° and N. 50°; and the centre of lowest pressure appears to have moved rapidly towards the European coasts, attended by strong easterly gales in the northern quadrants. On the 28th, the disturbance appeared off the southwest coast of England, as a very violent and destructive storm, and is hereafter described as low area xxii.

VIII.—This depression appeared in Dakota on the 25th; during the day the centre moved eastward to the lake region. Crossing Lakes Huron and Michigan, the disturbance was central in Ontario on the 26th; passing thence eastward, the depression moved over the maritime provinces, causing rain and snow along the Saint Lawrence. On the 27th, the disturbance moved eastward with decreasing energy and appears to have dissipated over the ocean. The s. s. "Mosel," in N. 42°, W. 59°, reported fresh nnw. to n. gale and high sea, on the 27th.

IX.—This storm developed in the tropics and was central in the Gulf of Mexico on the 28th. On the 29th, the centre of disturbance was in Alabama, attended by high winds and heavy rains throughout the Atlantic coast districts. On the 30th, the depression moved northeastward in a line parallel to the coast, and on the 31st was central in northern Maine. Strong gales and heavy rain occurred in the Canadian maritime provinces, as the centre moved toward the Saint Lawrence.

The following descriptions are given of the storm appearing over Europe:

X.—This is a continuation of low-area xxi. of the September chart. Moving southeastward from northern Norway, the depression was central near the White sea on the 1st. On the 2d, the storm moved to the northeastward of Archangel and disappeared in the Arctic regions.

XI.—This depression developed over the northern part of the North sea on the 1st, and moved over southern Sweden on the 2d, causing cloudy weather and rain and a fall in temperature over the northern part of the British Isles and Denmark. On the 3d, the disturbance crossed the Baltic, where it was central on the 4th; on the 5th, it moved over Russia, and continued its easterly course until the 7th, when it disappeared in the valley of the Obi.

XII.—This is a continuation of low area viii. of the September chart; central as a severe storm over the Azores on October 1st, the depression moved slowly northeastward during the 2d, 3d, and 4th, and was central over the Bay of Biscay on the latter date. On the 5th the disturbance moved over the English Channel, attended by rain near the centre, and cold northeasterly gales in the northern quadrants. On the 6th the depression appeared central over the North sea; moving eastward, the disturbance was near the eastern shore of the Baltic on the 7th, the pressure in rear of the disturbance increas-

ing very slowly. On the 8th the centre was in Russia, and on the 9th it moved eastward into Siberia, barometer at Ekaterinburg reading 29.58 (751.4), calm; raining. During the 10th and 11th the depression continued its easterly movement and disappeared in northeastern Siberia on the 12th.

XIII.—This depression appeared off the northwestern coast of France on the 7th, and moved slowly toward the channel during the 8th and 9th. During these days, there was a general increase of pressure to the north and south of the centre of disturbance, thereby causing steep gradients over the British Isles. Strong easterly to northeasterly gales occurred in the channel and unusually heavy rains fell in the southern and eastern parts of England. The depression appears to have remained nearly stationary over northwestern France from the 8th to the 10th; on the 11th, the centre of disturbance apparently moved southeastward through France, with rapidly increasing pressure in its rear. On the 12th, the depression was shown in Italy; on the 13th, the course changed to the northeastward and the disturbance moved into Austria, after which it ceased to exist as a depression.

XIV.—This disturbance developed in the west of Greenland on the 8th, and moved eastward during the 9th and 10th, on which date the centre appeared near Iceland, barometer at Stykkisholm reading 29.53 (750.0). The depression moved rapidly eastward, and on the 11th was central off the northern part of Norway; on the 12th, the area moved over Lapland and the White sea, its course changing slightly to the southward. During the 13th and 14th, the disturbance continued to move by an east-southeasterly course through Russia, and on the 16th, the course changed to northeasterly, and the depression disappeared in the valley of the Obi on the 17th. After the passage of this depression, generally high-pressures prevailed over Greenland throughout the month.

XV.—During the 14th, the pressure decreased in southern Sweden and by the 15th, a well-defined area of low-pressure covered the Baltic, causing westerly to northwesterly gales over the North sea, Norway, and Denmark. Moving eastward, the depression appears to have filled up near the Gulf of Finland on the 16th.

XVI.—This area appeared in northern Scandinavia on the 17th, and moved in a southeasterly course through Sweden, attended by rain and snow over the Gulf of Bothnia. On the 18th, the centre of disturbance was in southern Sweden, attended by generally cloudy weather, and rain or snow and slightly lower pressures over Germany and parts of the British Isles. On the 19th, the disturbance moved northeastward, and disappeared over the Arctic ocean on the 20th.

XVII.—This is a continuation of the storm traced across the Atlantic ocean as low-area iii. of the present chart. Central off the mouth of the English Channel on the 20th, the depression moved northeastwardly, attended by a decided fall in temperature, and rain and snow over the British Isles and northern and western France, and fresh to strong winds in the western quadrants. The fall of snow was unusually large in the southern part of England. The disturbance developed great energy during its passage along the European coasts, from Brest to Memel; during the night of the 20th—21st, the wind reached a velocity of forty to seventy miles per hour, at stations in northern Germany, and along the shores of the Baltic, the lowest pressure, 28.71 (729.3), was reported from Memel on the 21st. Several buildings were damaged and many trees uprooted, while shipping suffered considerably. By the 22d, the disturbance had passed into Russia, with its centre to the northwest of Kasan, barometer at that station, 28.99 (735.4), wind sw. During the 23d and 24th, the storm appears to have followed a northeasterly course towards Siberia, disappearing on the latter date. This was one of the most important storms of the month, and appears from the force and circulation of the winds, to have possessed the characteristics of a tropical hurricane.

XVIII.—This depression appeared central near the Azores on the 20th, and moving northeastward, appeared over the Bay

of Biscay on the 22d, with its centre near Brest, where the pressure was 29.40 (746.7). Heavy rain fell in advance of the centre, over the English channel and northwestern France, accompanied by a general rise in temperature over the districts named. On the 23d, the depression passed eastward into central Germany; moving in an east-southeasterly course through Austria, the depression was shown in Russia on the 24th, with its centre near Nikolaiev. The area then moved northeastward and disappeared in eastern Russia on the 25th.

XIX.—This was a depression which appeared in Sweden on the 24th, and crossed the Gulf of Bothnia, disappearing in Finland on the following day.

XX.—This disturbance developed over the North Sea, north of Scotland, on the 24th, and moved southeastward, causing a rapid fall in barometer over Scotland on the 25th. On the 26th, the disturbance appeared over Denmark, with generally heavy rains and slightly higher temperature over the British Isles, Germany and northern France. On the 27th, the area of low-pressure, having crossed the Baltic, was shown near Saint Petersburg; passing thence northeastward, it disappeared in northeastern Russia on the 28th.

XXI.—This was probably a subsidiary depression, which formed off the British coasts on the 26th and 27th, in advance of low area xxii., with which it merged on the 28th.

XXII.—This is a continuation of the tropical hurricane traced across the ocean as low-area vii., and was one of the most disastrous storms ever experienced in Europe. During the 26th and 27th, the barometer remained low and falling over the British Isles and western Europe, and generally unsettled weather prevailed, with a general rise in temperature. On the 28th, a deep depression—28.80 (731.5)—appeared off the southwest coast of England, with unusually heavy rains in England and snow in Scotland. Very heavy northeast to southwest gales prevailed over the British Isles and on the eastern shores of the North sea; on the 29th, the depression moved eastward over the North sea, accompanied by heavy rain and violent northerly and easterly gales and snow in the northern quadrants. On the 30th, the disturbance moved northeastward, with slowly increasing pressure along the shores of the Baltic, and on that day was central near Saint Petersburg, where it remained as an area of low-pressure at the end of the month. After the passage of this depression the pressure quickly recovered over the British Isles, France and Germany, and at the close of the month, an area of high barometer occupied central Europe; northwesterly winds with considerably lower temperature prevailed, and frost was reported throughout England. This storm caused great damage to shipping along the shores of the North sea and Baltic, and the heavy rains caused floods in the inland counties of England. More than one hundred and sixty vessels were reported to have been wrecked on the British coasts alone, and many lives were lost.

XXIII.—This depression appeared over northern Scandinavia on the 30th, and moving southeastward, probably united with the preceding depression, number xxii, forming an area of low pressure which occupied northern Europe at the close of the month.

Of the storms appearing over eastern Asia, the following descriptions are given:

XXIV.—This depression probably developed in northwestern China, on the 23d, and moving slightly south of east, was central near Vladivostock on the 24th, accompanied by strong southeasterly gales, which caused much damage. On the 25th, the depression crossed the sea of Japan, the s. s. "Appin," in N. 39° 06', E. 131° 12', reporting, barometer at noon, 29.48 (748.8), sse. force 10, thunder and lightning and heavy rain; at 1.15 p. m., barometer stationary, wind w., force 10. On the 26th, the disturbance crossed the northern part of Nippon and disappeared eastward over the Pacific ocean. Owing to lack of data this is the only storm that appears on the daily international charts of the Signal Service, but Mr Marc Dechrezens, Director of the Zi-Ka-Wei observatory, states that several depressions traversed the northern part of China during

the month, and were generally more or less violent during their prevalence.

XXV.—This disturbance first appeared in Tartary on the 4th or 5th, and moving eastward was probably the storm that occurred over the Aleutian islands on the 5th. The Signal Service observer at Attou island (N. 52° 38', E. 172° 30') reported that a terrific storm occurred on the 5th, carrying away the anemometer and wind-vane, and unroofing the office building. The storm was accompanied by torrents of rain; barometer (corrected for temperature and instrumental error only) 29.67 (753.6) to 29.15 (740.4). The disturbance probably passed northeastward, causing a rapid fall in the barometer at Sitka, Alaska, during the 5th and 6th, with wind changing to westerly.

XXVI.—There was a decrease of pressure at Fort Saint Michael's, Alaska, on the 25th; and on the 26th and 27th, a severe storm prevailed along the Alaskan coast. On the 26th, the barometer at Sitka read 28.78 (731.0), wind se., force 8; several shocks of earthquake were felt during the storm. The s. s. "Princess Alice," near Fort Wrangel, reported: 26th, 2:00 a. m., heavy ese. gale, steamer just making headway; at 6:00 a. m., barometer 29.00 (736.6), heavy squalls; 7:00 a. m., 28.70 (729.0), ship hove-to; 7:30 a. m., 28.60 (726.4), heavy rain, with terrific squalls, ship unmanageable; 8:45 a. m., barometer 28.58 (725.9); a little patch of blue sky became visible in the south, and the barometer began to rise, the wind shifting suddenly to south, and the sky clearing. 27th, barometer 29.44 (747.8), snow squalls; 11:00 a. m., southerly gale and heavy rain. The depression probably passed eastward, and was shown over Hudson's Bay on the 28th and 29th.

XXVII.—This is a storm which occurred in the Pacific ocean near N. 15°, W. 120°, during the 2d and 3d. The ship "Lorenzo," in N. 14° 23', W. 120° 18', reported: October 2d, encountered a cyclone, beginning at northwest and ending at southeast, lasting twenty-four hours; vessel lost fore and main-topmasts, and a number of sails. The schooner "Sadie F. Caller," in N. 15° 20', W. 119° 58', reported: October 3d, 8:00 a. m., barometer 30.00 (762.0), wind increasing and weather threatening; 11:30 a. m., strong wnw. gale, very high sea, barometer oscillating between 29.90 (759.4) and 29.80 (756.9); at noon, ship under bare poles, wind hauled more to the westward and freshened to a violent gale, barometer 29.40 (746.7), and falling. At 4:00 p. m., wind blowing with hurricane force from wnw., tremendous sea running, decks swept and bulwarks stove, barometer 29.25 (742.9), and falling rapidly; 4:30 p. m., barometer 29.10 (739.1), and still falling. At 5:00 p. m., it suddenly fell calm, and the weather cleared up for a few minutes, sea very high and ship unmanageable; 5:30 p. m., a heavy sea broke on board, sweeping the decks of every thing movable and damaging the rudder, barometer 28.90 (734.0), falling; at 8:00 p. m., barometer 28.80 (731.5), wind blowing with increased force. At 10:30 p. m., the gale began to abate, and the barometer rose almost simultaneously; at 6:00 a. m. of the 4th, the wind hauled to ese.; moderately fine weather and sea going down fast; barometer 30.26 (768.6).

The following descriptions of the typhoons of October, 1880, are given, supplemented by notes from the "Bulletin Mensuel," published by Mr. Marc Dechrezens, of Zi-Ka-Wei, China.

I.—This was the most destructive typhoon of the season, and great loss of life and property occurred during its passage over Japan. The disturbance was first encountered by the ship "Cilurnum" (which vessel also experienced the typhoon of September 25th–28th) on September 30th, in about N. 30°, E. 131°, wind ne. by e., force 8, (Beaufort scale), high se. sea, barometer falling. On October 1st, the vessel, having lost sails and sustained other damage, appears to have been blown towards the centre; at noon of the 1st, her position was N. 29° 11', E. 132° 20', barometer 29.63 (752.6), wind ne., force 10. During the 2d, the wind increased to force 12, and the barometer fell to 27.88 (708.1); at this time, the vessel was on her beam-ends, with sea making a clean breach over her, steer-

ing gear disabled, and masts and sails broken or cut away. On the morning of the 3d, the wind suddenly changed to north-west, and moderated to force 11, barometer rising; during that day and the following, the wind gradually moderated and the barometer rose steadily. The reports of vessels encountering the typhoon were sufficiently numerous and complete, to admit of the accurate tracing of the movement of the centre along the coast of Japan. Owing to lack of space, these reports cannot be given in detail, but all report hurricane winds and very high seas, in which the ships sustained more or less damage. On land, the typhoon was equally disastrous in its effects. The centre passed Tokio at 2:00 a. m. of the 4th (local time); the wind reached a velocity of seventy miles per hour from the northwest, increasing suddenly at 2:00 a. m., to a velocity of one hundred miles per hour. More than 1,000 houses were completely demolished and 2,000 were more or less damaged; twenty-eight persons were killed, and sixty were injured, many seriously. The largest trees were uprooted and all gardens destroyed; at Shiba, the streets were strewn with branches of trees and other debris, and large numbers of birds were killed by the fury of the storm. An immense scaffolding, used in the building of the temple of Hijio-Honto, was blown down, the debris forming a mass more than one hundred feet high. At Yokohama, Kobé and at many villages in the interior, the loss of life and property was very great, many bridges were swept away, and vessels in the harbors dragged their anchors and were driven out to sea. The precipitation attending the typhoon was very heavy, the rainfall at Tokio, amounting to 4.61 inches (117 m. m.) After the passage of the centre over Tokio, the barometer rose rapidly and the typhoon disappeared over the ocean on the 5th. Its progressive movement was about nineteen miles (thirty-five kilometres) per hour; and its diameter, from southwest to northeast, was about one hundred and fifty miles when near Tokio.

II.—This typhoon first appeared to the eastward of Luzon, on the 10th, and moved in a westerly direction towards the coast of China. It entered the China sea by the channel of Bashee, between Luzon and Formosa, on the 12th, and reached the island of Hainan on the 16th, and the Gulf of Tonquin on the 17th. The typhoon was very violent during its passage over the sea, as indicated by the following vessel reports. The ship "James Bailey," which left Hong-Kong on the 14th, reported barometer 29.84 (757.9), wind ne.; at noon of the 15th, the barometer read 29.10 (739.1), wind blowing furiously from the east; at midnight, barometer 28.50 (723.9), wind sw. At 3:00 a. m. of the 16th, the sails were blown from the yards and the wind had increased to a hurricane, and at 4:00 a. m. the foretop-gallant and main-royal masts broke off, and three men were washed overboard. During the next twenty-four hours the wind travelled round the compass, no less than four times, and at 6:00 p. m. of the 17th, the vessel drove ashore on Hainan Sands. The French ship "Taffar-ette," which left Hong-Kong on the 11th, was also wrecked on Hainan reefs. At 1:00 a. m. of the 16th, a tremendous squall struck the vessel, throwing her on her beam ends, the main-mast was cut away to right the ship, when terrific seas broke on board, sweeping the decks. After the violent squall, it became calm suddenly, the sky was clear above the vessel, but the horizon was covered with dense black clouds, and the sky was brilliantly lighted by the vivid lightning which appeared to start from the zenith. The calm lasted twenty minutes, during which time, the barometer oscillated between 27.87 (718) and 28.74 (730), the calm was followed by a terrific squall from the northwest, which hove the vessel down. On the 19th, the ship was abandoned, being a total wreck. The ship "John A. Briggs" left Hong-Kong on the 10th, and the 13th encountered a hurricane from all points of the compass, and lasting twelve hours, with an intermission of two hours, afterwards fresh ne. winds prevailed.

III.—This typhoon apparently developed on the 24th, the circulation of the winds at Manila indicating that the disturbance was southwest of Luzon on that day. The typhoon moved

slowly northward during the 25th, 26th, and 27th; on the 28th, the disturbance was south of Formosa, and on the 29th, it was over the Channel of Bashee, disappearing on the following day to the eastward of Formosa. The lowest barometer reported was at Takao, Formosa, 29.69 (754.0), on the 28th. The only vessel report of this typhoon is the following: 26th, in N. 18° 19', E. 120° 00', the ship "Joseph Hayden" encountered typhoon winds from the northeast, with very heavy sea from the north-northeast, lasting three days.

TEMPERATURE OF THE AIR.

The distribution of mean temperature over the United States for the month of September, 1882, is exhibited on chart number ii., by the dotted isothermal lines. The table of mean comparative temperatures in the lower left-hand corner of the chart, shows the average temperature for the month in the several districts, as determined from observations taken at Signal Service stations during the month of September in previous years. The second column shows the mean temperature for the current month; the third column shows the departures of the mean of the current month from the mean of several years. East of the one-hundredth meridian and south of the thirty-seventh parallel of latitude, the temperature ranges from normal in the south Atlantic states to 6°.3 below in the southern slope. West of the one-hundredth meridian and south of the forty-second parallel, the temperature is also below the normal, but the departure is less marked, the range being from 0°.2 in the south Pacific coast region to 2°.8 in the southern plateau district. In the northern sections of the country from the Pacific coast to New England the temperature is generally above the normal, the greatest departure (3°.3) occurring in the extreme northwest; in the Ohio valley, the temperature is normal; on the summit of Mount Washington, 1°.9 above; and on the summit of Pike's Peak, 2°.1 below.

DEVIATIONS FROM MEAN TEMPERATURE.

Under this heading, departures exhibited by the reports, from the regular Signal Service stations, are shown in the table of comparative temperatures, on the left-hand side of chart number ii. The following items of interest, in connection with this subject, are reported by voluntary observers:

Illinois: Riley, mean temperature, 60°.6, or 0°.4 above the September average for the past twenty-one years. Swanwick, mean temperature, 65°.5, or 3° below the September average.

Indiana: Vevay, mean temperature, 69°.12, is about the September average of the past seventeen years. Saint Meinrad, mean temperature, 62°.8, or 0°.5 below the September average of the past seven years. The maximum temperature of the month, 87°, is 3° below the mean maximum temperature, and the minimum, 49°, is 3°.6 above the mean minimum temperature of September for the past seven years.

Iowa: Clinton, mean temperature, 61°.6, is about the September normal.

Kansas: Lawrence, mean temperature, 69°.3, or 3°.17 above the September average of the past fourteen years. During that period, the highest September mean, 70°.59, occurred in 1881; the lowest 62°.37 occurred in 1868. The maximum temperature of the month, (105° on the 12th,) is the highest recorded during the past fourteen years; the next highest maximum temperature, 91°, occurred in 1881. Wellington, mean temperature, 67°.5, or 1°.7 below the average of the past three years. The mean temperature of the ten days from September 11th to 20th, 76°.7, has been exceeded but once during the present year: viz.: from June 21st to 30th, when the mean was 79°.9. Clay Centre, mean temperature, 68°.9, or 1°.6 below the average of the past two years.

Maine: Gardiner, mean temperature, 59°.09, or 0°.51 above the September average of the past forty-six years.

Maryland: Fallston, mean temperature, 66°.27, or 0°.71 above the September average of the past eleven years. During that period, the highest September mean, 74°.55, occurred in 1881; the two lowest, 61°.27 and 61°.28, occurred in 1871 and 1879, respectively.