

in the Gulf states they were variable; on the California coast they were west, except southeast at Cape Mendocino.

TOTAL MOVEMENTS OF THE AIR.

[In miles.]

In the following table are given the stations reporting the largest and smallest total movements of the air in each of the various districts :

Districts.	Stations reporting largest.	Miles.	Stations reporting smallest.	Miles.
New England.....	Block Island, R. I.....	13,502	New London, Conn.....	6,033
Middle Atlantic states.	Del. Breakwater, Del.....	14,133	Lynchburg, Va.....	3,859
South Atlantic states.....	Hatteras, N. C.....	14,708	Augusta, Ga.....	2,647
Florida peninsula.....	Punta Rassa.....	8,210	Cedar Keys.....	6,805
East Gulf.....	Starkville, Miss.....	6,961	Mobile, Ala.....	4,442
West Gulf.....	Indianola, Tex.....	9,801	Denison, Tex.....	4,133
Rio Grande valley.....	Brownsville, Tex.....	7,061	Eagle Pass, Tex.....	4,134
Ohio valley.....	Champaign, Ill.....	11,486	Cincinnati, Ohio.....	5,254
Tennessee.....	Knoxville.....	5,942	Memphis, Tenn.....	4,891
Lower lakes.....	Sandusky, Ohio.....	11,824	Detroit, Mich.....	7,025
Upper lakes.....	Milwaukee, Wis.....	10,389	Chicago, Ill.....	6,704
Extreme northwest.....	Moorhead, Minn.....	9,901	Bismarck, Dak.....	7,193
Upper Mississippi valley	Saint Louis, Mo.....	8,530	Dubuque, Iowa.....	3,580
Missouri valley.....	Huron, Dak.....	7,393	Yankton, Dak.....	5,726
Northern slope.....	Cheyenne, Wyo.....	7,438	Helena, Mont.....	4,460
Middle slope.....	Fort Elliott, Tex.....	8,649	Denver, Colo.....	3,928
Southern slope.....	Fort Stockton, Tex.....	6,541	Fort Davis, Tex.....	4,830
Southern plateau.....	Santa Fe, N. Mex.....	6,839	Silver City, N. Mex.....	2,576
Middle plateau.....	Salt Lake City, U. tah.....	5,010	Pioche, Nev.....	4,136
Northern plateau.....	Eagle Rock, Idaho.....	5,759	Lewiston, Idaho.....	1,732
North Pacific.....	Portland, Oreg.....	2,750	Olympia, Wash.....	92
Middle Pacific.....	Cape Mendocino, Cal.....	*10,606	Sacramento, Cal.....	4,688
South Pacific.....	San Diego, Cal.....	4,288	Visalia, Cal.....	2,489

* Record from 1st to 26th, inclusive.

On the summit of Mount Washington, New Hampshire, the total movement was 34,800, which is the largest monthly movement ever recorded at this station, but the average daily movement was 34.6 miles less than for the twenty-eight days of February.

HIGH WINDS.

On the summit of Mount Washington, New Hampshire, velocities exceeding 50 miles per hour were recorded on every day of the month, with the exception of the 21st, 23d and 27th, and they exceeded 75 miles per hour as follows: 84, nw., 5th; 80, se., 6th; 100, nw., 7th; 112, nw., 8th; 84, e., 10th; 108, nw., 11th; 92, nw., 12th; 80, nw., 13th; 96, w., 14th; 114, nw., 15th; 84, w., 18th; 100, sw., 19th; 80, s., 20th; 92, nw., 24th; 150 (maximum) nw., 25th; 80, nw., 28th.

On the summit of Pike's Peak, Colorado, the highest velocity, 76 miles, nw., occurred on the 18th, when the anemometer was broken. No record was kept from the 1st to 3d inclusive, or after the 18th.

At Cape Mendocino, California, a hurricane began on the 25th and continued with great violence until the 28th. A wind-velocity of 66 miles per hour was recorded at 5.35 p. m. of the 25th, when the anemometer was blown away, the wind attaining an estimated velocity of 100 miles. During a lull in the storm, the instrument was replaced, but was again blown away on the 26th; the velocity at this time was probably not less than 125 miles—80 miles having been recorded before the instrument was broken. During an abatement in the storm on the morning of the 29th, the anemometer was again replaced, but at 1.15 p. m. was broken after recording 76 miles. On this date the storm reached its maximum violence at about 8.15 p. m., when the velocity of the wind was estimated at 100 miles per hour.

Other high winds have been reported as follows:

Kittyhawk, North Carolina, 60, n., 15th and 16th; 53, ne., 20th; 56, ne., 26th and 27th. Portsmouth, North Carolina, 56, nw., 16th; 69, ne., 26th; 49, ne., 27th. Hatteras, North Carolina, 52, ne., 16th; 60, ne., 26th. Billings, Montana, 60, nw., 17th. Fort Assiniboine, Montana, 50, w., 17th. Fort Benton, Montana, 52, ne., 17th. Fort Shaw, Montana, 52, sw., 17th. Fort Maginnis, Montana, 52, nw., 6th. Fort Elliott, Texas, 52, nw., 18th. Fort Stevenson, Dakota, 64, n., 9th. Bismarck, Dakota, 50, nw., 9th. Fort Bennett, Dakota, 60, nw., 9th. Indianola, Texas, 54, ne., 7th. Galveston, Texas, 61, n., 13th. Champaign, Illinois, 51, n., 18th. Block Island, Rhode

Island, 55, ne., 10th. Cape May, New Jersey, 56, nw., 11th; Delaware Breakwater, Delaware, 52, nw., 7th. Cape Henry, Virginia, 52, nw., 15th.

LOCAL STORMS.

Galveston, Texas, 13th.—A gale began at 2.34 p. m., the wind reaching a velocity of sixty-one miles. The storm was apparently of local character, and resulted in no damage in this locality.

New Orleans, Louisiana.—A storm began at 1 p. m., accompanied by heavy rain; the wind attained its highest velocity at 3.10 p. m., blowing down fences, trees, etc., and doing other damage.

Fort Yates, Dakota, 8th.—During a storm of this date the instrument-shelter was blown from the building, for a distance of fifty yards.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for March, 1883, with the telegraphic reports for the succeeding twenty four hours, shows the general average percentage of verifications to be 90.27 per cent. The percentages for the four elements are: Weather, 90.66; direction of the wind, 88.47; temperature, 91.66; barometer, 90.28 per cent. By geographical districts, they are: For New England, 88.31; middle Atlantic states, 89.54; south Atlantic states, 90.59; eastern Gulf, 92.76; western Gulf, 91.14; lower lakes, 90.93; upper lakes, 88.38; Ohio valley and Tennessee, 91.37; upper Mississippi valley, 89.46; Missouri valley, 89.75; north Pacific, 89.29; middle Pacific, 95.65; south Pacific, 94.57.

There were eighty-two omissions to predict (twenty-six being due to the absence of reports from the Pacific coast) out of 3,813, or 2.15 per cent. Of the 3,731 predictions that have been made, fifty-nine, or 1.47 per cent., are considered to have entirely failed; fifty-three, or 1.42 per cent., were one-fourth verified; three hundred and nineteen, or 8.55 per cent., were one-half verified; four hundred and thirty-five, or 11.66 per cent., were three-fourths verified; 2,869, or 76.90 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During March, 1883, one hundred and seventeen cautionary signals were displayed. Of these, one hundred and fifteen, or 98.3 per cent., were justified by winds of twenty-five miles per hour or more, at or within one hundred miles of the station. Thirty-two cautionary off-shore signals were displayed, twenty-seven of which, or 84.4 per cent., were justified, both as to direction and velocity; twenty-eight, or 87.5 per cent., were justified as to velocity, and thirty, or 93.8 per cent., were justified as to direction. Two "northwest" signals were displayed, both of which were justified. Forty-seven cautionary signals were changed to off-shore signals. One hundred and fifty-one signals of all kinds were displayed, and one hundred and forty-four, or 95.4 per cent, were fully justified. These do not include signals ordered at display stations, where the velocity of the wind is estimated only. Two signals were ordered late.

One hundred and thirty winds of twenty-five miles or more per hour were reported, for which signals were not ordered; many of these were high local winds or strong sea-breezes.

NAVIGATION.

STAGE OF WATER IN RIVERS.

The upper Mississippi river remained frozen during the month at St. Paul, Minnesota, and at La Crosse, Wisconsin, but at the latter station, observations were made by clearing the ice from the river-gauge, from the 1st to 5th, and from the 13th to 19th. At Davenport, Iowa, observations were made daily after the 18th. The highest stages at Keokuk, Iowa and Saint Louis, Missouri, were observed on the 1st. At stations below Cairo, Illinois, this subject is considered under the heading of Floods.

In the Missouri river, at Leavenworth, Kansas, the highest

stage occurred on the 27th, being nine feet, seven inches below the danger-line. At Omaha, Nebraska, the river was frozen from the 1st to 9th, after which observations were made daily, the highest stage being observed on the 25th. At Yankton, it was frozen from the 1st to 4th, and on the 11th, 12th and 13th.

The Ohio river was highest at Pittsburg, Pennsylvania, on the 1st and 31st, and at Cincinnati, Ohio, and Louisville, Kentucky, on the latter date.

At Pittsburg, on the 31st, a sudden rise of over eight feet occurred, sinking several coal barges and one steamer. The losses entailed are estimated at \$50,000.

The highest and lowest stages of water observed at the Signal-Service stations, during the month of January, 1883, are shown in the following table:

Heights of rivers above low-water mark, March, 1883.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.	
		Date.	Height.	Date.	Height.
<i>Red River:</i>	<i>ft. in.</i>		<i>ft. in.</i>		<i>ft. in.</i>
Shreveport, La.	29 9	11, 12	25 3	30	19 7
<i>Arkansas:</i>					
Little Rock, Ark.		1	19 7	28, 29	2 10
Fort Smith, Ark.		1	8 0	25	*-2 0
<i>Missouri:</i>					
Yankton, Dak. †	20 0	26	10 4	19	5 0
Omaha, Nebr. ‡	16 0	25	10 1	10	5 3
Leavenworth, Kans.	21 0	27	11 5	2	5 8
<i>Mississippi:</i>					
Saint Paul, Minn. †	14 6				
La Crosse, Wis. ‡	18 0	15, 16, 17	3 8	1, 2	3 4
Dubuque, Iowa. ‡	21 10	19	8 7	29, 30	5 6
Davenport, Iowa. ‡	15 0	18	7 8	31	4 6
Keokuk, Iowa.	14 6	1	12 10	31	7 2
Saint Louis, Mo.	30 0	1	25 9	29	17 0
Cairo, Ill.	40 0	1	51 10	26	24 3
Memphis, Tenn.	31 0	5 to 8	35 8	30	19 2
Vicksburg, Miss.	41 0	31	43 5	1	42 3
New Orleans, La. †	-2 6	31	-0 10	1	-2 11
Port Eads, La.		31	10 6	22	9 3
<i>Ohio:</i>					
Pittsburg, Pa.	20 0	31	14 6	29	4 3
Cincinnati, Ohio.	50 0	31	30 6	28	10 9
Louisville, Ky.	24 0	1, 31	11 8	18, 29	8 2
<i>Cumberland:</i>					
Nashville, Tenn.	42 0	31	18 10	22, 23	6 8
<i>Tennessee:</i>					
Knoxville, Tenn.		8	5 2	30	2 1
Chattanooga, Tenn.	31 0	10	9 10	24, 25	5 0
<i>Monongahela:</i>					
Pittsburg, Pa.	29 0	31	14 6	29	4 3
Morgantown, W. Va.	28 0	31	18 0	28	2 8
<i>Savannah:</i>					
Augusta, Ga.		27	13 0	18, 19	7 5
<i>Willamette:</i>					
Portland, Oreg.		30, 31	10 7	5	3 9
Umatilla, Oreg.		31	11 8	0	5 0
<i>Sacramento:</i>					
Red Bluff, Cal.		29	13 0	23, 24	1 4
Sacramento, Cal.		29	19 3	1	10 10
<i>Mobile:</i>					
Mobile, Ala.		25	17 4	26	15 4
<i>Colorado:</i>					
Yuma, Ariz.		29, 30	18 10	4, 5, 6	16 3

*Below bench-mark. † Below high-water mark of 1874. ‡ Frozen the entire month. § Frozen part of month. See text.

FLOODS.

The floods in the lower Mississippi river which had not reached their greatest height at the close of February, although less destructive than the floods of 1882, have caused loss of life and great damage to property, the heaviest losses being along the western banks of the river in Arkansas.

At Cairo, Illinois, the river fell uninterruptedly during the month, falling below the danger-line on the 12th.

At Memphis, Tennessee, it rose until the 5th, and remained stationary until the 8th, being thirty-five feet eight inches above low-water, or one foot eight inches above the danger-line. After the 8th it fell steadily until the close of the month.

The river rose about one inch per day at Vicksburg, Mississippi, until the 11th, after which it remained nearly stationary until the 21st; it then fell slowly until the 28th, when it began to rise, reaching its highest stage on the 31st, the range for the month being one foot, two inches.

At New Orleans, Louisiana, it rose steadily during the month, at an average rate of less than one inch per day. On the 31st it was within ten inches of the high water-mark of

1874 and five inches below the highest of 1882, which occurred March 27th.

Although the water in the Ohio river had fallen below the danger-line, except at points in the vicinity of Cairo, Illinois, by the close of February, its disastrous effects will long be felt at the various towns on and adjacent to the river. Great destitution prevailed among many of the inhabitants of the flooded districts. Contributions amounting to more than \$50,000 were collected by the "New York Herald" and distributed to the sufferers at the various places along the river.

Concerning the floods during March in the Mississippi south of Cairo, the following information has been collected:—

At Helena, Arkansas, the river rose one and one-half inches during the 1st, at which time it was forty-three feet, eight inches above low-water mark, and six inches below high-water mark. The water in the White and Cache rivers was sufficiently high to cause great inconvenience to the inhabitants and the drowning of cattle. Breaks occurred in the vicinity of Vicksburg, but the damage to property was slight.

On the 2d, the water in the sunk lands and Saint Francis river continued to rise, the latter having risen fourteen inches during the preceding twenty-four hours.

The river continued to rise on the 3d, and from Helena to Memphis the water covered the country for miles on either side. From the Saint Francis river to the sunk lands, a large section of country was under water, except the Indian mounds and a few high ridges. Much stock was driven back to the hills, and the inhabitants abandoned the plantations in the lowlands.

On this date (3d) the water extended to Blackfish Bayou, twenty miles west of Memphis, sweeping away the telegraph-poles and causing interruption of communication and other damage between Memphis and Helena. In several places between Memphis and Blackfish, the track of the Little Rock railroad was badly washed. A rise of two inches occurred at Vicksburg on this date, causing breaks in the levees and flooding large sections of lowlands in Mississippi and Louisiana, and also several miles of the Shreveport and Pacific railroad in the latter state.

Reports received at New Orleans on the 5th, stated that a serious break had occurred in the Pastorio levee, inundating all the plantations outside of Lake Chicot, except those which were protected by private levees. During the night of this date the Totten levee, below Friar's Point, Mississippi, gave way, making a crevasse about two hundred yards wide, through which the water rushed with great force, flooding valuable plantations in that locality.

On the 7th, the water was from three to four feet higher than the lower parts of the city of Helena, and was rapidly rising. The levee about three miles below Friar's Point Mississippi, gave way and flooded that town. Other breaks also occurred at points below this place. The town of Austin, Mississippi, about seventy-five miles south of Memphis, was completely submerged. Large numbers of sawn logs were swept away in the Saint Francis river.

At places above Memphis, on the 8th, the river had declined from four to eight inches below the highest point attained. On plantations along the river below Memphis, people were confined to the upper stories of their houses, and rafts were constructed on which stock was placed. Skiffs and "dug-outs" were the only means of communication on the submerged farms. The first break on the east bank in the second levee district was reported at Memphis on this date (8th) by the officers of the steamer "Kate Adams." Below Helena the country was flooded to depths of from five to fifteen feet. The back-water from the Hubbard break appeared in the lower end of the city.

At Memphis, on the 9th, the river had fallen one inch during the twenty-four hours ending at 1.08 p. m., and at Helena it was about stationary. From Helena to Oldtown Ridge, eighteen miles below, the lands adjacent to the river were covered to as great, and in places to greater depths than during

the flood of 1882. Much stock was lost in this section, and great distress prevailed among the laboring classes. Some of the plantations as far out as Big Creek and White river bottoms were covered where there was no overflow in 1882. The trestle-work on the Iron Mountain and Southern railroad over Langville bottom was covered with four feet of water, and the track south of Helena was also submerged. In the Saint Francis river region the people resorted to the Indian mounds as the only places of safety. The town of Lake Village, Chicot county, Arkansas, was completely submerged by the breaking of the Panther Forest levee.

At Memphis, on the 11th, the river had fallen to thirty-five feet, three inches, or a total of seven inches during the four preceding days, and was one foot below high-water mark of 1882. At points above Memphis the river was within its banks and was declining at Helena and points below. To the south of Helena to the mouth of the White river, a distance of more than two hundred miles, and westward for a distance of thirty miles, the entire country was flooded. In this section large numbers of cattle and hogs were drowned, there being no means of rescuing them. All of the residents moved into higher localities. At Austin, Mississippi, the water flowed through the streets, invading all the dwellings and flooding the adjacent country.

On the 13th, the river at Helena had fallen about two inches during the preceding twenty-four hours. Great difficulty was experienced by the river steamers in delivering freight. At Friar's Point the wharf-boat was sunk and no freight could be delivered. At Westover, Arkansas, opposite Friar's Point, the water covered everything but a few of the highest points, on which live stock was gathered. A break occurred at Mason's in the Concordia and Australia sections in Mississippi. Seven miles of the Mobile and Northwestern railroad was swept out of position for a distance of one and one-half miles. On the Saint Francis river the floods have proved much more destructive than those of 1882. Wittsburg, the largest town on the river, was inundated to a greater extent than in 1882, and the damage is also much greater.

At Memphis, on the 13th, the river had fallen thirteen inches below the highest point reached, and the back-water which had covered the Little Rock and Memphis railroad was also declining. At Helena, the decline in the river was very slow, owing to the overflowed condition of the bottom-lands of the Saint Francis and White rivers.

On the 14th, the river at Helena had fallen one inch during the preceding night. On this date the Pacific and Southern Express Company resumed their regular trips over the Saint Louis, Iron Mountain, and Southern railroad. The breaks in the levee at Beasley's, in Laconia Circle, and Mason, Arkansas, occasioned great loss of property on both sides of the river. Over 30,000 acres of the richest land in that locality was flooded to depths of from three to six feet.

On the 15th, the river had fallen to two inches below the danger-line at Memphis, and was within its banks at points above. On this date the planters throughout this section began shipping mules to their plantations and making other preparations for farming operations. On the 16th, at 1 p. m., the river had fallen to thirty-three feet, and a general feeling of hopefulness prevailed. More than 1,000 men were employed in repairing the track of the Memphis and Little Rock railroad.

On the 17th, the river at Memphis had fallen to two feet, two inches below the danger-line, being a total decline of three feet, ten inches from the highest point attained. The situation at this time and place, as compared with that of 1882, shows a favorable contrast. The floods of this year will not interfere with the planting of crops in the Mississippi valley between Cairo and Vicksburg. In 1882 it was estimated that there were at least 20,000 persons rendered destitute in the Mississippi valley, and who were sustained for more than a month by the government. With the exception of stock drowned and of fences washed away, the damage sustained by the planters this

year has been nominal. In the counties along the western banks of the Mississippi in Arkansas the floods were more serious than those of 1882. In the vicinity of Oldtown, Arkansas, they were the most destructive ever experienced. In the Saint Francis river region large quantities of the cotton seed reserved for planting purposes were lost. This will occasion serious trouble to planters, as they had disposed of large quantities of seed to the oil-mills, reserving only a sufficient supply for seeding.

The heavy rains of the 20th and 21st caused damaging freshets in the Maritime Provinces of Canada, especially in Nova Scotia. The rivers and streams overflowed their banks, flooding the lowlands and sweeping away many bridges. The tracks of the various railroads were submerged and badly washed, causing delay of trains. In the Cornwallis river at Kentsville, Kings county, the freshet was reported to have been the severest known for many years. The floods in Cumberland county were also very destructive. Three bridges across the river Phillips were carried away. The Halifax and Cape Breton railway was seriously washed near Antigonishe. The town of Sherbrooke, Guysborough county, was flooded, and some houses were washed away. Great damage was also done to the bridges and mills along Wallace river and in other localities.

At New Ulm, Austin county, Texas, on the 24th, over six inches of rain fell in nine and one-half hours. The lowlands were overflowed and much damage done by washing up the newly planted corn.

On the 18th, at Chicago, Illinois, a heavy sea along the lake shore, caused damage to the extent of several thousand dollars. A large quantity of valuable timber on the government pier was washed off and carried into the lake. Several incomplete cribs were floated away and destroyed. It was with great difficulty that the steamer "Ludington" made this port.

HIGH TIDES.

New Haven, Connecticut, 10th; Block Island, Rhode Island, 10th; Flushing, New York, 10th; Eastport, Maine, 10th, 12th, 13th; Hatteras, North Carolina, 26th, very high, overflowing part of the island.

LOW TIDES.

Fort Macon, North Carolina, 13th; Flushing, New York, 14th.

ICE IN RIVERS AND HARBORS.

Passamaquoddy bay.—Eastport, Maine: floating ice in bay from 5th to 9th.

Hudson river.—Albany, New York: 10th, ice in river opposite city moved short distance. On the 29th, the steamer "Lotta" forced passage through the ice from this city to New Baltimore, being the first departure of the season. On the 29th, the ice moved out leaving the channel clear. 31st, navigation formally opened; the tug "Niagara" arrived, having in tow several canal-boats from New York.

Roundout, New York: on the 19th, all ice south of Poughkeepsie was moving and, active preparations for the resumption of navigation were in progress. From Roundout to Hudson there were many open places, and along the shores the ice was broken and detached. The steamers on the lower Hudson made irregular trips during the previous week. The boats of the Havrestraw and Newberg line were in operation, and also those of the Homer Ramsdell line, of Newberg, and of the Poughkeepsie transportation company.

Troy, New York: on the afternoon of the 29th, the ice in the river opposite the city moved out without causing damage. At this time the river was open its entire length, but in places it was full of floating ice.

Niagara river.—Fort Niagara: during the night of the 14th-15th, the ice-bridge over the river broke up.

Broad lake.—Burlington, Vermont: lake frozen from 1st to 31st.

Lake Ontario.—Rochester, New York: on the morning of the 24th, a field of ice, about twenty miles in length, was observed

on the lake; 25th, the lake, as observed from this place, appeared to be covered with ice, and also on the 30th.

Sandusky bay.—Sandusky, Ohio: during the afternoon of the 14th, the ice in the bay began to move slowly, and on the 15th, the bay was entirely free of ice; but it again froze over on the 20th.

Delaware and Raritan canal.—Bordentown, New Jersey: 12th, canal navigation open; numerous arrivals on this date from Baltimore and Philadelphia, bound to New York.

Maumee river.—Toledo, Ohio: floating ice on the 1st, 3d, 5th; river frozen, 7th. On the 21st, the river was covered with ice from one to two inches thick. On the 27th, the river at Toledo was nearly free of ice, but at points below it was still frozen. On the 30th, the ice was disappearing rapidly.

Cuyahoga river.—Cleveland, Ohio: 8th and 9th, river was frozen during the morning but was opened by tugs; 14th, ice became detached from the shores and moved out. On the 21st, the river was again frozen; and was opened by tugs on the 24th.

Lake Erie.—Cleveland, Ohio: 19th, lake was filled with floating ice; on the 20th, it was frozen for a distance of one mile from the shore.

Detroit river.—Detroit, Michigan: drift-ice in river from 1st to 31st.

Lake Michigan.—Grand Haven: the steamer "Wisconsin" was fast in the ice, six miles north of the outer piers, from the 8th to 18th; on the latter date she was loosened from the ice-fields during a storm and arrived at Grand Haven in the afternoon. Captain McGregor reported that the ice was from twenty to thirty feet in thickness for a distance of from four to six miles, and that the ice-fields extended lakeward for a distance of from twenty to twenty-five miles. The "Wisconsin," although laden with nine hundred tons of freight, was lifted one foot above the water a few hours before being loosened from the ice. The steamer "Michigan" left harbor on the 18th for Milwaukee, and was caught in the ice about three miles off this port and is supposed to have drifted southward with the moving ice-fields.

Milwaukee, Wisconsin: Captain McIntyre, of the Goodrich transportation company, arrived during the morning of the 20th and reported that his boat was caught in the ice-fields for twelve days, six miles north of Grand Haven. The ice extended as far south as Holland, Michigan; it was from fifteen to eighteen miles wide and thirty feet in depth.

Lake Huron and Saint Clair river.—Port Huron, Michigan: the ice-bridge at Fort Gratiot light-house and the ice-dam opposite the lower end of the city broke during the morning of the 2d. There was heavy floating ice in the river on the 5th, 11th, 15th, and 28th. On the night of the 19th-20th, a second ice-bridge formed near Fort Gratiot light-house at the base of Lake Huron. On the 27th, solid ice extended out into the lake as far as the eye could reach, and also on the 31st.

Little Bay de Noquet.—Escanaba, Michigan: bay frozen from 1st to 31st.

Lake Superior.—Duluth, Minnesota: all ice moved out on the 24th; lake frozen as far as the eye could reach on the 28th.

Mississippi river.—Saint Paul, Minnesota: river frozen from 1st to 31st.

La Crosse, Wisconsin: river frozen from 1st to 31st; teams crossed on the ice up to 13th.

Dubuque, Iowa: on the 2d, the ice was about fifteen inches thick, and afforded safe transit for teams. At 10 a. m. of the 8th, the ice broke below the railroad-bridge, but teams continued to cross opposite the levee. The ice melted rapidly on the 14th, and on the 16th, an ice-dam formed on the islands below the city. On the 24th, the ice-dam above the bridge gave way. The river was free from ice except along the shore on the 28th, and on the 29th, the steamer "Keokuk" arrived from Saint Louis, being twenty-seven days later than the first arrival of 1882. Floating ice continued on the 29th, 30th, 31st.

Davenport, Iowa: the ice moved slightly on the rapids during the afternoon of the 2d; and on the 9th, the ice above the

bridge moved about one-half mile. On the 13th and 14th, an ice-dam formed at the islands below the city. The ice-dam broke on the 17th; and floating ice continued until the 21st. The steamer "J. W. Mills," (the first boat of season) arrived on the 27th.

Burlington, Iowa: the ice began to move on the 1st, and continued during the 2d. The first boat of the season arrived on the 15th.

Keokuk, Iowa: the ice broke up during the afternoon of the 1st. The steamer "Keokuk" from Saint Louis arrived on the 5th, being the first boat of the season.

Maquoketa river.—Monticello, Iowa: the ice moved out of the river on the 18th; it had been closed since December 6th, 1882—one hundred and two days. The ferry-boat began running on the 19th.

Des Moines river.—Des Moines, Iowa: the ice broke in the river on the 12th, and by the 23d the river was clear of ice.

Humboldt, Iowa: on the 12th, the ice broke up in the river between this place and Fort Dodge, a distance of twenty miles. On the 17th, the river was free from ice.

Republican river.—Clay Centre, Kansas: the ice moved out of river on the 1st.

Missouri river.—Fort Benton, Montana: the ice in the river at this place broke up at 10 a. m. of the 5th.

Fort Bennett, Dakota: ice broke up during the afternoon of the 17th.

Fort Hale, Dakota: river opened at this place on the 17th.

Fort Randall, Dakota: ice broke during the afternoon of the 21st.

Yankton, Dakota: the ice began to move at 4.50 p. m. of the 4th, but remained solid until the afternoon of the 13th, when it broke up. Ferry-boats first crossed the river on the 21st.

Omaha, Nebraska: river opened on the 9th.

Leavenworth, Kansas: floating ice from 1st to 8th, 12th, 22d, 27th to 31st.

Yellowstone river.—Billings, Montana: ice broke up during the afternoon of the 17th.

Terry's Landing, Montana: river opened on 13th.

Fort Keogh, Montana: river opened on 12th.

Gleedive, Montana: the ice broke up and moved out without damage at 3 p. m. of the 17th.

Tongue river.—Fort Keogh, Montana: river opened on 2d.

Miscellaneous.—Reports from Saint John, New Brunswick, on the 21st, stated that Mines Basin, Nova Scotia, was blocked with immense ice-fields extending from shore to shore. In the centre of the basin the ice had formed into lumps of more than ten feet in thickness and weighing many tons.

Dyberry, Pennsylvania: on the 5th, the ice on ponds in this vicinity was twenty-five inches thick.

Catawissa, Pennsylvania: navigation on the North Branch canal opened on the 31st.

WATER-SPOUTS.

The Chief Signal Officer has received from Captain A. W. Jeffery, of the s. s. "Ptolemy," an interesting letter, together with an illustration concerning a water-spout which was observed at 7 a. m. of February 10, 1883, in latitude S. 7°, longitude W. 34°.

The water-spout traveled in a westerly direction at about the rate of twenty miles per hour. The edges of the column were well-defined and seemed semi-transparent. The spiral column was a modified form of the nimbus cloud, and the well-defined edges seemed nothing but rain. As the rain became exhausted from the cloud, the column gradually diminished and finally ascended into the cloud.

Captain Jeffery states that, in his opinion, the danger from water-spouts does not arise from the deluge of water, but from the strength of the whirlwind against the canvas of the vessel.

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors